

**FOREIGN EXCHANGE RISK MANAGEMENT IN
UK MULTINATIONAL COMPANIES**

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Contents

	Page
Acknowledgements	i
List of Tables and Figures	viii
Abstract	x
Chapter 1 Introduction	1
I Rationale and Objectives of the Study	1
II Summary of the Remaining Chapters	2
III Contribution to Knowledge	7
Chapter 2 Foreign Exchange Risk: Does it Exist?	8
I The Traditional Theory	9
II The Evidence	20
II.A Methodological Issues	20
II.B Testing the Assumptions of the Traditional Theory	26
II.C Testing the Predictions of the Traditional Theory	44
III A Synthesis	66
IV Summary, Conclusions and Implications	70
Chapter 3 Corporate Exposure to Foreign Exchange Risk	74
I Classifications of Exposure to Foreign Exchange Risk	74
II From General to Partial Equilibrium	79
III Corporate Exposure to Foreign Exchange Risk	81

III.A	Gains from International Diversification	84
III.B	The Structure of Subsidiary Operations	85
III.C	Multicurrency Holdings	98
III.D	The Domestic Firm	99
III.E	Intersubsidiary Linkages	100
III.F	Conclusions	101
IV	Measuring Exposure to Exchange Risk	102
IV.A	Accounting Measures of Exposure	102
IV.B	Statistical Measures of Exposure	107
IV.C	Qualitative Measures of Exposure	109
V	Summary and Conclusions	111
Chapter 4	Managing Exposure to Foreign Exchange Risk	113
I	The Normative Case for the Management of Foreign Exchange Risk	113
II	Managing Foreign Exchange Risk	120
II.A	Managing Transaction Exposure	120
II.B	Managing Economic Exposure	123
II.C	Summary and Conclusions	134
III	Theories of Internal Organisation	134
III.A	Prior Applications	135
III.B	Intellectual Pedigree	136
III.C	Markets and Hierarchies	142
IV	Internal Organisation and Exposure Management	146
V	Conclusions	148

Chapter 5	Research Methodology	151
I	Stylised Facts	151
II	Previous Investigations	153
	II.A Research Methods	154
	II.B Limitations	156
III	Research Methods in This Study	160
	III.A Research Design	162
	III.B Data Collection Methods	169
	III.C Summary	173
IV	The Data Collection Process	174
	IV.A The Irish Subsidiaries	174
	IV.B Data Collection in the UK	180
V	Analysis of Data and Presentation of Results	185
	V.A Data Analysis	185
	V.B Presentation of Results	186
VI	Summary and Conclusions	188
Chapter 6	Transaction Exposure and the HQ Treasurer	190
I	The Role of the HQ Treasurer: Transaction Exposure	191
	I.A Classification of Practices	192
	I.B Description of Practices	198
	I.C Conclusions	211
II	Explaining the Management of Transaction Exposure	211
	II.A Trivial Transaction Costs	212
	II.B Transaction Costs	215

II.C	Implications of the Analysis	218
II.D	Conclusions	226
III	Implications of the Netting Motive	227
IV	Summary and Conclusions	229
Chapter 7	Economic Exposure and the HQ Treasurer	231
I	The Management of Economic Exposure	231
I.A	Corporate Uses of Currency Options	232
I.B	The Investment and Financing Decisions	238
I.C	Managing Economic Exposure	246
II	Discussion	252
II.A	Financial Instruments and Economic Exposure	253
II.B	Comprehensive Systems	256
II.C	The Operational Involvement of Treasurers	258
III	Conclusions	259
Chapter 8	Exchange Risk and the Foreign Subsidiary	261
I	The Immediate Impact of the Break with Sterling	262
I.A	Irish Exchange Controls	263
I.B	The Reaction of Firms to the Break	268
II	Transaction Exposure and the Foreign Subsidiary	272
II.A	Managing Transaction Exposure	272
II.B	Subsidiary-HQ Relationships	281
II.C	Summary and Conclusions	285
III	Economic Exposure and the Irish Subsidiary	286
III.A	The Marketing Subsidiaries	286

III.B	The Manufacturing Subsidiaries	297
III.C	The Exporting Firms	305
III.D	The Macroeconomic and Sectoral Impact of Exchange Rate Changes	308
IV	Summary and Conclusions	311
Chapter 9	Economic Exposure and the MNC	313
I	The Economic Exposure of the MNC	314
II	Managing Economic Exposure	325
II.A	Sticky Price Exposure	326
II.B	Traded Good Exposure	328
II.C	Parallel Importing	333
II.D	Sectoral and Macroeconomic Effects	335
Chapter 10	A Decision Support System	337
I	The Basic Model	338
I.A	Assumptions of the Basic Model	338
I.B	Theoretical Framework	339
II	Extending and Using the Basic Model	361
II.A	Relaxing the Assumptions of the Basic Model	362
II.B	Applications of the Model	365
III	Summary and Conclusions	368
Chapter 11	Summary, Conclusions and Implications	370
I	Summary	370
II	Implications	380
III	Suggestions for Future Research	380

Appendix 1	The Population	383
Appendix 2	External Validity: Other MNCs	385
Appendix 3	Exchange Rate Behaviour: The Punt	389
Appendix 4	Data Collection Guide	397
Appendix 5	Details of Irish Firms and Interviewees	407
Appendix 6	The Punt and the Media	408
Appendix 7	Listing of the Basic Model	447
Appendix 8	Tests of the Decision Support Model	464
References		472

List of Figures and Tables

		Page
Figure 2.1	Parity Relationships	14
Table 6.1	Degree of HQ Involvement in Transaction Exposure	195
Table 6.2	Degree of HQ Involvement Compared with Collier and Davis [1985]	196
Table 6.3	Degree of HQ Involvement in Transaction Exposure: Company Names	198
Table 6.4	Netting Opportunities and Centralised Action	219
Table 7.1	Treasurers' Perceptions of Exchange Risk	247
Table 8.1	Details of Irish Subsidiaries	262
Table 8.2	Managing Transaction Exposures in Ireland	273
Table 8.3	Average Proportion of Transactions Covered	277
Table 8.4	Divisional Influence	284
Table 8.5	Classification of Product Groups	286
Table 8.6	Classification of Marketing Subsidiaries	288
Table 8.7	Classification of Marketing Subsidiaries by Name	288
Table 8.8	Classification of Marketing Subsidiaries Selling Low Volume High Value Goods	294
Table 8.9	Classification of Marketing Subsidiaries Selling Low Volume High Value Goods by Name	294
Table 8.10	Classification of Domestic Manufacturers	298
Table 8.11	Classification of Domestic Manufacturers by Name	298

Table 8.12	Classification of Exporters	305
Table 8.13	Classification of Exporters by Name	305
Table 8.14	The Macroeconomic Impact of Exchange Rate Changes	309
Table 9.1	Classification of UK MNCs	314
Table 9.2	UK Sales and Exports: Traded Product Companies	316
Table 9.3	UK Sales and Exports: Traded Product and Factor Companies	323
Table 10.1	Treatment of Transactions under Double Entry: Current Cost Basis	360
Table A2.1	Probability of Sample Outcomes given the Population Frequency	387
Table A2.2	Probability of an Observation in the Sample given the Population Proportion	388
Fig. A3.1	The Sterling-Punt Exchange Rate	392
Fig. A3.2	Sterling-Punt PPP Deviations	393
Fig. A3.3	UK vs. Irish Inflation Rates	394
Fig. A3.4	Deutschemark-Punt Exchange Rate	395
Fig. A3.5	Dollar-Punt Exchange Rate	396
Table A5.1	Irish Subsidiaries: Turnover	407
Table A5.2	Irish Subsidiaries: Employees	407
Table A8.1	Test 1	469
Table A8.2	Test 2	470
Table A8.3	Test 3	471

ABSTRACT

While there have been a number of studies of foreign exchange risk management in UK Multinational Companies (MNCs), the management of economic exposure has received very little attention. The aim of this study was to describe the management of economic exposure (and its relationship to transaction exposure) in UK MNCs.

A random sample of twenty MNCs was selected, and archival data relevant to foreign exchange risk management were gathered. Finance personnel in both the HQ and the Irish subsidiaries of the twenty companies were interviewed.

The results of the study with respect to transaction exposure were similar to previous studies. However, data collected at a subsidiary level revealed that the degree of centralisation may be underestimated by HQ treasurers, since divisional personnel may influence the practices in foreign subsidiaries. The degree of centralisation was explained by the presence of transaction costs in foreign exchange markets, and a relationship between centralisation and netting opportunities was detected. The in-house bank was highlighted as a mechanism for realising transaction cost savings without decreasing operating unit autonomy.

An examination of the economic exposures of the sample companies revealed that economic exposure might be classified into four subsets:

- 1) Sticky Price Exposure (of which transaction exposure is a subset)
- 2) Traded Good Exposure (which arises from the tradability of the MNC's products and factors of production)
- 3) Parallel Import Exposure
- 4) The Macroeconomic and Sectoral Consequences of Exchange Rate Changes

The managerial response to economic exposure was also examined. The majority of corporate treasurers were only involved in transaction exposures and, with a few exceptions, the response to economic exposure was operational rather than financial. Political and promotional tactics were used extensively to manage economic exposure in the short-run. The creation of barriers to entry (and the resultant decrease in the tradability of the firm's products) was a popular medium-run strategy. The author also found that only some of the sample MNCs had significant economic exposures.

Finally, a decision support model was developed in order to operationalise the measurement of economic exposure, and the evaluation of exposure management alternatives.

CHAPTER 1

INTRODUCTION

Multinational Companies (MNCs) may be differentiated from the domestic firm by virtue of the fact that they operate in a number of national jurisdictions. One of the key economic characteristics of different national jurisdictions is the existence of different national currencies. The aim of this thesis is to document the effects of fluctuating currencies on UK MNCs and to document how UK MNCs manage foreign exchange risk. In this chapter the rationale for the study is examined and the remaining chapters of the thesis are summarised. Finally, the contribution to knowledge of this thesis is examined.

I: Rationale and Objectives of the Study

Foreign exchange risk management has received considerable attention in both the international financial management and the international accounting literature. Moreover, foreign exchange risk management is of considerable practical concern and in recent years, the profession of treasurer has emerged in the UK. However, despite both the attention which foreign exchange risk management has received in both academic and practical circles, there has been very little field research done on the practice of foreign exchange risk management. This study is based upon the premise that a more intimate knowledge of the practice of foreign exchange risk management will facilitate the development of improved techniques for the management of foreign

exchange risk. While there have been surveys of foreign exchange risk management in the past, both in the UK and elsewhere, the surveys have been limited to the examination of the HQ treasurer's involvement in the management of a subset of foreign exchange risk (transaction exposure). The objective of this study is to examine how UK MNCs manage foreign exchange risk (both economic and transaction exposure) at both a subsidiary and a HQ level. Moreover, it is hoped that this analysis will lead to suggestions as to how foreign exchange risk management may be improved in practice.

In the following section, the remaining chapters are summarised and the extent to which these objectives have been met is examined in the final section of this chapter.

II: Summary of the Remaining Chapters

The first issue tackled in this thesis is the possibility that foreign exchange risk management as a problem may be irrelevant. There is a case for suggesting that foreign exchange risk management should not concern managers. Dufey and Srinivasulu [1984] summarise the argument in the following way.

"Foreign exchange risk does not exist; even if it exists, it need not be hedged; even if it is to be hedged, corporations need not hedge it."

This statement forms the subject matter of chapters two to four. The existence of foreign exchange risk is discussed in chapter two. The theory of international parity is critically examined, and empirical studies of the parity relationships are

surveyed. The conclusion of chapter two is that there are potent empirical and theoretical reasons which support the existence of foreign exchange risk.

Having established the existence of foreign exchange risk, the effects of foreign exchange risk on the cash flows of the MNC are examined, and the prior literature in this area is reviewed in chapter three. It is shown that exposure will be firm specific, and that apart from the effects of exchange rate changes on contractual commitments (transaction exposure), the costs, prices and volumes of the MNC may be affected by exchange rate changes. Having determined how the MNC may be exposed to exchange rate changes, the measurement of exposure is examined, and it is pointed out that it is likely that there will be considerable difficulties attached to the measurement of exposure to foreign exchange risk, and that it is extremely unlikely that financial statements will reflect the effects of changes in exchange rates on the cash flows of the firm.

If MNCs are exposed to foreign exchange risk, then should it be managed, and if so, how? Some answers to this question are sought in chapter four. The normative case for the management of foreign exchange risk is similar to the arguments against the dividend and debt irrelevancy propositions in domestic finance. It is argued that there will be considerable informational and capital market barriers to 'homemade hedging' and that there is a normative case for the management of foreign exchange risk. Some of the techniques, both financial and operational, which

have been suggested for the management of foreign exchange risk are then surveyed. It is argued that there may be organisational constraints on the management of foreign exchange risk, since there will be a case for centralising it, and that it is quite possible that the locus of foreign exchange risk management may be distributed between the HQ and the subsidiary. Moreover, it is argued that the management of transaction exposure is more likely to be centralised than the management of economic exposure, due to transaction cost and measurement considerations.

The prior literature and the theoretical reasoning in chapter four lead to the rationale for this study, that transaction exposure is only a subset of foreign exchange risk and that the management of foreign exchange risk is likely to be distributed throughout the MNC. In order to demonstrate the uniqueness of this rationale as a guide to field research in foreign exchange risk management, some prior empirical studies of foreign exchange risk management are surveyed in chapter five. A research design is then proposed which consists of an examination of foreign exchange risk management at both the HQ and the Irish subsidiaries of UK MNCs. The research methods suggested consist of a combination of interview and archival data, and it is argued that a relatively unstructured approach to data collection is most appropriate to the problems being considered in this thesis.

Chapters six to nine concentrate on the results of the field study. The role of the HQ treasurer in the management of

transaction exposure is summarised in chapter six. It is noted that many UK companies allow their foreign subsidiaries considerable autonomy in the management of transaction exposure and that a significant proportion of UK MNCs do not centralise their UK transaction exposures. Moreover, these results are shown to be consistent with the results of earlier UK studies. The emergence of the internal bank as a mechanism for facilitating the centralisation of transaction exposure is also described, and it is argued that transaction cost considerations may be the main force behind the centralisation of transaction exposure. Moreover, it is suggested that it is quite possible that the future may be characterised by the increased decentralisation of the management of transaction exposure rather than increased centralisation.

The role of the HQ treasurer in the management of economic exposure is examined in chapter seven. It is shown that the HQ treasurer has very little involvement in the management of economic exposure and that there were only isolated examples of HQ treasury involvement in the use of financial instruments for the protection of economic exposure. However, it was found that the advent of foreign currency options had led to some alterations in both foreign exchange risk management policies and the role of the HQ treasurer. Indeed, the availability of foreign currency options may lead to an increased central treasury role in the management of economic exposure.

The management of foreign exchange risk in the Irish subsidiaries

of UK MNCs is summarised in chapter eight. It is shown that the management of transaction exposure is constrained by the existence of exchange controls but that operating and financial personnel were quite involved with one another in foreign exchange risk management decisions. Moreover, while the treasurer's perceived role in the management of transaction exposure at a subsidiary level was consistent with the results obtained at the subsidiary level, examples were found of HQ divisional staff attempting to influence the foreign exchange risk management policies of the foreign subsidiaries. The economic exposure of the Irish subsidiaries is also described and the management tactics used to overcome economic exposure are also summarised. In order to classify the subsidiaries, the tradability of the subsidiaries' products and factors is used as a basis for classification.

The economic exposure of the UK MNCs as a whole is examined in chapter nine. It is shown that a substantial number of UK MNCs have economic exposures, only to the extent that there is a time lag between a change in the costs of a MNC and its subsequent reflection in product prices. Moreover, transaction exposure may act as a proxy for this particular form of economic exposure. However, it is also shown that some UK MNCs have significant economic exposures and the tactics which may be used to manage economic exposure are summarised, using a six-fold classification of economic exposure.

A decision support model is developed in chapter ten which may be

used to measure the exposure of both the subsidiary and the MNC as a whole. It is also demonstrated how the effects of alternative policies on the exposure of the MNC may be evaluated. Finally, the conclusions of the study, and some suggestions for future research are presented in chapter eleven.

III: Contribution to Knowledge

This thesis represents a contribution to knowledge in so far as it provides a description of the management of foreign exchange risk (including economic exposure) at both a HQ and a subsidiary level. The main limitation of the study is that only the Irish subsidiaries of UK MNCs were examined. Moreover, the results of the study should lead to an improvement in the practice of foreign exchange risk management for two reasons. Firstly, a complete catalogue of alternative tactics which may be used to manage foreign exchange risk are presented, based upon observed management practices. Secondly, a decision support model is developed which permits managers to evaluate the effects of alternative tactics and strategies on the MNC's foreign exchange risk profile.

CHAPTER 2

FOREIGN EXCHANGE RISK: DOES IT EXIST?

"There is no sphere of human thought in which it is easier to show superficial cleverness and the appearance of superior wisdom than in discussing questions of currency and exchange."

Sir Winston Churchill
House of Commons: 28-9-1949

In the previous chapter, it was pointed out that there may be circumstances under which foreign exchange risk does not exist. The purpose of this chapter is to examine the conditions under which foreign exchange risk is unlikely to exist in order to highlight the conditions which would lead to the existence of foreign exchange risk. The traditional theory of international parity receives considerable attention in international financial management textbooks and constitutes a series of sufficient conditions for the non existence of exchange risk. In the following paragraphs, the traditional theory of international parity is critically examined from both a theoretical and an empirical perspective. One of the most interesting aspects of this discussion is the manner in which the traditional theory seemed to be accepted in both theoretical terms, and from an empirical point of view, until the end of the last decade. Since then however, the evidence against the traditional theory, both theoretical and empirical, leads this author to conclude that the traditional theory is unlikely to hold, and that it is reasonable to assume that foreign exchange risk does exist.

The traditional theory is discussed in the first section of this chapter, along with the assumptions which are sufficient to derive the theory. The empirical evidence supporting and refuting the relationships postulated by the traditional theory is then evaluated. An attempt is then made to synthesize both recent theoretical and empirical research, to demonstrate that exchange risk does exist. Finally, the conclusions and the implications of the review are examined.

I: The Traditional Theory

The 'traditional' theory of international parity, is based upon the work of Fisher, Keynes and Cassel early in the twentieth century. Giddy [1976a, 1977] resuscitated these theories and they are now standard material in the international financial management textbooks (e.g. Eiteman and Stonehill [1983], Shapiro [1982]; Feiger and Jacquillat [1981] is a notable exception). Eaker [1977] has suggested that the role of this model, rather than being seen as representative of the world, should be seen as a benchmark to signal profit making opportunities. This is a reasonable justification if deviations are the exception rather than the rule. However, the evidence suggests that deviations from parity relationships are the rule, and this in turn questions the usefulness of international parity as a benchmark.

The following paragraphs provide an exposition of international parity similar to that of Giddy [1976a] and a set of sufficient conditions for international parity to hold. Finally, an

attempt is made to discuss the a priori implications of the relaxation of these conditions.

The predictions of the Giddy [1976a] model, which in turn was based upon the work of Aliber [1976a] and Aliber and Stickney [1975], are threefold. Firstly, it is predicted that the expected exchange rate change will equal the forward premium or discount. This relationship is known as the unbiased forward rate effect. The second prediction is known as the International Fisher effect which predicts that the expected exchange rate change will equal the difference in interest rates between the two countries. Finally, the third relationship is known as the purchasing power parity theorem and predicts that the expected change in the exchange rate will equal the difference between the anticipated inflation rate in the two countries.

These three relationships may be deduced using the Fisher effect as a starting point (Fisher [1907]), which states (ignoring the cross product and using logarithms) that the nominal rate of interest (R_n) reflects the real rate of interest (R_r) plus anticipated inflation (P):

$$R_n = R_r + P \quad (1)$$

Assuming only two countries in the world, and using the superscript "*" to denote one country and no superscript to denote the other country, we can also say that this relationship

will hold in the second country.

The unbiased forward rate theory states that the forward rate (F_0) equals the expected future spot rate (S_1). By implication, the expected change in the spot rate equals the forward premium or discount.

Letting S_0 represent the current spot rate, we can say:

$$F_0 = S_1 \quad (2)$$

$$S_1 - S_0 = F_0 - S_0 \quad (3)$$

Because of opportunities for covered interest arbitrage, the expected terminal value of investing in a foreign currency denominated bond and a forward exchange contract equals that of making an investment in home currency in a similar bond.

$$R_n - R_n^* = F_0 - S_0 \quad (4)$$

The main justification for this is that if the condition did not hold, traders could earn more than the risk free return for undertaking a risk free transaction.

The International Fisher Effect predicts that the expected change in the exchange rate equals the expected interest rate differential between two countries:

$$R_n - R_n^* = S_1 - S_0 \quad (4a)$$

From equation (1) , we know that:

$$R_n = R_r + P : R_n^* = R_r^* + P^*$$

Subtracting,

$$R_n - R_n^* = R_r + P - R_r^* - P^* \quad (5)$$

Since it is a unified capital market, the real rates of interest in both countries must be equal.

$$R_r = R_r^* \quad (5a)$$

Furthermore the left hand sides of both equations (4) and (5) are identical , so:

$$\begin{aligned} F - S_0 &= R_r + P - R_r^* - P^* \\ &= P - P^* \end{aligned} \quad (6)$$

Then, using either the forward rate equation (3) or alternatively the interest rate theory of exchange rate expectations (4a),

$$S_1 - S_0 = P - P^* \quad (7)$$

This is purchasing power parity (PPP) which in ex ante terms states that the expected rate of change of the exchange rate

equals the expected inflation differential.

In terms of equations, there are a number of ways to reach the same conclusion; the system is overdetermined. In all, there are six possible relationships which underly international parity:

1. International Fisher Effect (eq.4a)
2. Purchasing Power Theory (eq.7)
3. Covered Interest Arbitrage (eq.4)
4. Unbiased Forward Rate (eq.2)
5. Fisher Effect and worldwide real interest rate (eqs. 1,5a)
6. Covered Commodity Arbitrage (eq.6)

The latter relationship has not, as far as this author is aware, been discussed in the literature before or tested. For example, Eiteman and Stonehill [1983] dismiss it by arguing that since the other five relationships hold, it will also hold. Roll [1979] discusses cross border commodity speculation as a mechanism for purchasing power parity deviations and may be construed as being in a similar vein. In principle, it would consist of selling a commodity forward in one currency, buying it forward in a second currency and using a forward contract to pay for it.

The interesting feature of these six relationships is that they are interdependent and empirical results are to some extent analagous to the degrees of freedom problem in statistics. If one relationship can be falsified, then at least one other must also be falsifiable. Figure 2.1 illustrates the interaction of these relationships and the degrees of freedom problem.

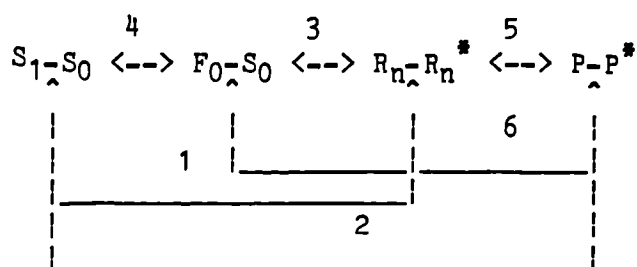


fig. 2.1

Giddy [1976a] while presenting the traditional theory as "An Integrated Theory of Exchange Rate Equilibrium", only succeeds in providing a description of exchange rate equilibrium, and manifestly fails to describe the underlying assumptions. Solnik [1978] has suggested four assumptions which are sufficient to derive these relationships. They are:

- A1 Financial markets are perfect and frictionless. There are no transactions costs, government controls or taxes.
- A2 Goods markets are perfect and frictionless. International shipment is free, instantaneous and costless. This also implies the law of one price.
- A3 There is only one consumption good, which is common to everyone.
- A4 The future is known with certainty.

Essentially, the assumptions lead to a general equilibrium setting. Unfortunately, the monetisation of such a setting, in particular with a quantity theory formulation as in Cassel [1916a] poses problems since excess demands for goods are homogeneous of degree zero in money prices while the excess demand for money is homogenous of degree one in money prices. Patinkin [1956] overcame this problem by incorporating real money balances in the system.

However, there is still a basic paradox in the model since within such a world it is difficult to find a rationale for the

existence of money, or for that matter, foreign currency.

Keynes [1937], argued that:

"Our desire to hold money as a store of wealth is a barometer of the degree of distrust of our own calculations and conventions concerning the future..."

This line of reasoning has also been pursued more recently by Clower [1965] and Leijonhufvud [1968]. The implication of this discussion is that the existence of a store of value will arise only when assumption A4 is relaxed, since consumers will no longer be perfectly informed about present and future exchange opportunities, this in turn may lead to the non clearance of other markets and the violation of assumptions one and two.

Rather than formally derive the parity relationships, the remainder of this section shall analyse the consequences of relaxing these assumptions. Firstly, it is necessary to specify which relationships are contingent on particular assumptions.

A1	=> Interest rate parity (IRPT)
A1 + A4	=> The unbiased forward rate (UBF)
A1 + A2 + A3	=> Purchasing power parity theory (PPPT)
A1 + A2 + A4	=> The Fisher effect (FE)
A1 + A2 + A3 + A4	=> The international Fisher effect (IFE)
A1 + A2 + A3 + A4	=> Covered commodity arbitrage (CCA)

I.1: Relaxing the Assumption of Perfect Financial Markets

This possibility has not been analysed to any great extent in the literature. On a priori grounds, it seems reasonable to argue

that imperfections may hinder all the relationships. Unfortunately, obtaining determinate solutions in the presence of transaction costs, or segmented international financial markets, is not amenable to many of the analytical techniques in financial economics. Deardorff [1981] has examined the effect of transaction costs on IRPT and we will return to his analysis in the section on the tests of IRPT.

I.ii: Relaxing the Assumption of Perfect Goods Markets

Again, this assumption has not received much attention in the literature. Grauer et al. [1976] did examine the case of ad valorem imperfections, but otherwise, empirical evidence against the law of one price has been invoked against this assumption rather than a priori arguments. It is however worth noting, that a number of macroeconomic models and the exposition of Adler and Lehmann [1983] assume that goods markets are 'stickier' or more inefficient than financial markets. This issue will be dealt with more fully in section III.

I.iii: Relaxing the Assumption of a Single Good

This assumption has received widespread attention in the literature, and Adler and Dumas [1983] suggest it as the basis of international finance. The difficulties with relaxing this assumption arise from the problem of constructing an index to represent the consumption of many goods 'as if' they were only one good in order to produce a 'well behaved' measure of price

change in the form of an index. Burstein [1963, p12], suggests the following scenario to indicate the difficulties in constructing price indexes. Burstein [1963] considers the case where there are three types of individual in the world:

- 1) Mohommedans who love proteins, are allergic to cotton and live in countries without highways.
- ii) Hindus, allergic to horses, living in a country with good roads and a warm climate.
- iii) Vegetarian seventh day adventists who are allergic to wool.

Such a world with heterogeneous consumption tastes leads Burstein [1963 p13] to conclude that:

"It is abundantly clear that alternative sets of prices cannot be ordinarily considered independently of the tastes and habits of the persons involved when one ranks purchasing powers of money."

Apart from habits and tastes, and of varying consumption opportunity sets, there is also the issue of homotheticity. Samuelson and Swamy [1974, p592], refer to this as a 'Santa Claus hypothesis', since it is invoked to overcome difficult analytical problems. It implies that (Samuelson et al. [1974, p568]):

"Each dollar of income be spent in the same way by rich or poor...otherwise, a price change in luxuries could affect only the price index of the rich."

More formally, it amounts to assuming unitary income and technological elasticities. The analytical implication of homothetic preferences is that the bundle of consumption goods in the index may be treated as if it were only a single consumption good, with individual goods consumed in constant proportions. Stulz [1981] and Breeden [1979] suggest techniques to overcome

these problems, however such solutions require both a marginal and an average index. The assumption of a single consumption good may therefore be replaced by the assumption of identical worldwide homothetic preferences. If it is not the case, deviations from PPP, IFE and CCA will be observed.

Solnik [1974] and Adler and Dumas [1983] use the assumption of identical homothetic preferences within countries but non identical preferences between countries as a characterization of the asset pricing problem in an international context. The main implication of this characterization is that investors in different countries, if they are interested in real rather than nominal returns, will use different price indexes to deflate asset returns and this leads to obvious complications with the normal separation theorems of asset pricing theory. It should also be pointed out that, models which attempt to describe asset pricing in a domestic setting under inflation (e.g. Friend, Landskroner and Losq [1976]) are also relevant to this particular formulation of the international asset pricing problem.

I.iv: Relaxing the Certainty Assumption

This scenario will invalidate the Fisher effect, the international Fisher effect, the unbiased forward rate and covered commodity arbitrage. The first three difficulties are illustrated by Grauer et al. [1976], using fluctuating inflation rates as a form of uncertainty. Essentially, they use a model which is identical to a domestic economy, with the addition of

some extra nominally riskless securities, which permit bets to be taken on the outcome of a number of uncertain inflation rates. Assuming risk averse investors, there will be risk premia based on these monetary factors. However, investors in different geographical locations will price assets identically.

I.v: Relaxing both the Certainty Assumption and the Perfect Goods Markets Assumption

Roll and Solnik [1977], suggest an asset pricing model where exchange risk arises from imperfections in goods markets. In such a setting commodity prices are uncertain and PPP will be derived in terms of expected prices. Uncertain transaction costs, import and export taxes and other imperfections will lead to random fluctuations in the price of the good, and hence, the presence of risk premia.

I.vi: Many Goods in an Uncertain World with Homothetic National Preferences.

Solnik [1974] examines this possibility. Unlike the Grauer et al. [1976] monetary uncertainty, Solnik assumes that the monetary authorities maintain the inflation rate constant. This leads to the random fluctuation of exchange rates with the relative value of national consumption baskets. Exchange risk arises because of uncertain changes in the real value of the national consumption basket.

I.vii: A Conclusion?

The foregoing analysis suggests that there may be strong reasons for questioning the pre-eminence of the theory of international parity on a priori grounds, since it is not robust to relaxations of the sufficient conditions posited by Solnik [1978]. Both the empirical tests of the assumptions and the predictions of the traditional theory are reviewed in the next section.

II:The Evidence

This section examines empirical tests of the assumptions and predictions of the theory of international parity. The section falls into three parts. Firstly, there is a discussion of some methodological problems associated with many of the studies cited. Secondly there is an examination of tests of the assumptions of the theory and finally a summary of some tests of the predictions of the theory.

II.A: Methodological Issues

The main issues relating to the research methods and designs used in empirical studies of the international parity relationships are the time period studied, the countries and markets studied, the comparability of the studies, the ex post nature of the data used, the design of statistical hypothesis tests, and the assumed distribution of exchange rate changes. The main reason for discussing these issues is to highlight the difficulties in

interpreting the tests of international parity.

The international parity relationships are postulated to hold under freely floating exchange rates. Unfortunately, freely floating exchange rates are a relatively recent phenomenon and fixed exchange rates or dirty floats have been dominant during this century. The only other periods when exchange rates floated in the twentieth century were in the period from 1914 to the mid 1920's and in Canada in the mid fifties. Apart from these two periods, floating rates have only been in existence since 1973, and this in turn leads to relatively small numbers of observations of exchange rate changes until comparatively recently. Moreover, even in the most recent period, government intervention in foreign exchange markets has been considerable (cf. Aliber [1978]). The net result is that until recently, there has been insufficient modern data. Furthermore, the external validity of tests carried out on data which is now sixty years old, given the changes in the world economy, may be questioned.

Secondly, many of the studies have been carried out by American researchers using exchange rates vis-a-vis the dollar. The dollar may be unrepresentative of other world currencies given its use as an international medium of exchange. In addition, many of the studies have focused only on the currencies of developed countries, and some research studies which have been carried out using more comprehensive data, suggest that developing countries may systematically differ from developed

countries. A notable exception to this tendency is the study of black markets in foreign exchange.

Thirdly, there is virtually no duplication or replication of studies and in most cases, studies are incomparable, since they use both different data sets and different statistical techniques. It is therefore difficult to know why researchers have obtained different results to prior researchers.

The fourth issue arising from these studies is that they may be criticised as invalid tests of the theory of international parity. The theory is stated in an expectational form, and in order to test the theory, expectations of financial variables rather than realised financial variables should be used. For example, earlier tests of the unbiased forward rate used the realised spot rate as a proxy for the expected future spot rate. More recent studies have attempted to adjust this formulation for expectational errors. Recent studies have also made use of the Livingstone data on inflationary expectations, as a proxy for expected inflation.

The tests also pose some statistical problems since many of the tests involve the use of an ambiguous unspecified alternative hypothesis. For example, studies of exchange market efficiency fail to specify the nature of the alternative of inefficiency, while tests of the unbiased forward rate may fail to specify the nature of the bias. This may to some extent be due to the lack of a coherent theory to specify such variables, which in turn

leads to the question of the power of tests, in which, due to the lack of a coherent theory, it is difficult to control for other variables. Moreover, the studies examined below are replete with joint hypothesis problems. For example, tests of the unbiased forward rate may involve a joint hypothesis of no bias and a model of expectation formation, while Levich [1978a] points out that efficient market tests involve a test of both market efficiency and a hypothetical structure of "normal" equilibrium returns. It should also be pointed out that many of the tests of purchasing power parity, and to a lesser extent the unbiased forward rate, use single equation models. Bilson [1984] argues that a single regression between a security and a dependent variable would never be considered because of noise, while this approach is used throughout the foreign exchange literature.

Finally, the distribution of exchange rate changes represents one of the most fascinating puzzles in the international financial management literature. If exchange rate changes are distributed non normally, then there are likely to be considerable problems in the interpretation of research results which use parametric statistical techniques. Moreover, portfolio theoretic approaches to foreign exchange risk will need to involve restrictive assumptions about individual utility (i.e. parabolic utility) in order that the covariance matrix may be interpreted. It is therefore important to know the distribution of exchange rate changes since it will affect the analytical and statistical techniques used, as well as form a basis for the development of theories of exchange rate determination which explain the

observed distribution.

However, the studies of the distribution of exchange rate changes are not without their own problems; in particular, demonstrating that a sequence of observed random variables is stable and non-normal is hazardous unless both random and chronological orderings of the variable are used [Granger 1975]. Westerfield [1977] has tested for normality and maintains that exchange rate changes can be modelled as non normal Pareto Levy distributions. However, the study used only chronological orderings of exchange rate changes to establish the value of the characteristic exponent. Vinso and Rogalski [1978] supported the results of Westerfield [1977] and found that a Pareto-Levy distribution produced a reasonable fit.

MacFarland et al.[1982] attempted to overcome the deficiencies of Westerfield's[1977] study by testing both chronological and random sequences. They also studied a later time period (January 1975 to July 1979) and found that the distribution had a characteristic exponent which increased as the sample size of the observations increased. Burt et al. [1977] and Dooley and Shafer [1976] have also produced results which support this evidence.

Calderon-Rossell et al.[1982] found that distributions were different for different currencies and concluded that the distribution of exchange rates was non unique and suggested that central bank policies and underlying economic forces may explain

this observation. However, they did not attempt to test this hypothesis. They also expressed "serious doubts" about empirical studies which relied on normality as an assumption [op.cit.p109]. MacFarland et al. [1982] produced evidence of trading day effects. They suggest using daily data with 'extreme caution' and that:

"standard deviations calculated from sample observations should be used with caution in assessing the extent of risk associated with holding foreign exchange."

[op. cit.p713]

As yet, there has only been one study of minute by minute exchange rate changes. Wasserfallen et al. [1985] examined the Swiss Franc - Dollar exchange rate and found that the distributions were non normal. They concluded [op. cit., p.65]:

"On the whole it appears that the process generating returns on the foreign exchange market changes in several important dimensions from one day to the next. Not even adjacent days form an exception to this rule as the results ... demonstrate. Assuming the existence of one specific distribution over long periods of time as it is done in examinations of daily, weekly and monthly data, does not seem to be an appropriate procedure."

This finding would suggest that the distribution of exchange rate changes is both non normal and unstable. Moreover, by examining instantaneous changes, it would seem that models of international asset pricing assume an overly simplified stochastic process.

On a less pessimistic note, the Farber et al.[1977] study suggests that the return from holding a foreign currency deposit may not deviate as much from normality as the distribution of foreign exchange rate changes. On balance, it would seem that

the ex post distribution of exchange rate changes is non normal. Should this also be the case for the ex ante distribution, then it will have implications for many areas in international financial management. The MacFarland et al. [1982] results may be explained using a combined diffusion and jump process. However, if the processes are unstable, even relatively complicated models of portfolio selection such as that of Kouri [1976] which incorporates both a jump (Poisson) and a diffusion process are likely to be over stylised versions of reality.

One might conclude by pointing out that there are limitations to empirical examinations of the international parity relationships, and that the results are difficult to interpret. It should be borne in mind that until the end of the last decade, researchers believed that empirical evidence confirmed the traditional theory of international parity. In the following section, it will be shown that empirical evidence would lead one to reject the traditional theory. Given that a change in beliefs has occurred once, there is no reason why beliefs may change again and that the theory of international parity will once again come into vogue when tests are refined and modified. Finally, the discussion illustrates the difficulty of testing the theory of international parity, since the conditions necessary for the theory to hold have never been stated.

II.B: Testing the Assumptions of the Traditional Theory

In the first section of this chapter, it was pointed out that

Solnik [1978] had suggested four assumptions which represented sufficient conditions for the theory of international parity to hold. Solnik [1978] points out that if there are perfect frictionless commodity and financial markets, there is only one consumption good and the future is known with certainty, then the theory of international parity would hold. In this part, the issue of whether these conditions are likely to be met in practice is examined.

II.B.i: The Assumption of Perfect Goods Markets

If goods markets are perfect and frictionless, then one would imagine that the law of one price would hold. Studies by Crouhy-Veyrac et al. [1982], Isard [1977], Katseli-Papaefstratiou [1979] and Richardson [1978] would indicate that in practice the law of one price is violated, and this author could not locate a study which suggested that the law of one price holds. Indeed, Isard [1977, p942] concluded that:

"In reality, the law of one price is flagrantly and systematically violated."

It is however possible that the law of one price fails to hold due to different tastes, or transaction costs in goods markets. The Richardson [1978] study is particularly interesting in this regard, since he based his conclusions on US and Canadian data. One would expect that barriers to arbitrage would be relatively low between these two countries, however Richardson found that commodity arbitrage could not be detected for the majority of commodity classes, and that the law of one price was violated.

Therefore, it would seem that there are substantial imperfections in international goods markets.

II.B.ii: The Assumption of Homothetic Preferences

In order to examine whether preferences are homothetic, one could examine purchasing power parity deviations, in order to disaggregate the deviation into a portion which is attributable to deviations from the law of one price and the portion which is attributable to differences in national consumption baskets. Kravis et al. [1975] and Kravis and Lipsey [1978] examined deviations from purchasing power parity using both individual national index weightings and a unitary weighting system. . They found that a significant proportion of the purchasing power parity deviation could be explained by heterogeneous national weightings. This finding would lead to the conclusion that national consumption baskets do differ, and that the assumption of homothetic consumption preferences, at a global level, is unacceptable. They also examined the importance of deviations from the law of one price as an explanation of purchasing power parity deviations and concluded that the deviations were due to both the invalidity of the law of one price and the existence of heterogeneous international consumption preferences. Roll [1979] also acknowledged the importance of differing national consumption bundles, but argues that purchasing power parity deviations arose from government imposed distortions.

II.B.iii: The Assumption of Perfect Financial Markets

There are a variety of types of tests of the degree of perfection of international financial markets. In this section, three types of test will be examined. Firstly, one could examine the extent to which the law of one price holds in financial markets. The amount of research in this area is quite limited. Maldonado and Saunders [1983] found that the law of one price held for securities which were traded on both the New York and London Stock Exchanges. Secondly, one could examine the extent to which foreign exchange markets were informationally efficient, and finally, one could examine the extent of world capital market segmentation. The latter two types of test are examined in the following paragraphs.

II.B.iii.1: The Informational Efficiency of Foreign Exchange Markets

Tests of the informational efficiency of foreign exchange markets are of considerable importance. Firstly, if one found that foreign exchange markets were not informationally efficient, then it is unlikely that foreign exchange markets are efficient in other respects. Secondly, if foreign exchange markets are informationally efficient, then MNCs operating in foreign exchange markets are unlikely to earn abnormal returns unless they have a comparative forecasting advantage. Thirdly, some modern theories of exchange rate determination assume that foreign exchange markets are informationally efficient.

Despite the importance of informational efficiency in international financial management, Kohlshagen [1978a, p34] points out:

"It seems that the basis for this literature - namely, what is conclusive evidence of an efficient foreign exchange market, has not been very well developed."

The first step in the development of a concept of efficiency is to define informational efficiency. Beaver [1981], in the context of efficiency in securities markets, has suggested the following definition:

"The market is efficient with respect to some information system (η) if and only if the prices of the securities are the same as they would be in an otherwise identical economy (with the same configuration of preferences and endowments and information systems), except that every individual has access to " η " as well."

At first glance, one would expect that this definition might be equally applicable to foreign exchange markets, however there are two important differences between foreign exchange markets and security markets which may pose problems for the definition.

Firstly, governments intervene in foreign exchange markets. This may in turn render the foreign exchange market a non zero sum game. Taylor [1980] maintains that the foreign exchange losses of the five largest central banks in the world exceeded ten billion dollars between 1973 and 1979. Aliber [1976a] has produced similar evidence.

Secondly, it is difficult to define an information system within the foreign exchange market. Unlike securities markets, one cannot readily define the universe of publicly available

information, given that there is no analogue to statutory financial reporting in foreign exchange markets. Moreover, 'strong' forms of efficiency (Fama [1970]) are unlikely, given the informational advantages of central banks.

Two types of information system have been examined in the literature. The first type of information system is the use of past price data. Such a system is similar to the 'weak form' partition suggested by Fama [1970]. However, it is impossible to establish that one cannot earn abnormal returns using past price data, since there are an infinite number of ways of combining past data. Weak form efficiency cannot be unambiguously established unless all possible models incorporating past price data are tested.

The second type of information system which has been examined is the ability of commercially available forecasting services to produce 'superior' forecasts. These may be based on past price trends, judgement or econometric models. Apart from forecasts based upon past price trends, this form of test may be seen as analagous to tests of semi-strong efficiency in securities markets. The two types of test are examined in the following paragraphs.

II.B.iii.2: 'Weak Form' Efficiency

Studies of weak form efficiency closely parallel the methods used in the 'Random Walk' literature. Poole [1967] studied ten time

series of flexible exchange rates and found that they could be approximated by a martingale. He did however detect significant serial dependencies, particularly for the Canadian dollar and therefore he rejected the random walk hypothesis. This evidence presumes a stationary distribution of returns, which may not be the case.

Apart from studies which test a random walk hypothesis, other studies have been carried out which use runs tests, spectral analysis and filter rules.

Grubel [1965,1966] found that the use of simple filter rules in the forward exchange market would have yielded significant profits in the late fifties. Dooley and Shafer [1976] carried out similar tests in the floating period from March 1973 to September 1975 for nine currencies. They maintained that it was possible to trade profitably using simple filter rules. Cornell and Dietrich [1978] used the same time period as Dooley and Shafer [1976] and claimed that the foreign exchange markets were at least weakly efficient and that the rate of return on spot contracts approximated the distribution of common stock and commodity futures contracts. They also maintained that the profits from filter rules and rules based on runs tests were not enormous and that they might only be sufficient to compensate for filter search costs and risk.

Upton [1972] used spectral analysis for the ninety day forward dollar using weekly observations from 1961-1967. He maintained

that there were three different cycles of varying lengths in operation. This would suggest the existence of profit making opportunities.

McInish et al.[1982] used a runs test to overcome the deficiencies of serial correlation tests which assume normality. They examined nineteen international money market instruments and found that inefficiencies could only be detected in four instruments.

Wasserfallen et al. [1985] using data on instantaneous exchange rate changes found that there were cases of significant autocorrelations, particularly in periods of less than five minutes. However the serial correlations were unstable, and they argue that it was unlikely that excess profits could be earned.

Giddy and Dufey [1975] examined data for four currencies in the periods 1919-1926 and 1971-1974. They attempted to test for 'memory' in spot prices and concluded that:

"For short periods, one is able to detect a low degree of market inefficiency in the foreign exchange market. But the longer the forecasting horizon, the more evident is the inaccuracy of the time series forecasting of exchange rate changes."

They tested five alternative models using different trading rules. They found that the best predictor was the current spot rate adjusted for interest rate differentials.

A more recent study by Cosset [1982] tested for bias in the

Eurocurrency markets. He found that the forward rate was a biased but non optimal predictor of future interest rates. He found no support for the existence of a systematic risk premium and found no serial correlation in the error terms. He therefore concluded that it confirmed a 'weak market efficiency' (cf. Fama 1970). He also found that for five out of the seven currencies tested, the forward rate was superior to either autoregressive models or martingale models, but that ARIMA time series models were superior to the forward rate. This conclusion had one caveat however, the data used to construct the ARIMA model were based on the whole sample period and might therefore contain an information set that was unavailable to the market ex ante.

One might safely conclude that the poor performance of models tested by academics using time series of exchange rates is consistent with weak form efficiency. However, it is possible that currency forecasters may have access to superior models which incorporate past price data. Fortunately, there has been some research dealing with the success of forecasting services which use technical analysis and chartist techniques. It should be pointed out that these tests do not adjust for the costs of acquiring information and are therefore ambiguous (cf. Grossman and Stiglitz [1976]).

Technical analysis consists of using past trends in prices to extrapolate future trends in prices. If technical analysts provided their forecasts for nothing and users succeeded in earning abnormal returns, then one might conclude that weak form

efficiency does not hold. Rosenberg [1981] pointed out that:

"Few forecasting tools have been received so enthusiastically by the market and scorned so completely by academics as technical analysis."

Rosenberg [1982] has argued that technical analysis may be useful given that exchange rates overshoot. However, he does not define overshooting, and overshooting in Dornbusch [1976] is entirely consistent with weak market efficiency. Technical analysis is not.

Goodman [1979] attempted to evaluate the performance of technical analysts and found that they were superior to econometric models at forecasting. He tested both chartist and momentum models against econometric models for six leading currencies over three years for three and six month forecasting horizons. However, he assumed that one could act on the information from the technical forecast upon receipt of the forecast, whereas users of econometric services could not act until the end of the month.

Goodman [1978,1980,1981,1982] and Goodman and Jaycobs [1983] have done annual surveys evaluating technical analysis against one econometric forecasting service. The results are however based on the returns from "selective" hedging based on two services agreeing on the likely exchange rate movement. It might therefore be reasonable to suggest that his results are weighted against the econometric service outperforming the technical service. Moreover, subscribing to a number of forecasting services in order to obtain a consensus forecast is likely to be

relatively costly.

II.B.iii.3: Semi-Strong Tests of Market Efficiency.

Unlike securities markets, there is no required information disclosure in foreign exchange markets. This in turn implies that it is more difficult to define publicly available information. One possible information set albeit a costly one (cf. Ensor and Antl [1982]), is the use of a forecasting service which uses economic data to produce forecasts. Unfortunately, some of the services tested are also 'judgemental', and returns from the use of such services may include monopoly returns to expert skills or access to non public information.

One approach to examining the role of publicly available economic information set is the use of discriminant analysis. Murenbeeld [1975] and Folks and Stansell [1975] have published papers maintaining this method is successful in fixed rate systems. These models are of interest since they may alert one to potentially important variables, given their inductive nature. However, Foster [1978] has referred to such exercises as "fishing expeditions" in the context of bankruptcy models.

Folks and Stansell [1975] used devaluations in 1963-4 and 1967-8 to obtain weights and then tested the model on 1971-2 data. They attempted to predict a devaluation of more than five per cent for fifty-one countries and had a success rate of eighty-six per cent. They found that the growth of reserves ratio, the

rate of change of the consumer price index, the ratio of imports to exports and the ratio of debt service costs to reserves were significant variables. Furthermore, they found both the rate of money supply growth and the marginal propensity to import were insignificant.

Murenbeeld (1975) produced a similar model, to predict both the direction and timing of an exchange rate change. He found a different set of variables to be significant. They included wholesale price inflation, unemployment, the ratio of reserves to imports, the rate of change of reserves, the rate of growth of the money supply and the budget deficit as a percentage of gross national product. The model had a success rate of seventy eight per cent until 1971, after which it failed to perform as successfully.

It would seem that forecasting exchange rates under fixed rate regimes is possible, whereas the models are less successful under floating exchange rate regimes. The papers suggest that in situations of pegged currencies, or fixed parity regimes, abnormal profits may be possible. However, the costs of developing and using the models may be less than the returns earned; this possibility has not been tested empirically.

Apart from studies which construct models incorporating publicly available information, another approach is to test the ability of forecasting services to produce superior forecasts. The approach is not without its limitations, which might include:

1. The measurement of success is not entirely clearcut. For example, Min [1980] has pointed out that measures of success such as the mean absolute forecast error and the mean squared forecast error may not be of interest to the users of forecast services. One might in the first instance measure success as a correct forecast of the direction of an exchange rate change. Then one might focus on predicting the amount and timing of the change.
2. It is necessary to obtain the co-operation of forecasting services, in order to test their forecasting ability. It is quite possible that there may be a systematic difference in the forecasting abilities of co-operating services.
3. The costs of the forecasting services are ignored. Moreover, there could be cost differences between forecasting services.
4. Spivey and Wroblewski [1979] point out that correlations between the forecast errors of econometric models, renders the ranking of the performance of forecasting services ambiguous.

A number of authors including King [1979] and Prefontaine [1980] have studied the performance of the forecast services. The most prolific researcher in this area however is Richard Levich, and it is to his work that we now turn.

Initially, Levich [1980] found that the forecasting services' performance had a mean squared forecast error greater than the

forward rate. Interestingly, he also found that judgemental forecast services were superior for periods of less than one year whereas econometric services were superior for periods of more than one year. Using a composite approach, Levich [1981a] found that for one month forecasts, the services had a seventy two percent success rate, and for two month forecasts they had a sixty nine per cent success rate. Further work, led Levich [1981b] to conclude that there was a possibility that the services "exhibited expertise". However, a later study in Levich [1982c] suggested that the result for 1981 may have been misconceived. In the final study, Levich [1983b, p47] concluded that:

"The nagging possibility is that foreign exchange relationships may evolve more quickly than many forecasters can comprehend or make judgements."

Given that a single forecasting service is unlikely to be successful, an alternative approach has been suggested in the literature. Bilson [1981] argues that using only one forecasting service is analagous to holding only one share in one's portfolio. He therefore suggests an approach to the use of forecasts based on Markowitz [1952]. The essence of the approach is using the error terms of different forecasting services to attach a series of weights to individual forecasting services based on their past performance and then use a "composite forecast" for making decisions. The approach has been tested by Levich [1981] and Bilson [1981]. They both report considerable success using this approach. The only difficulty with the approach is that the 'one share in one's portfolio' analogy may be misleading, since one must pay for a forecasting

service, whereas one hopes to earn a return on a share. Neither Bilson [1981] nor Levich [1981] take account of the increased costs of subscribing to all forecast services.

On the other hand, the composite approach may be a more appropriate test of market efficiency, since one would expect that the composite forecast should be reflected in exchange rate expectations if the market is efficient in an informational sense. This argument is similar to that of Figlewski [1978] and Figlewski and Urich [1983].

The informational efficiency of the foreign exchange market is to some extent still a debatable issue. Certainly, compared to tests of stock market efficiency, the results have not been as clear cut. Moreover, two recent studies are somewhat disturbing. Bilson [1984] used purchasing power parities to devise profitable trading strategies. Unfortunately, it is impossible to determine whether the profits are due to an inefficiency or a risk premium. The profits were uncorrelated with the Standard and Poor 500, so if the profits arise from a risk premium, it is difficult to establish the source of the risk premium. Sweeney [1986] using daily data since 1973 devised profitable trading strategies based upon filter rules. If the risk premium were constant over time, profits could not be explained. He suggests that the results could arise from speculative bubbles, government intervention or the lack of stabilising speculation. Unfortunately the evidence could be consistent with either a market inefficiency or the existence of

time varying risk premia. The difficulties of testing for risk premia are examined in a later part of this chapter.

From the point of view of corporate policy the implications are unclear. It would seem that commercial forecasting services are unlikely to provide superior forecasts. It is also possible that forecasting success may be increased using a portfolio of forecasts. However, it is possible that abnormal profits may be earned using relatively simple trading strategies. The real difficulty rests in deciding whether the abnormal profits arise from risk premia in foreign exchange markets or from market inefficiencies. This latter issue is still an open issue, but it will be assumed in the remainder of this chapter that financial markets are more efficient than non financial markets.

II.B.iii.4: Market Segmentation

While market segmentation may arise from the segmentation of international commodity markets, it may also arise independently because of government restrictions or disincentives on overseas investment, and because of investors' lack of information or irrational fears of expropriation. The issue is however an important one, since if capital markets are segmented internationally, then corporate financial decision-making rules will need to be modified. Unfortunately, a satisfactory method of determining the extent of segmentation has not been devised.

One approach to examining the extent of capital market segmentation is to examine the extent to which there are gains from internationally diversified portfolios. Grubel [1968], Levy and Sarnat [1970], Lessard [1974] and Solnik [1974b] examined the possibility of obtaining efficient portfolios of national stock market indices and found that there would be considerable scope for risk reduction by using international diversification. While these studies were based upon the degree of correlation between market indices, an alternative approach used by Agmon [1972], Solnik [1974c] and Lessard [1976] consists of regressing stock returns or index returns on a world market index. The implication of both types of study is that there are substantial gains from international portfolio diversification.

The index approach has been successfully applied in a domestic context, because any residual risk is diversifiable. In an international context where there are deviations from purchasing power parity, investors in different countries will differ as to the constituents of an efficient portfolio, unless they have logarithmic utilities (see Adler and Dumas [1983]). Moreover, the rates of return may not be stationary. Maldonado and Saunders [1981] produced evidence which suggested that returns were not stationary, whereas Phillipatos et al. [1983], using a more refined statistical technique, found evidence of stationarity.

While one might argue that low covariances may be consistent with segmentation, they may also be consistent with a perfectly

integrated capital market, since the output mixes of countries may differ, and therefore, may be subject to different state variables. One might conclude that the portfolio approach may not be an appropriate test of capital market segmentation.

It is however possible to produce evidence consistent with the output mix explanation of low covariances by examining the role of MNCs as tools for investor diversification. Studies by Jacquillat et al. [1978], Brewer [1981] and Senshak and Beedles [1980] all concluded that MNCs were poor surrogates for holding stocks in different countries. Only one study (Agmon and Lessard [1977]) produced contradictory evidence. One might conclude that this evidence was consistent with the output mix hypothesis. However, it is difficult within this form of research design to distinguish between the gains from exploiting monopoly power, and the gains from international diversification (see Errunza and Senbet [1981, 1984]). One would expect that the completeness of the market will only be increased if MNCs invest in countries where no other MNC has invested, since investment by a UK MNC in the US is replicating market opportunities which already exist.

An alternative approach used by Stehle [1977] is to specify different asset pricing models under different conditions. In order to overcome deviations from purchasing power parity, Stehle assumed that investors have logarithmic utilities. In an integrated capital market, the relevant portfolio is the world portfolio, whereas in a world characterised by segmented national

capital markets, the efficient portfolio will be the national portfolio. Stehle, using US data, was unable to discriminate between the two models.

Errunza and Losq [1985] use a variant of the Stulz [1981a] model to test the segmentation hypothesis. Unlike the Stehle [1977] approach, it incorporates a continuum from complete integration to complete segmentation. They discovered that there was 'tentative' support for a hypothesis of mild segmentation when US returns were examined against the returns from a number of less developed countries.

On balance, it might be concluded that there are considerable problems associated with the development of an appropriate test of the degree of international capital market segmentation. Empirical work to date suggests that capital markets are neither totally integrated nor totally segmented, but that a degree of segmentation exists. . However, this result is extremely tentative until further research is completed in this area.

II.C: Testing the Predictions of the Traditional Theory

In the previous part, some tests of the sufficient conditions for the theory of international parity were examined. One might conclude that while financial markets would seem to be relatively perfect and frictionless, goods markets are not. It would be premature to conclude that the theory of international parity does not hold on the basis of this evidence, since it is quite

possible that there is an alternative set of sufficient conditions. In this section an instrumentalist approach is applied by examining the predictions of the traditional theory. Each of the predictions is examined in turn and tests of the predictions are discussed.

II.C.1: Purchasing Power Parity Theory (PPP)

Purchasing power parity is one of the most important predictions of the traditional theory, since it is a necessary condition for the absence of economic exposure in a single commodity world, or in a world where homothetic preferences prevail.

The origins of PPP may be traced back to the writings of the Spanish Salamanca School in the late sixteenth century (see Kalamatousakis [1978], Officer [1976, 1976a, 1982a, 1982b] and Einzig [1970]). More recently, Gustav Cassel has been acknowledged as the driving force in the twentieth century and coined the term 'Purchasing Power Parity' in Cassel [1918].

Officer [1976] distinguishes two versions of PPP. Firstly, there is the absolute version which states that the exchange rate equals the ratio of the foreign to the domestic price level. Unfortunately, as Isard [1978] points out, this version is virtually untestable. Secondly, there is the relative version of PPP which states that the exchange rate reflects changes in the price level between two countries since a base period when the two exchange rates were in equilibrium. While this version

is testable, it should be pointed out that it is unlikely that one can establish or indeed identify an initial equilibrium.

The mechanism by which PPP is attained is a further issue. Grauer et al. [1976] have proven that PPP may be attained if individuals have homothetic tastes and commodity price parity holds. Empirical studies summarised in the previous section did not support the existence of either homothetic tastes or commodity price parity. An alternative approach is to examine PPP in a macroeconomic context and argue that PPP is the outcome of monetary equilibrium. Cassel [1916a] suggested the 'Quantitative Theory of Money' as a mechanism to attain PPP. Similarly Frenkel [1976] argues that PPP is a product of international monetary equilibrium and that (Frenkel [1978, p188]):

"The relationship embodied in the traditional forms of PPP should not be viewed as a theory of the determination of exchange rates. Rather, it describes an equilibrium relationship between two endogenous variables. As such, the PPP relation should be viewed as a short cut rather than a substitute for a complete model of the determination of prices and exchange rates."

This argument amounts to PPP having the same status as the Phillips Curve, a construct which has been empirically observed, for which there is no underlying theory. The only difficulty with this approach is that one has no explanation available when PPP does not hold. The empirical view should be contrasted with the view of Cassel [1921, p183] which would suggest that PPP has the status of a theory rather than the status of a 'relation'. Similarly Officer [1976, p5] says that:

"Following Cassel, the criterion for a PPP theory adopted in

this review is that the PPP be the most important determinant of the exchange rate."

This leads to the issue of other determinants of the exchange rate. In principle, if monetary factors dominate real factors, then PPP may be the most important determinant of the exchange rate. Examples of real factors might include productivity biases (see Ballassa [1964], Officer [1976a] and Hsieh [1982]), and changes in trade patterns (see Korteweg [1980]). The kernel of this work is that the ratio of tradeable to non tradeable goods within a price index will influence the PPP relationship. Many real factors will affect the ratio including productivity and raw material prices (e.g. oil).

Apart from the difficulty of deciding whether PPP is a theory or a relationship or a major determinant of exchange rates, there is also the issue of time horizon. Until the mid seventies, it was believed that PPP held in the long run, but that deviations were observed in the short run. Since there is no theory of PPP, it is impossible to suggest the mechanisms which ensure that the relationship holds in the long run. Moreover, the existence of a long run relationship may be inconsistent with market efficiency, since one would expect to observe a serial correlation as the exchange rate was being driven back towards its long run equilibrium value. Indeed from a policy making point of view, the long run construct may not be particularly helpful. Mussa [1976, p193] points out that:

"The horizon of the policy maker is typically much shorter than a decade ... the advocacy of a monetary approach to the balance of payments necessarily involves the assertion that these 'longer run consequences' materialize within a time horizon of two to three years."

To conclude, PPP maybe a theory, or a relationship, or a major determinant of exchange rate changes. It may hold in the long run, or in the short run, or both. There may be other real factors which cause exchange rate changes. The next issue is whether or not it holds.

II.C.i.1: Tests of Purchasing Power Parity

The first published tests of PPP were Cassel [1916a]. Following the collapse of the Gold Standard in 1914, he used data of price indices, money supply and exchange rate changes. Cassel [1916a, p63-64], concluded:

"All other factors, such as e.g. the balance of trade, and the confidence in the future of this or that country in the world, have only a quite temporary or secondary importance."

It would seem reasonable to infer that his concept of 'short' was extremely short, given that he only used two years data and in one case, eleven months data. It also reinforces the interpretation of PPP as the main factor influencing exchange rate changes, and the possibility of a monetary explanation of PPP.

* Gailliot [1970] used data on the exchange rate between the U.S. and Canadian dollars, the French and Swiss francs, the Yen, Sterling, the Deutschmark and the Lire. He compared the average wholesale price index (WPI) from 1903 to 1907 with the average WPI from 1963 to 1967. There were large deviations observed for

some currencies, in particular the yen. He concluded that PPP held in the long run, and, using casual observation, he suggested the possibility of five year cycles of positive deviations from PPP preceeded by negative deviations in the following decade. This evidence suggests that deviations are serially correlated. This could lead to an interpretation of an informational inefficiency in the foreign exchange market.

*Aliber and Stickney [1975] examined the relationship between changes in the consumer price index and exchange rates for 48 countries from 1960 to 1971 inclusive, using annual data. (They also used the wholesale price index and found it was immaterial with a few exceptions). The highest average deviation for any one country over the period was 5.6% and for most countries, the deviation was in the +/-1% range. However, they also observed annual deviations of up to 73%. The evidence of average deviations over the period being less than absolute deviations in any one year, led to the conclusion of PPP deviations being more likely in the short run than the long run, under pegged exchange rates. They also found, by observation, that there were differences between the deviations of developed and developing countries with respect to both the sign and the size of the deviations.

While the results of the Cassel [1916a] studies support PPP in the relatively short run, the Gailliot [1970] and Aliber and Stickney [1975] studies find that the relationship holds over periods of a decade or so. Moreover, if deviations from PPP

were a totally random event, to ensure market efficiency, one would expect the mean deviation to be zero.

Hodgson and Phelps [1975] examined monthly data on the floating rate period from 1919 to 1925 with 14 countries using the CPI (the WPI was used for Austria). They found that movements in relative prices explained ninety per cent of the variation when lags between price level changes and exchange rate changes were taken into account. Their methodology consisted of using a regression technique with lagged coefficients. They found that PPP changes preceded exchange rate changes. The average lag between a change in the index and an exchange rate change was 6 months, but the majority of the impact was in the first three months. They concluded [op. cit. p63]:

"With the passage of a relatively short period of time, current purchasing power parities begin to exert a dominant influence on exchange rates and explain a remarkably high percentage of the variation."

Rogalski and Vinso [1977] also examined the 1920s floating period for six currencies and the Canadian dollar from 1953 to 1957 when it was floating. Unlike Hodgson and Phelps[1975], they used a more sophisticated technique to examine serial correlation and found that price changes were immediately incorporated in the exchange rate. They also pointed out that predictable lags would be inconsistent with an efficient market hypothesis.

In a similar study, Roll [1979] examined the issue of deviations from PPP using twenty years of monthly data (1956 to 1976) from twenty-three countries. The express concern of the study was to

investigate the existence of serial correlations and their implications for market efficiency. The author concluded that [op.cit.]:

"With a few significant exceptions, there is little evidence of disequilibria nor of slow adjustment of prices to a long run parity. Indeed, the general impression for most countries and for all of the largest trading nations is a very rapid adjustment of less than one month's duration."

Frenkel [1978] also examined the 1920s floating period, using the monthly cross rates between the dollar, the pound and the franc from 1921 to 1925. The most interesting part of his study was an attempt to analyse the pattern of causality between exchange rates and prices. Unlike previous studies, he found that exchange rates performed better as independent variables. This evidence would be consistent with faster speeds of adjustment in asset markets than commodity markets. He found further evidence to support this hypothesis as well as finding that exchange rate changes were incorporated more quickly in commodity prices if they were anticipated, where the degree of anticipation equalled the difference between the forward rate and the subsequent spot rate.

Genberg [1978] found that deviations from PPP during fixed rate periods were smaller and less prolonged than deviations during floating rate periods. However, his conclusion is based upon only four years of floating rate data.

Adler and Lehmann [1983] used a distributed lag regression technique and they could not reject the hypothesis that PPP deviations follow a martingale. It is a noteworthy study since

it used ten years of recent floating rate data, and it was compared with fixed rate data. Moreover, both annual and monthly data were used, and lags of up to ten years duration were tested.

While recent investigations of PPP suggest that deviations are likely to be observed, studies of the determination of black market exchange rates (Culbertson [1975], Fishelson [1978], Giddy [1978a] and Gupta [1981]) support PPP to the extent that PPP acts as a predictor of black market exchange rates. Kaveos and Seifert [1985] have confirmed the Adler and Lehmann [1983] result for black market exchange rates in South America.

One might conclude that deviations from purchasing power parity are the norm and behave as a martingale. It may be concluded that exchange risk will arise. Even in the absence of deviations from PPP, Cornell [1979] argues that exchange risk will exist since exchange rates are more variable than price indices. He suggests that this arises due to a diversification effect among commodities. As yet, this hypothesis has not been tested, and if a real time inflation index were devised, it is quite possible that the diversification effect may be immaterial.

II.C.ii: The Unbiased Forward Rate

In its simplest form the unbiased forward rate effect hypothesises that the forward rate is an unbiased predictor of the future spot rate. In principle, it is similar to a test of

market efficiency and involves testing a joint hypothesis. The first part of the hypothesis is that the market is efficient with respect to all publicly available information concerning the future spot rate and that this is reflected in the forward rate. The second part of the hypothesis is that there is no risk premium included in the forward rate.

During the mid seventies, it was maintained (e.g. Giddy [1976a, p890]) that the existence of a risk premium would be inconsistent with an efficient market since it involved a trader in one country benefiting at the expense of a trader in another country. There are three difficulties with this approach. Firstly, the approach implies that distributions with means of zero are risk free. Secondly, it assumes that traders in different countries use the same measures of real returns. Solnik [1974] demonstrates that should national consumption baskets differ, then different measures of 'benefit' will be used. Thirdly, there is the possibility of monetary disturbances which has been examined by Grauer et al. [1976]. While international asset pricing theorists agree that a risk premium will exist in conditions where there are deviations from purchasing power parity, or monetary disturbances, or both, there is as yet no agreement on the measure of a systematic risk premium.

Moreover, it is unlikely that progress will be made in this area due to the difficulties inherent in tests of international asset pricing models. Firstly, some models including Solnik [1974] involve the identification of a world market portfolio. It is

unlikely that a world market portfolio will be identified because of both the Roll [1977] critique and other difficulties highlighted by Solnik [1978]. Alternative formulations, such as the Stulz [1981] extension of the Breeden [1979] model are also untestable since it relies on the observation of state variables (see Cornell [1981]). Solnik [1983b] proposed an extension of the Ross [1976] arbitrage pricing theory to cope with international asset pricing. The model has been tested by Cho et al. [1986] and they rejected international arbitrage pricing. Unfortunately, their study tested a joint hypothesis of arbitrage pricing theory and a unitary capital market. Therefore, their result could be due to either the failure of arbitrage pricing theory, segmented capital markets or both. The prospects of identifying a risk premium are slim and this author concurs with the conclusion of Haache et al. [1981, p495]:

"While the theoretical implications of risk premia for exchange rate determination are thus far reaching, it is difficult to identify them in practice. Evidence on the existence and magnitude of risk premia is necessarily indirect, since there are no reliable data on expected exchange rate movements. Moreover, only very partial data are available on the currency distribution of official and private portfolios; and they are all necessarily ex post, reflecting responses to exchange rates, interest rates and other variables, as well as variations in ex ante portfolio preferences."

The implication of this quotation is that it is unlikely that a test may be devised which would allow researchers to specify a test which would discriminate among competing asset pricing formulations. Empirical work to date has been limited to attempts at ascertaining the existence of risk premia. A variety of approaches have been used, and each method is examined in turn in the following section.

II.C.iii: The Unbiased Forward Rate: Tests

A simple approach to testing whether the forward rate is unbiased is to examine the prediction error of the forward rate. If the mean prediction error is zero, then one might conclude that the forward rate was an unbiased predictor of the future spot rate. Cornell [1977] using four years of monthly data found that the forecast error was zero. Levich [1979a] tested the forward rate as a predictor of the direction of change of the spot rate and found that it did so correctly in 50% of the cases which consisted of nine currencies from 1967 to 1979. Similarly Kohlhagen [1975] found that the ninety day forward rate was an unbiased predictor of the spot rate for six currencies from 1971 to 1974. These conclusions are also supported by Logue et al. [1978] and Frankel [1980]. However, this form of test is unlikely to identify a risk premium if the risk premium varies over time and on average equals zero.

An alternative approach is to regress the forward rate on the realised spot rate. In principle one could conclude that unless the regression line has a slope of unity and an intercept of one, then it is likely that there are either transaction costs or a risk premium. Unfortunately, the test has produced mixed results. Kaserman [1973], Bilson [1976], Bilson and Levich [1977] and London [1978] could not reject the null hypothesis of unbiased prediction. On the other hand, Frankel [1980], Frenkel [1977] and Tryon [1979] rejected the null hypothesis. Jacobs

[1982] argues that the test is biased against rejecting the null hypothesis, since it assumes that there are no expectational errors, in order that the actual future spot may be used instead of the expected future spot rate. Jacobs [1982] replicated this test using both an autoregressive expectations model and the actual future spot rate with the same data set. He found that he could not reject the null hypothesis using the realised spot rate, but that the null hypothesis was rejected when the expectations model was incorporated in the test.

A third approach is to examine the prediction errors for serial correlation. Cornell [1977], Frankel [1980] and Hansen and Hodrick [1980] tested the prediction errors and found that there were significant autocorrelations. Geweke and Feige [1979] found that the returns on forward contracts exhibited autocorrelation. Similarly, Stockman [1978] found that there were biases for some currencies, and perhaps more interestingly, that the risk premium was likely to be volatile. Baillie et al. [1983] used an unrestricted bivariate autoregression and Wald tests to reject the hypothesis for six currencies from 1973 to 1980. Finally, Cosset [1982], Cumby and Obstfeld [1981], Hakkio [1981], Longworth [1981], Meese and Singleton [1982] provide indirect evidence which is inconsistent with the unbiased forward rate hypothesis.

Logue and Sweeney [1984] adopted a novel approach of using the interest rate parity theorem in the eurocurrency market to examine biases in the forward rate. They found evidence of

considerable biases in the forward rate and suggested term premia as an explanation. However, the influence of expectations is ignored and a debatable annualisation technique is used. Moreover, their results are consistent with a number of alternative specifications of the bias.

The evidence rejects the hypothesis that the forward rate is an unbiased predictor of the future spot rate. The most recent studies are virtually unanimous in this regard and it has been shown that earlier studies used a methodology which would not reject the hypothesis if the risk premium varied over time and had a mean of zero. It was also pointed out that the test is a joint hypothesis of market efficiency and a risk premium. If the market is efficient, then one would expect that the explanation for bias is attributable to risk premia.

A number of researchers including Kaserman [1973] and Wong [1978] have observed that the forward rate consistently underestimated the future spot rate when the spot rate was increasing, and overestimated the future spot when it was decreasing. Levich [1978b] obtained similar results and the latter attributed his results to transaction costs which penalise speculation. Baillie et al. [1984] and Hodrick and Srivastava [1984] produce evidence which supports a risk premium explanation rather than a market inefficiency explanation. Recent research by Hodrick et al. [1986] and Fama [1984] also supports the existence of a risk premium explanation and produce evidence of a time varying risk premium. Unfortunately, identifying the risk

premium is problematic due to the difficulties inherent in testing international asset pricing formulations. Roll and Solnik [1977] using data between 1953 and 1973 found some evidence of a systematic risk premium. Cosset [1984] using an arbitrage pricing theory formulation also found that there were systematic biases in forward rates. Fukao [1981] produced evidence that the risk premium may be a function of indebtedness for three out of five countries. However, the results from all three studies are not convincing, and considerably more research will need to be done in this area.

It would seem that the unbiased forward rate hypothesis has been well and truly rejected. Unfortunately, it can only be replaced by a vacuum. Econometric evidence suggests that the bias is more likely to arise from a risk premium rather than a market inefficiency and that the risk premium is most likely to vary over time and have a mean of zero. From a practical point of view, one can only conclude that the forward rate seems to underestimate exchange rate changes if the exchange rate is increasing and overestimate exchange rate changes when the spot rate is decreasing. There is also the nagging possibility that the observed biases may arise from a market inefficiency, given the recent studies of Bilson [1984] and Sweeney [1986]. Unfortunately, the whole issue is unlikely to be resolved until a testable formulation of risk premia is devised which is immune to capital market segmentation.

II.C.iv: Interest Rate Parity Theorem [IRPT]

IRPT states that the forward discount or premium equals the interest rate differential between two currencies. Traditionally, the method by which this relationship is achieved is covered interest arbitrage as enunciated by Keynes [1923]. Indeed, covered interest arbitrage seems to be the basis for determining forward rates in unregulated markets. Herring and Marston [1976 fn.3] using survey techniques reported that:

"Foreign exchange traders said that Eurocurrency rate differentials determined the forward rates that they quoted, while Eurocurrency traders said that forward exchange rates determined differentials between non-dollar Eurocurrency rates and the Eurodollar rate."

In order to attain an equilibrium and encourage arbitrage, profit making opportunities must exist. Deardorff [1981 p361] refers to this as the 'paradox' of IRPT and suggests another possible mechanism which he calls 'one way arbitrage'. This latter possibility arises from the commercial transactions of firms. For example, a firm with a foreign currency denominated liability could pay its creditor by transacting in a number of different spot, forward and money market combinations. The main difference between the two mechanisms is lower transaction costs. Deardorff [1981] maintains that covered interest arbitrage is three times more expensive than one way arbitrage.

There have been a number of studies of the empirical validity of the IRPT, and they have confirmed the validity of the IRPT. Branson [1969] compared the Canadian and U.S. markets and concluded that transaction costs were significant. Giddy and

Dufey [1975] maintained that deviations were insignificant, while Frenkel and Levich [1975,1977] found that unexploited profit opportunities were unlikely except in 'turbulent periods' (1968-9). Aliber [1973] tested IRPT in both Eurocurrency and domestic financial markets. He found that deviations were significantly lower in the Eurocurrency markets. Marston [1976] tested IRPT in the Eurocurrency markets. Over a six year period using monthly data, the regression equation produced an exact fit, and deviations were only observed when he used weekly observations over a one year period. Other studies include Pippenger [1978], Browne [1983], McCallum [1977] and Callier [1981]. These results are however dependent on their calculations of transaction costs under covered interest arbitrage. If one way arbitrage possibilities exist, then there will be unexploited profit opportunities.

The IRPT represents a relatively accurate representation of financial market behaviour, with the exception of turbulent periods. However, the studies which were surveyed used monthly data, and it is quite possible that the relationship may not hold in periods of less than one month. A number of explanations of turbulent periods have been advanced and are discussed in the following paragraphs.

Firstly, Keynes [1923] suggested the possibility of limits to the supply of arbitrage funds. Prachowny [1970] and Frenkel [1973] have argued that such a situation could occur when the lending and borrowing rates differ or when the borrowing rate is a

function of the gross liabilities of the borrower. Frenkel and Levich [1977] provide evidence of the elasticity of supply of arbitrage funds being virtually infinite, however they also suggest that some limit on the funds available for arbitrage may explain their results for turbulent periods.

Secondly, Aliber [1973] attributes the superior performance of the IRPT in Eurocurrency markets to political risks, in particular the imposition or potential imposition of exchange controls. This is also similar to Dooley's [1976] argument of non comparable assets. Stoll [1968] and Brown [1977] have also examined this issue.

Other phenomena which may interfere with IRPT include premature repatriation (Officer and Willet [1970], asymmetric taxes (Levi [1979]) and time lags between the observation of arbitrage opportunities and the execution of transactions (Frenkel and Levich [1975]).

Covered interest arbitrage is therefore the rule when there are no political risks in unregulated markets. There are possible exceptions which may arise in the short run because of insufficient liquidity and time lags in the execution of transactions. There may be opportunities to earn excess returns from covered transactions because of one way arbitrage opportunities and asymmetric taxes.

II.C.v:The Fisher Effect

The Fisher effect states that nominal interest rates incorporate inflationary expectations. Two types of test of the Fisher effect have been attempted. Firstly, researchers have attempted to establish the link between yields on short dated government bonds and proxies for expected inflation. Secondly, attempts have been made to assess the incorporation of inflationary expectations into security prices. The Fisher Effect might not hold because of tax effects (Miles [1983]) or aggregate supply effects (Peek and Wilcox [1983]).

Inflationary expectations and interest rates have been investigated as far back as Fisher [1930]. Recent tests include Fama [1975] and Fama and Gibbons [1981]. These studies relied on treasury bill rates as proxies for inflationary expectations and therefore involve assumptions of stable real interest rates. Peek and Wilcox [1983] attempted to overcome this deficiency by using the Livingston Survey of inflationary expectations to examine the post-war stability of the Fisher effect. They found that tax and aggregate supply effects were important and that the demand for bonds from abroad exerted influence on the interest rate in the U.S. This latter effect was particularly noticeable in the seventies, and may be attributed to the redistribution effect of increased oil prices. Kane et. al. [1983], using a Fama [1975] type methodology, tested the Fisher Effect on the Euromarkets. They found evidence of reasonable though non-conclusive evidence of the Fisher Effect holding on international

markets.

Early tests of inflation and the equities market, such as Nelson [1976], Jaffe and Mandelker [1976], Bodie [1976], Fama and Schwert [1977], produced evidence of a negative relationship between stock market returns and inflation using treasury bills as proxies for expected inflation. In a related vein, Schwert [1981] found that the market reacted negatively to unanticipated inflation and that this information was not incorporated until the announcement of the price index figures about one month after the inflation occurred. In order to explain the negative relation between inflationary expectations and stock market returns, Geske and Roll [1981] suggested a mechanism whereby a decrease in stock prices would signal an expectation of decreased economic activity. This in turn would signal an expectation of decreased government revenue, an increased government deficit and an increase in the money supply. Geske and Roll [1983] also report a successful test of this model on U.S. data. Solnik [1983a] tested the Geske and Roll [1983] model internationally, using data from nine countries from 1971 to 1980. He rejected the assumption of real returns not being a function of the exchange rate (i.e. the Fisher effect). Furthermore, his results were consistent with the Geske and Roll [1981] model. Gultekin [1983a] also reports international tests but Solnik [1983a] maintains that they are deficient. Gultekin [1983b] tested the relationship for U.S. data using the Livingston Survey of inflationary expectations. His results suggest that the negative relationship between inflation and stock market returns

may not be clearcut, however this problem may arise from biases in the Livingston data (see Figlewski and Wachtel [1981]). Finally, Peel and Pope [1985] tested the hypothesis in the UK and found strong support for the hypothesis when the possibility of variable real rates of return was incorporated using econometric techniques.

One might conclude that the Fisher Effect does seem to hold unless there are tax effects or aggregate supply effects arising from exchange rate changes and exogenous shocks. The results of tests of the Fisher Effect and stock returns are not clearcut, and the presence of the Geske - Roll effect is at odds with the presence of the Fisher effect.

II.C.vi: The International Fisher Effect (IFE)

The IFE states that the expected change in the exchange rate equals the interest rate differential between two currencies and is named after its original proponent Irving Fisher (Fisher [1930]). It differs from the IRPT, since it is not a risk free transaction. The investor must trade at an uncertain future spot rate. One might therefore expect that the results of empirical tests of this relationship would yield results similar to those obtained in tests of the unbiased forward rate.

Giddy and Dufey [1975] examined the interest rate differential to see if it was an unbiased predictor of the future spot rate and concluded that it was reasonably unbiased. Aliber and Stickney

[1975] tested the relationship using annual interest rate differentials and observed exchange rates. They found that deviations were significant but less than PPP deviations. They also suggested that deviations were greater for developing countries. However their evidence was based upon a smaller number of observations for developing countries which included Levich and Frenkel's [1977] turbulent period. Cumby and Obstfeld [1981] examined the Eurocurrency market using more sophisticated techniques. They assume that traders formulate rational expectations and that any observed deviations will be due to 'white noise', if IFE holds. They report significant serial correlation in the error terms and therefore reject IFE. This result is consistent with the existence of a risk premium, and the forward rate tests. These results are however sensitive to non normal exchange rate distributions. Mishkin [1984] examined whether real interest rates were equalised across countries and rejected the International Fisher Effect. On the basis of his study, he suggested that all future attempts at modelling should incorporate time varying risk premia, different real interest rates and deviations from purchasing power parity.

The results of tests of the International Fisher Effect suggest that it is unlikely to hold. However, there is no theoretical rationale for the observed deviations apart from a possible link to biases in the forward rate. The implications of international asset pricing models for the International Fisher Effect are as yet unexplored and it would be premature to attempt to explain the observed deviations.

III: A SYNTHESIS

The previous sections have examined a considerable volume of empirical studies of exchange rate behaviour. This material will be drawn on again in later chapters. This section attempts to make some inferences from the studies and to offer a rationale for the observed behaviour.

III.1: Summary

This chapter has focussed on the theory of international parity. An attempt was made to examine a wide range of studies in order to illustrate the methodological problems inherent in many of the studies and to demonstrate why international parity was accepted until the mid seventies and to document its subsequent rejection.

The assumptions of international parity were examined and it was pointed out that apart from the theory being inconsistent with a monetary economy, three of the assumptions were unlikely to hold. It would however seem reasonable to conclude that financial markets are closer to perfection than goods markets. In addition, tests of informational efficiency in foreign exchange markets suggest that the market is at least efficient with respect to some simple models which use historical exchange rate data.

The predictive ability of the international parity theory was also examined. The theory predicts six relationships. While

one relationship has not been tested, there is reason to doubt the other five predictions. It was pointed out that PPP deviations can not be statistically distinguished from a martingale process, while the forward rate seemed to be a biased predictor of the future spot rate. Both the International Fisher effect and the domestic Fisher effect also seemed unlikely to hold; fortunately, interest rate parity does seem to hold except in 'turbulent' periods. On both descriptive and predictive counts, the theory of international parity is of questionable usefulness. While it may be useful as a heuristic device to order scholarly research, Eaker's [1977] argument that the theory of international parity may assist in the identification of profitable opportunities may be rejected. Profit - making opportunities are unlikely to be identified unless the presence of risk premia and transaction costs are incorporated into the model.

III.11 : A Rationale

Given that the theory of international parity was advanced by early twentieth century economists such as Keynes, Fisher and Cassel, it would seem natural to examine the progress of contemporary economists. Krueger [1983], points out that theories of exchange rate determination have evolved, inter alia, with changes in the international environment. For example, she points out that in 1969, she entitled a review article 'Balance of Payments Theory', rather than 'Exchange Rate Determination'.

This change of emphasis may be attributed to three basic factors. Firstly, there was the resurgence of 'monetarist' approaches to monetary and macroeconomic phenomena. Secondly, the advent of floating exchange rates in the early seventies and the subsequent unexpected volatility of exchange rate changes. Thirdly, there was the increased significance of international capital flows relative to international trade flows. These issues are discussed more fully in the following paragraphs.

The 'monetary approach to the balance of payments' is indicative of the 'monetarist' influence. Essentially, in its stricter forms, it is a macroeconomic equivalent of the theory of international parity. The literature has been surveyed by Frenkel and Johnson [1978], and Whitman [1975] who referred to the stricter form as 'Global Monetarism'. Hahn [1977] points out that this literature, is based on an assumption of a frictionless, costless, instantaneous adjustment world with efficient resource allocation, perfectly mobile capital, neutral money, and real output being dependent on neo-classical forces. The similarity of the position adopted by Hahn in his critique of global monetarism and the Solnik [1978] critique of Giddy [1976a] is remarkable. The positions may be characterised as Neo-Keynesian and Hard Monetarist.

Dornbusch [1976], in an attempt to explain exchange rate volatility, used an assumption of perfect financial markets and sticky goods markets to explain overshooting. Dornbusch argues that in a full employment economy where the money supply is

increased, interest rates will decrease if the change in the money supply is expected to be permanent. However, goods markets will not react immediately, an exchange rate decline will be expected and exchange rates will decrease. As the money supply change filters through into the goods market, prices will increase and the exchange rate will tend back to the PPP level. This phenomenon is referred to as 'overshooting'. In situations of less than full employment, 'undershooting' may be observed.

The Dornbusch [1976] model includes both the influence of the monetary approach to the balance of payments and the observed volatility of exchange rates. The final strand in the exchange rate determination literature is the growth of capital flows relative to trade flows. Macroeconomists are now suggesting that the foreign exchange markets behave as if they were asset markets because of their volatility rather than adjusting smoothly to international price level differentials. Branson [1983] maintains that a 'consensus' has been reached among macroeconomists which uses asset market equilibrium to explain short run exchange rate changes and real factors to influence exchange rate changes in the long run. Frenkel [1981a, 1981b] provides evidence supporting the negligible influence of inflation differentials, however, these results have been disputed by Davutyan and Pippenger [1985]. The OECD [1981 p59] supports such an approach:

"The main economic variables thought to explain exchange rates are monetary conditions (and expected interest rate differentials), current account developments and relative price performance. But over recent months the influence of inflation differentials has been uncharacteristically small or operated with considerable delay, the dominant

role being played by monetary conditions and current account developments."

The asset market approach is now being used by macroeconomists to test for the impact of 'news' on exchange rate changes. Branson [1983], Dornbusch [1980], Cosset et al. [1985] and Frenkel [1981b] have examined the impact of news. With the exception of the Cosset et al. [1985] study, they do not explicitly model the arrival of new information, but rely on autoregressive techniques to extrapolate the impact of news. While this approach is still in its infancy, it does imply that exchange rate changes are influenced by unanticipated changes or innovations rather than by inflation differentials.

IV: Summary, Conclusions and Implications

In this chapter, the theory of international parity has been reviewed. While a series of necessary conditions for the existence of international parity has not been proposed, it was shown that the sufficient conditions suggested by Solnik [1978] were unlikely to be met. A review of empirical studies of the sufficient conditions revealed that goods markets were likely to be significantly more inefficient and imperfect than financial markets.

The predictions of the theory of international parity were also examined and it was shown that many of the predictions were not borne out in practice. Indeed, the only prediction which was supported was the interest rate parity theorem. This finding is consistent with financial markets being more efficient than goods

markets. A model was then suggested which incorporated this difference between financial and non financial markets and recent macroeconomic theories were reviewed which view foreign currencies as a store of value rather than a medium of exchange. The review has significant implications for the management of foreign exchange risk.

Firstly, a necessary condition for the existence of economic exposure to foreign exchange risk is that deviations from purchasing power parity exist. Recent research shows that deviations from purchasing power parity behave as a martingale. This finding implies that that real economic exposure exists since the direction of the deviation will be uncertain.

Secondly, exchange rates are not normally distributed. This fact becomes most apparent when daily data are examined. As yet, there has not been an examination of the implications of this result for models of exchange rate changes, or indeed, whether these findings are consistent with market efficiency. The finding is important since the measurement of risk within a mean variance context becomes problematic unless restrictive assumptions are made about the utility of the decision maker.

Thirdly, the evidence suggests that foreign exchange markets are relatively efficient in an informational sense. This evidence is consistent with an asset market view of foreign currencies. Moreover, it is unlikely that it is possible to consistently produce superior forecasts of exchange rate changes. Research

to date found that forecasting services do not perform particularly well, and this research ignored the costs of purchasing forecasts. However, there is some recent evidence of possible inefficiencies in foreign exchange markets. Unfortunately, it is impossible to say whether they are inefficiencies, or arise from unspecified risk premia. Until, this issue is resolved, it is difficult to know whether corporations should proceed on the basis of market efficiency or market inefficiency.

Fourthly, the issue of whether world capital markets are segmented or integrated is still an open issue. There is some evidence which suggests that the US capital market may be mildly segmented. From the point of view of corporate policy, a safe conclusion may be that they are partially but not totally segmented. It is quite possible that MNCs are in a unique position to take advantage of such imperfections.

Fifth, forward rates seem to be biased predictors of future spot rates. While there is no empirically tested theoretical rationale for this observation, it should be incorporated in the hedging decision, since the bias will constitute part of the opportunity cost of using a forward hedge.

Finally, interest rate parity is a relatively valid description of a real world phenomenon. However, it does not necessarily imply that there are no exploitable opportunities, since corporations are in a position to take advantage of both

turbulent periods and one way arbitrage. Moreover, the relationship is more successful in Eurocurrency markets and this in turn would suggest opportunities for MNCs to exploit differences between regulated and unregulated market rates.

CHAPTER 3

CORPORATE EXPOSURE TO FOREIGN EXCHANGE RISK

In the previous chapter, the international financial environment was examined. It was demonstrated that deviations from purchasing power parity were commonplace. In this chapter the implications of deviations from purchasing power parity from the point of view of the corporation are examined. In the first instance, it is necessary to show that the cash flows of firms may be exposed to purchasing power parity deviations.

In the first part of this chapter, the different types of exposure are discussed. It is argued that the only type of exposure that poses a conceptual problem is economic exposure to exchange risk. Previous research on economic exposure has focused upon partial models of economic exposure, and the limitations of a partial equilibrium approach are discussed in the second part of this chapter. A variety of models of economic exposure are reviewed in the third section, and the possibilities of measuring exposure are discussed in the fourth section. The conclusion is somewhat pessimistic. Corporate exposure to exchange risk is unlikely to be measurable.

I: Classifications of Exposure to Foreign Exchange Risk

Conventionally, exposure to exchange risk is classified as being either a translation, transaction or economic exposure. Each class of exposure is examined in the following paragraphs, and

some of the difficulties inherent in the classification of exposure are discussed.

I.i: Translation Exposure

When the financial statements of the foreign subsidiaries of a MNC are consolidated, it is necessary to express the individual statements in a numeraire currency and this gives rise to (Eiteman and Stonehill [1986, p155]):

"Accounting based changes in the consolidated financial statements caused by a change in exchange rates."

Translation exposure has been excluded from consideration in this thesis because it is no longer an important issue. There is evidence that US MNCs were extremely concerned by translation exposure when FAS 8 (FASB [1975]) was in operation. Surveys such as Evans et al. [1978] found that US MNCs devoted considerable resources to the management of translation exposure. However, FAS 8 (FASB [1975]) was replaced by FAS 52 (FASB [1981]) and it is unlikely that translation exposure is still an issue in the US. Indeed, a recent study by Doukas [1984] found that sixty per cent of the firms surveyed hedged translation exposure under FAS 8. Under FAS 52, he found that only three per cent of the respondents were hedging translation exposure. One would expect that a similar situation pertains in the UK given the similarity between SSAP 20 and FAS 52, however, the management of translation exposure in the UK has not been examined empirically.

Apart from the decreased management interest in translation

exposure, stock market based research of FAS 8 (Griffin [1979], Makin [1978a], Dukes [1978] and Fredrikson and Mogus [1978]) found that there was no price reaction to FAS 8. This evidence implies that shareholders may be indifferent to translation exposure, or at any rate, indifferent to where unrealised foreign exchange gains and losses are reported.

Given both the apparent lack of management and shareholder interest in translation exposure, it will be ignored in the remainder of this chapter.

1.11: Transaction Exposure

Transaction exposure has received considerable attention in both the practitioner and the academic literature. Srinivasulu [1981, p17] defines it as the:

"Uncertain domestic value of a cash flow known and fixed in foreign currency."

Foreign currency denominated monetary assets and liabilities are frequently cited as examples of transaction exposure, despite the possibility that they may not be certain with respect to amount and timing due to credit risks, political risks and disputes with customers or suppliers. Consequently, it could be argued that transaction exposures are a special case of cash flow exposure in general, and while the assumption of certainty with respect to timing and amount may be a useful construct in the development of decision models, it may be inappropriate in a practical context.

Transaction exposure will always exist unless nominal exchange rates are constant. Such a condition implies that transaction exposure will not exist if exchange rates are permanently fixed.

I.iii: Economic Exposure

The third class of exposure to foreign exchange risk is economic exposure. It has been defined by Srinivasulu [1981, p17] as:

"The uncertain domestic value of a cash flow that is uncertain in foreign currency."

The only difference between transaction exposure and economic exposure is that transaction exposure is a special case of economic exposure where the amount is certain in foreign currency. The source of this exposure is the failure of exchange rate changes to reflect international inflation differentials, since such deviations from purchasing power parity lead to subsidies and tariffs on goods from different countries. It is also possible that exchange rate changes will have more subtle influences on the cash flows of firms. For example, changes in exchange rates may effect the sourcing decision of entirely domestic industries such as electricity generation.

I.iv: Difficulties with the Classification of Exchange Risk

The Srinivasulu [1981] definitions of exposure are based upon classifying foreign currency exposures as either certain or uncertain with respect to amount and timing of the foreign currency cash flow. This classification may be inappropriate

for a number of reasons.

Firstly, it is possible that the cash flows of the firm may be affected by exchange rate changes even if the cash flow is not denominated in foreign currency. This issue is examined in the third section of this chapter. Moreover, the cash flows of the firm may be affected by exchange rate changes even if there are no foreign currency denominated items and the firm does not produce traded goods, or source in traded goods markets. This latter possibility has been ignored in the literature and is discussed in the second section of this chapter. The classification scheme is not collectively exhaustive.

Secondly, the source of cash flow uncertainty is not identified. For example, a cash flow may be uncertain due to exchange rate changes, or because of other uncertain state variables. Moreover, from a management point of view, the degree of uncertainty is probably important. Compare the uncertainty surrounding the cash flow from export sales over a period of time with the uncertainty of an exporter in a letter of credit situation.

In the remainder of this chapter, the analysis will concentrate on cash flows which are uncertain with respect to amount and timing, in cases where the uncertainty arises from exchange rate changes. Exposures which are certain with respect to amount and timing are conceptually uncomplicated since they are readily identifiable. Cash flows which are uncertain due to factors

other than exchange rate changes are also readily identifiable in terms of exchange risk exposure.

II: From General to Partial Equilibrium.

In the previous section, it was pointed out that industries which have no involvement whatsoever in traded goods markets, and have no foreign currency cash flows whatsoever, may be exposed to the effects of exchange rate changes. The reason that this may arise is due to the macroeconomic impact of exchange rate changes. The macroeconomic impact may be significant. Consider the case of the public sector deficit.

The government can finance a public sector deficit from a number of sources such as sales of non marketable debt, open market operations, the printing press and balance of payment flows. (cf. Goodhart [1976, chapter 13], Vane and Thompson [1979, chapter 3]). It amounts to saying that for every government transaction, there is a debit and a credit; a deficit must be financed somehow. The impact of changes in the financing or size of government deficits may influence goods markets, financial markets and foreign exchange markets. From an individual firm's point of view, all manner of cash flows may be affected since turnover, costs, taxation, financing costs and foreign exchange risk could be potentially affected.

Because of this interdependence within the market system, exchange risk becomes a classic chicken and egg problem. For

example, a reduction in the public sector deficit may affect the inflation rate, the demand for the firm's products and the exchange rate. The difficulty lies in uncovering the exogenous and the endogenous variables.

Unfortunately, economists have to a large extent, ignored the short run reactions of the economy to autonomous disturbances. Economists have tended to focus on the characteristics of equilibrium states rather than the transition towards equilibrium. One notable exception is the Flow of Funds literature (cf. Bain [1973], Freund and Zinbarg [1963], Mason [1976] and the Wilson Report [1981 chapter 11]). On the other hand, managerial and financial economists focus on situations of partial equilibrium, for example, the capital asset pricing model and the net present value rule.

The discussion of corporate exposure in this chapter assumes that a partial equilibrium situation pertains, since there has been little research in a general equilibrium context and because it would make the problem intractable. There are two implications from this discussion.

Firstly, it will be difficult to decide in practice when exchange rate changes may be considered autonomous or exogenous disturbances and when they are actually endogenous reactions to other variables.

Secondly, discussion within a partial framework precludes the

location of "optimal" decision rules. This issue may be circumvented by making assumptions about the goals of decision makers. However, it is still unlikely that a partial framework has incorporated all possible effects of a particular decision alternative.

III: Corporate Exposure to Exchange Risk.

This section begins by analysing a model advanced by Srinivasulu [1983]. The purpose of using the model is to provide a classificatory framework for prior research. The main innovation of the model is to discuss the foreign exchange risk (FER) problem in a three country rather than a two country framework.

Srinivasulu [1983, pp50-55] begins by assuming a single time period where the set of physical assets at the beginning of the period are constant until the end of the period. He then developed the following equation for expected end of period wealth.

$$W_t = W_{t-1} \{w_0(1+r_0) + w_1/e_{1,t-1}(1+r_1)e_{1,t} + w_2/e_{2,t-1}(1+r_2)e_{2,t}\}$$

where:

r_0 = random return in the period from the domestic subsidiary
"0".

r_1, r_2 = random return in foreign currency of the foreign

subsidiaries "1" and "2".

e_1, e_2 = prices of a unit of currencies 1 and 2 respectively, in terms of currency 0.

$e_{1,t-1}$ = the current spot exchange rate which is known with certainty.

$e_{1,t}$ = the end of period expected spot rate which is a random variable.

f_1 = the forward rate which is known with certainty.

w_0 = the proportion of wealth (W_{t-1}) invested in country "0".

W_{t-1} = initial wealth.

W_t = end of period wealth.

Finally, taxes are ignored in the model, or assumed symmetric.

It is then assumed that second order effects may be ignored and that:

$$e_{1,t} = e_{1,t-1} (1 + (e_{1,t} - e_{1,t-1}) / e_{1,t-1})$$

then if $Re_1 = (e_{1,t} - e_{1,t-1}) / e_{1,t-1}$

the first return equation may be reformulated as:

$$W_t = W_{t-1} \{w_0(1+r_0) + w_1(1+r_1+Re_1) + w_2(1+r_2+Re_2)\}$$

The main characteristic of this equation is the existence of a return from holding physical assets and a foreign exchange return. The variance of the expected terminal wealth (S^2) is then constructed as:

$$\begin{aligned}
S^2 = & w_0^2 S^2_{r_0} + w_1^2 \{ S^2_{r_1} + S^2_{Re_1} + 2 \text{cov}(r_1, Re_1) \} \\
& + w_2^2 \{ S^2_{r_2} + S^2_{Re_2} + 2 \text{cov}(r_2, Re_2) \} \\
& + 2w_0w_1 \{ \text{cov}(r_0, r_1) + \text{cov}(r_0, Re_1) \} \\
& + 2w_0w_2 \{ \text{cov}(r_0, r_2) + \text{cov}(r_0, Re_2) \} \\
& + 2w_1w_2 \{ \text{cov}(r_1, r_2) + \text{cov}(r_1, Re_2) \} \\
& + \text{cov}(Re_1, r_2) + \text{cov}(Re_1, Re_2) \}
\end{aligned}$$

This equation has five variance terms and ten covariance terms.

The covariance terms may be classified as:

1. Gains from international corporate diversification:
 $\text{cov}(r_0, r_1), \text{cov}(r_0, r_2), \text{cov}(r_1, r_2)$.
2. The structure of subsidiary operations: $\text{cov}(r_1, Re_2),$
 $\text{cov}(Re_1, r_2)$.
3. The management of a portfolio of currencies: $\text{cov}(Re_1, Re_2)$
4. The exchange risk of domestic operations: $\text{cov}(r_0, Re_1),$
 $\text{cov}(r_0, Re_2)$.
5. Intersubsidiary linkages: $\text{cov}(r_1, Re_2), \text{cov}(r_2, Re_1)$.

These five categories provide a useful framework for discussing some prior research on FER.

III.A: Gains from International Firm Diversification

Chapter two discussed the issue of segmented capital markets. Shareholders will value gains from international diversification under conditions of capital market segmentation, since the MNC offers opportunities of risk diversification which might otherwise be unavailable. The main economic justification for the existence of diversification opportunities is the existence of correlations of less than one between different national economies. The Levy and Sarnat [1970] study found stronger links between European economies using ex post data. This finding is in accord with the intuitive explanation of higher integration of geographically close economies in a relatively free trade zone. However, as pointed out in the previous chapter, our understanding of the causes of these covariances is at a primitive stage. It may well be that multinationality increases the opportunities to exploit product and factor market imperfections, rather than an opportunity to diversify risk.

If opportunities to reduce foreign exchange risk arise because of international diversification, it will be necessary to have a stable covariance matrix. This may be the case (Phillipatos et al. [1983]). Moreover, a technique for measuring the covariances will be necessary. Eun and Resnick [1984] compared a number of techniques, and found that a national market mean model was the most efficient of the models tested. Such a model is also consistent with market segmentation.

III.B: The Structure of Subsidiary Operations.

Dufey [1972] was the first to examine the possibility of exchange rate changes affecting the costs, revenues and volumes of the foreign subsidiary. Prior to this other authors such as Heckerman [1972] had assumed that cash flows in foreign currency terms were assumed known and fixed, with respect to amount and timing. Dufey [1972, p52] pointed out that this assumption was misleading and that:

"local currency revenue and cost streams will not follow the pattern projected before the devaluation. In fact, after the devaluation, these local currency flows will exhibit differences that are systematic and predictable as to direction. Therefore, a uniform, indiscriminate application of the devaluation percentage to the projected pre-devaluation cash flow gives an inaccurate picture."

This approach was later formalised by Shapiro [1975] and simplified versions of Shapiro's approach with minor modifications were produced by Jacque [1978] and Walker [1978]. These simplifications have been in turn adopted by Kettell [1979] and Levi [1983].

Conceptually, the approach is relatively straightforward, and it consists of an application of the elasticities approach to the balance of payments. As yet, the Marshall-Lerner condition has not been applied at the firm level. It is unlikely that it will offer any new insights. At the micro level, the approach may amount to an analytical examination of the exchange rate elasticity of revenues and costs.

As a basis for further discussion the original Shapiro model is

adopted. Differential equations are used in the model in order to evaluate the effects of simultaneous inflation and devaluation, and to provide a more concise account of this covariance. It should however be pointed out that the model assumes a set of relationships between exchange rate changes and firm characteristics as distinct from deducing such relationships. It will however be demonstrated that if purchasing power parity should hold, exposure does not exist.

The Shapiro [1975] model has been criticised as failing to distinguish between movements along the demand curve and demand curve shifts Hendershott [1975]. This exposition will attempt to clarify this difficulty by discussing real income effects separately.

The theory begins with a discussion of the demand curve and the cost curve. The effects of inflation and devaluation on profitability are then discussed individually. Finally, the effects of simultaneous inflation and devaluation are discussed.

III.B.i: The Demand Curve

It is assumed that the firm is oligopolistic and headquartered in Britain with a single overseas subsidiary. The traditional determinants of demand are the price of a good, the prices of other goods, income and tastes. The latter factors produce shifts in the demand curve while price changes produce movements along the demand curve. The demand for the product of the

subsidiary in local currency is described as a function of quantity Q_1 , the local wholesale price index W , and the sterling value of the local currency or exchange rate F .

$$P_1 = P_1 (Q_1, W, F)$$

It is then argued that the partial derivatives behave according to a number of factors such as the degree of import competition. It is assumed that the derivative of price with respect to quantity is less than zero. This implies that the demand curve for the firm's product is downward sloping. In other words, the firm sells in an imperfect or oligopolistic market. The derivative of prices with respect to inflation is assumed to be greater than or equal to zero. This implies that it may not be possible to increase prices in line with inflation because of import competition, price controls or other inflexibilities. Formally, these two derivatives are expressed in the following way:

$$\begin{aligned} \delta P_1 / \delta Q_1 &< 0 \\ \delta P_1 / \delta W &\geq 0 \end{aligned}$$

In the absence of import competition and inflexibilities, and given demand functions which are homogenous to degree zero in money prices, it would be possible for $\delta P_1 / \delta W = P_1 / W$.

The derivative of prices with respect to the exchange rate is assumed to be less than or equal to zero. This is based upon

the presumption that if the local currency devalues, then local goods would have a competitive advantage relative to imported goods. If the derivative is set to zero, then it would imply that there was either no import competition, or alternatively, that overseas competitors were prepared to accept a decrease in their profitability in order to maintain market share. Formally, this derivative is expressed as:

$$\delta P_1 / \delta F \leq 0$$

The exports of the firm are assumed to be denominated in dollars and to be a function of quantity (Q_x) alone. It should be pointed out that this assumption may be unrealistic, since one would expect that in conditions where the subsidiary is subject to import competition, its competitiveness should be increased when foreign inflation exceeds domestic inflation (*ceteris paribus*).

$$P_2 = P_2 (Q_x)$$

The demand curve for exports is also expected to be downward sloping.

$$\delta P_2 / \delta Q_x < 0$$

It is assumed that the domestic and export pricing decisions are independent of one another. This constitutes an immediate violation of the law of one price. Horst [1971] examines the

case of interdependence in the setting of prices.

III.B.ii: The Cost Curve

The traditional theory of costs maintains that costs are a function of the output level, factor prices, technology and in the long run, capital. Shapiro treats the sterling cost curve of the foreign subsidiary as a function of the quantity produced, the price index and the exchange rate.

$$C_1 = C_1 (Q_1 + Q_x, W, F)$$

This is one of the confusing aspects of the model, since revenues are denominated in the local currency of the subsidiary, whereas costs are denominated in the currency of the parent. The partial derivatives are expected to behave in the following way. Firstly it is assumed that costs will increase as output increases.

$$\delta C_1 / \delta Q > 0$$

Secondly, it is assumed that local costs will increase as the general level of prices increases.

$$\delta C_1 / \delta W > 0$$

It is however possible that the increase in costs will be less than the increase in inflation because of factor market

inflexibilities and the opportunity to substitute imported factors for local factors. Therefore,

$$\delta C_1 / \delta W < C_1 / W$$

Exchange rates are expected to increase costs in sterling terms as sterling is revalued.

$$\delta C_1 / \delta F > 0$$

However, there may be opportunities to substitute local for imported inputs, and so:

$$\delta C_1 / \delta F < C_1 / F.$$

III.B.iii: Inflation and Profitability.

The profit of the firm (S), is defined as:

$$S = \{P_1(Q_1, W, F)Q_1 F\} + \{P_2(Q_x)Q_x\} - C_1(Q_1 + Q_x, W, F)$$

Partial differentials are obtained so that the effects of inflation on profitability may be analysed.

$$\delta S / \delta W = (\delta P_1 / \delta W)Q_1 F - \delta C_1 / \delta W$$

The interpretation of this partial derivative is straightforward. It simply says that the effects of inflation on profitability

will depend on the effects of inflation on costs and revenues. The intuitive simplicity of the model may be seen in the situation where both prices and costs are homogenous to degree zero in prices, and there are no exports. In this case, prices, costs and profits will increase in line with inflation, and real profits will remain unchanged:

$$\begin{aligned}\delta S/\delta W &= P_1 /W Q_1 F - C_1 /W \\ &= S/W\end{aligned}$$

Similarly, if it is impossible to increase prices, or there is very stiff import competition, or all of the goods produced are exported, then profits will be adversely affected to the extent that costs are affected by inflation. The effect on profits will be:

$$\delta S/\delta W = - \delta C_1 / \delta W < 0$$

III.B.iv: Profitability and Local Currency Devaluation.

The analysis in this section is similar to the analysis of the effects of inflation on profitability. The first step is to evaluate the partial derivative of profit with respect to devaluation.

$$\delta S/\delta F = \delta P_1 / \delta F Q_1 F + P_1 Q_1 - \delta C_1 / \delta F$$

Again, this equation is self evident. Profits will be affected

by a devaluation to the extent that prices in the local market and costs are affected by devaluation. Note that exports are unaffected by devaluation because exports were assumed not to have an exchange rate elasticity. In the case where the firm exports all of its output, it will be better off to the extent that profit margins will be increased because local costs will have decreased.

$$\delta S / \delta F = -\delta C_1 / \delta F < 0$$

Therefore, the firm will gain on devaluation. This is in accord with the elasticities approach to the balance of payments. The derivatives are of opposite sign to the inflation case because a devaluation locally is a revaluation in sterling terms.

On the other hand, suppose that none of the output is exported. Further, assume that the firm faces no import competition in product markets.

$$\begin{aligned} \delta S / \delta F &= P_1 Q_1 - \delta C_1 / \delta F \\ &= P_1 Q_1 - C_1 / F \\ &= S / F > 0 \end{aligned}$$

In this case, costs are increased by the devaluation but there will be no increase in revenue, unless the devaluation has an impact on macroeconomic variables. Therefore, the firm loses out to the extent that its costs are affected by the devaluation. On the other hand, if the firm competes with overseas producers

in local markets, then it will be at an advantage as they will be forced to either accept a decrease in their profitability or alternatively sacrifice market share to domestic producers.

It should however be pointed out that a MNC will be interested in the profits of foreign subsidiaries in terms of parent currency and so there will be a translation impact.

III.B.v: The Case of Simultaneous Inflation and Devaluation.

This section examines the interaction of inflation and devaluation. In order to accomplish this task, it is necessary to use differential equations. The total effect on profit of the inflation devaluation cycle may be stated as:

$$dS = \delta S / \delta W dW + \delta S / \delta F dF$$

This equation states that the rate of change of profits is related to the rates of change of inflation and the exchange rate. Using the previous sections on the individual effects of inflation and devaluation, this may be expanded to:

$$dS = \{ \delta P_1 / \delta W Q_1 F - \delta C_1 / \delta W \} dW$$

$$+ \{ \delta P_1 / \delta F Q_1 F + P_1 Q_1 - \delta C_1 / \delta F \} dF$$

Unfortunately, in this situation the results are somewhat more ambiguous. If the firm exports all of its production, then:

$$dS = -\delta C_1 / \delta W dW - \delta C_1 / \delta F dF$$

If purchasing power parity holds, then $dF/F = -dW/W$, and it would be possible for $dS = 0$. In other words, the firm is unaffected if Purchasing Power Parity holds. If PPP does not hold, then the exporter will be adversely affected if devaluations fail to match the inflation rate.

If $Q_x = 0$, then changes in profit may be described as:

$$dS \geq P_1 Q_1 F \{dW/W + dF/F\} + \delta P_1 / \delta F Q_1 F dF$$

It is difficult to reach any firm conclusions in this case. Unless the terms of trade deteriorate the domestic producer will not gain. The domestic firm may gain if the elasticity of demand with respect to devaluation is sufficiently negative. Even in this case, the presence of strong import competition in the firm's product markets may be sufficient to eradicate such benefits. The time span of the cycle may be important since if an exporter gains initially due to devaluation, and then loses out to the same absolute extent because of local inflation, he may be better off due to the time value of money. Therefore, it would be unwise to suggest that there is no exposure since purchasing power parity holds in the long run.

Finally, it can be seen that the firm will experience a decrease in profits in the case of price controls unless costs are also

fixed or react perversely to inflation or devaluation.

III.B.vi: Real Income Effects

The discussion of real income effects make the discussion somewhat more realistic, since they attempt to broaden the scope of the model beyond the reaction of the firm to an autonomous shock, to the possible repercussions in other markets of inflation and devaluation, and the possible effects of such a situation on the activities of the firm.

The existence of real income effects is to some extent analagous to a Phillips curve. If expectations are rational [Muth 1961], and one produced an expectations augmented Phillips curve, then, real income effects would disappear (for an elaboration, cf. Goodhart [1976]). The existence of real income effects presupposes that money is non neutral with respect to real variables. This would also be the case in the Dornbusch [1976] unemployment case, where undershooting occurs. The existence of real income effects and real effects in general may ameliorate the inflation devaluation cycle from the point of view of the firm. This would arise since consumer and government spending might be increased. One might also find that countries with large amounts of foreign currency denominated debt may benefit from revaluation since the local currency financing costs would decrease and government spending may be increased or taxes reduced.

Therefore, the possibility of real income effects should not be ignored. They are probably time and location specific. Should such effects prevail, they are a source of additional threat and opportunity for firms.

III.B.vii: The Effects of Financing Practices.

Jacque [1981] points out that the Shapiro [1975] model fails to take account of the subsidiaries financing practices. Hodder [1982] incorporates the liability structure of the firm into the analysis by assuming:

- i) Two countries and a single time period.
- ii) Net worth is positive and predetermined. The real asset position of the firm is assumed fixed for the year; further, it is assumed that the market value of the firm equals the net worth of the firm, which in turn equals the sum of the market values of the firm's assets and liabilities.
- iii) Physical assets are assumed homogenous except for their location.
- iv) Liabilities are homogenous with respect to all factors other than currency of denomination and the applicable interest rate in the currency of denomination.
- v) Physical asset prices deviate between countries by a random factor.
- vi) Exposure is defined as the exposure of the rate of return on net worth to exchange rate changes after adjustment for general price change in the home country.

vii) For the purposes of deriving an optimal decision rule it is assumed that the decision maker has a quadratic loss function. This assumption, is similiar to the analysis of Shapiro [1977].

This leads to exposure (E) being deduced as:

$$E = NW (Cov_{r,e} / Var e)$$

where: NW = net worth

r = the real rate of return on net worth

e = the rate of change of the exchange rate

This exposure measure may then be decomposed into:

- i) The exposure of domestic assets
- ii) The exposure of foreign assets
- iii) The exposure of net worth to PPP deviations
- iv) The exposure of foreign currency denominated liabilities

These exposures are related to one another as follows:

$$E = i) - ii) - iii) - iv)$$

Shapiro's model deals with the cases of i) and ii). The policy implication of the model is that exposure is manipulated by altering the ratio of overseas to home debt. The exposure of balance sheet items is more difficult to understand. Hodder

[1982] cleverly sidesteps a number of important issues by assuming that the market value of the firm equals the net worth of the firm which in turn equals the market value of the sum of the values of individual assets and liabilities of the firm. Under these circumstances, all accounting problems have been assumed away and an economic measure of income is assumed. The plausibility of this assumption is examined in section IV of this chapter.

It may be concluded that should deviations from purchasing power parity exist, the costs and revenues of the firm may be affected. The extent to which costs and revenues will be affected will depend on the degree of tradability of the firm's factors and products, the macroeconomic impact of exchange rate changes and the degree of flexibility of product and factor market prices.

III.C: The Portfolio Effect of Multi Currency Holdings

This aspect has been dealt with by Makin [1978] and Gull [1977]. The main practical implication of this research is that maintaining open positions in currencies may decrease rather than increase risk.

Conceptually, it is a variant of the portfolio approach to security investment (see Markowitz [1952,1959]). Makin [1978] examines a situation similar to Sharpe's [1963] diagonal model. Makin's model focuses on the management of monetary assets and liabilities, however, it could in principle, be extended to the

location of physical assets. The approach assumes that there are stable covariances between currency movements, so that the management of a portfolio of assets and liabilities becomes equivalent to a series of investments in a portfolio model. A quadratic utility function is assumed in order to produce 'optimal' results. The most interesting insight of the model, is that an optimal solution may include open positions in certain currencies, whereas a 'one by one' approach would suggest that either one hedges everything or nothing. The Gull [1977] model is similar in approach and Blackie [1978] also advocates such an approach. Friedman [1981] points out some shortcomings with the model, some of which are corrected by Makin [1981].

III.D: The Exchange Risk of the Domestic Firm

It follows from the Hodder [1978, 1982] model that the domestic firm is exposed since:

$$E = i) - iv)$$

This also illustrates the counter intuitive result that the purely domestic firm may be more exposed than the international firm. This also follows from the Shapiro [1975] model, in the cases where the firm has both domestically sourced inputs and domestic sales. The exposure of the domestic firm arises from a number of factors which are discussed in the following paragraphs.

Firstly, if either the firm produces tradeable goods or some of the firm's factors are tradeable goods, then it will be exposed to exchange rate changes. In an open economy, non traded goods could also be affected by exchange rate changes.

Secondly, if domestic inflation is uncertain, then the domestic firm will be exposed to an inflationary risk. Under certain circumstances, this risk could be avoided by purchasing foreign currency denominated bonds.

Thirdly, exchange risk will be increased if there is high import competition in product markets. This effect will be exacerbated if there is a high degree of substitutability between domestic and foreign goods. Conversely, high import competition or foreign substitutability in input markets will decrease exchange risk. Therefore, the higher the percentage of tradeable inputs used, the lower the exchange risk.

Fourthly, if prices are more inflexible in factor markets, exchange risk will increase as local value added increases. It might also be suggested that restrictions on the openness of an economy such as high transport costs or restrictive trade policies will decrease exchange risk.

III.E: Intersubsidiary Linkages.

Intersubsidiary linkages consist of the effect of exchange rate changes in a third currency on the cash flows of the foreign

subsidiary. They arise from the use of a three country model in the work of Srinivasulu [1983]. Possible examples may include the setting of certain prices in the world economy in dollar terms, or competition from third countries. Srinivasulu [1983] does not discuss the issue and in an example in Srinivasulu [1983, chapter 5] this term is taken as given.

III.F: Conclusions

The Shapiro [1975] model implies that it is impossible to generalise about the effects of foreign exchange risk on the corporate sector. It will affect different firms in different ways. The model does however suggest that cash flows are exposed to foreign exchange risk in situations where PPP does not hold. In order to maintain some simplicity in the model, the effects of financial decisions such as the debt equity ratio were not discussed. The analysis does however highlight several key variables.

It was shown that the degree of tradability, price flexibility and substitutability of the firm's products and factors will determine the extent to which it is exposed to foreign exchange risk. Other influences on the exposure of the firm will include the impact of exchange rate changes on government policy and other macroeconomic variables. In the discussion of the Hodder [1982] model, it was pointed out that the presence of opportunities to raise debt in more than one country may ameliorate economic exposure.

Some counterintuitive results were also deduced. Portfolio analysis of multicurrency holdings suggests that open positions in currencies may be desirable, while it was also shown that the pure domestic firm in an open economy may be as exposed to exchange risk as the internationally oriented firm. Finally, it was shown that the covariances between currencies other than the home currency, and the covariances of real asset returns, may also have an impact on the exposure of the firm.

IV: Measuring Exposure to Exchange Risk

In the previous sections, the nature of corporate exposure to foreign exchange risk was examined. In this section accounting, statistical and qualitative measurement of foreign exchange exposure are examined. It will be shown that both statistical and accounting approaches to the measurement of economic exposure to foreign exchange risk are unlikely to be successful, and that ultimately, qualitative approaches to the measurement of foreign exchange exposure are likely to be the only operational technique. However, qualitative measurement amounts to the production of a more refined classification of exposure, and it is argued that measurement in a quantitative manner is unlikely, and that the real issue is the development of a more sophisticated classification of exposure.

IV.A: Accounting Measures of Exposure

Perfect and complete markets provide an opportunity to obtain a rigorous analysis of the difficulties of measuring economic exposure using accounting statements. This, in turn, highlights the differences between measuring translation (or accounting) exposure, and economic exposure. This characterisation, is based on the work of Debreu [1959]. For the purposes of this exposition, the following definitions are used.

- i) 'Complete Markets' are defined as the presence of organised markets which permit trading in all consumption goods and all factors of production. Furthermore, following Debreu [1959, chapter 7], if uncertainty is assumed, completeness includes a set of markets in which all conceivable state contingent trades may be made.
- ii) 'Perfect Markets' are markets which operate in a frictionless, costless, instantaneous manner. It is also assumed that all traders are prices takers and that there are no indivisibilities.

There are two significant features of the model. Firstly, the model is not monetised (see Debreu [1959, p36, fn.3]). Secondly, the valuation of assets is not a problem within this model, since, the present values of all assets will equal their current replacement cost or their net realisable value. Since a complete set of markets exists, all the assets and liabilities of the firm have market values. This means that the balance sheet

measure of net worth equals the market value of the firm. This is similar to the second assumption in the Hodder [1982] model. If worldwide identical homothetic preferences exist, purchasing power parity will prevail, since the law of one price will hold in perfect markets.

Beaver and Wolfson [1982] demonstrate that within such a setting, the use of current asset values and current exchange rates as a translation procedure for accounting statements, is the only translation method which possesses both economic interpretability and symmetry. Economic interpretability implies that the consolidated net worth will equal the present value of MNC future cash flows. Symmetry implies that the relationships between accounting numbers will be identical both in parent and subsidiary currencies.

Beaver and Wolfson examined the properties of two other translation methods (the current exchange rate - historic value method (C/H) and the historic exchange rate - historic value method (H/H)). They demonstrate that the H/H method possesses neither symmetry nor interpretability while the C/H method is only symmetric. As yet, it has not been demonstrated that perfect and complete markets are a necessary condition, (as distinct from a sufficient condition), for these results. Movement away from a perfect and complete markets framework is problematic, and the solution to the problem of foreign currency translation depends on a solution to the problem of inflation accounting outside of perfect and complete markets. The perfect

and complete markets setting is highly unrealistic since, within such a setting, it is difficult to know why academics would devote scarce resources to non problems, such as exchange risk, inflation accounting and foreign currency translation (for further discussion, see Beaver and Demski [1979], Beaver and Wolfson [1982], Bromwich [1977], Bromwich and Wells [1984] and Revsine [1973]).

The analysis indicates that the measurement of economic exposure is a non trivial issue, because the existence of incomplete markets will lead to many assets being non marketable, and asset valuation will be pambiguous. Market imperfections will lead to transaction costs, which will lead in turn to divergences between replacement costs and realisable values. Imperfections in second hand asset markets also pose problems in calculating depreciation charges, and cast doubt on the applicability of single period solutions to multi period problems (cf. Bogue and Roll [1974]). This result questions the Srinivasulu [1983] single period solution and the Hodder [1982] solution which assumed complete markets in order to measure net worth (e. g. the valuation of growth opportunities; see Myers and Turnbull [1977]) and a single period solution.

Glick [1986] uses a present value framework to demonstrate that the Beaver and Wolfson [1982] results will be violated when there are deviations from the traditional theory of international parity in a complete markets framework. To some extent, there is an internal inconsistency, since it is difficult to know how

deviations from neutrality might occur in situations where there were no difficulties in the measurement of asset values.

In principle however, the use of present values is appealing and, in the absence of a fully specified model, present values may provide an approximation to the value of the firm. This observation has prompted some authors (e.g. Cornell and Shapiro [1983], Shapiro [1986] and Eiteman and Stonehill [1986]) to suggest that exposure to exchange risk is the impact of exchange rate changes on the value of the firm or on the net present value of corporate cash flows. Hekman [1985] uses a present value framework to produce a potentially estimable coefficient of exposure. However, there are a number of restrictive assumptions made in the analysis, including the assumption that all elements of value are assumed to be functions of a single variable source - the vector of expected exchange rates. Moreover, it is assumed that the stochastic exchange rate process is fixed. While the model represents a useful first step towards integrating the analysis of foreign exchange exposure and corporate valuation theory, it is unlikely that the model could be applied in practice without substantially more development.

However, there are a number of potentially devastating criticisms of the net present value approach. Firstly, it is questionable whether value maximisation will be unanimously supported in segmented international capital markets. Secondly, a present value is a value which is known and certain if market prices are

used. It is vacuous to attempt to find a covariance between a current non random market value, and an infinite series of random future exchange rates. Adler and Dumas [1985, fn.6] point out:

"In finance, notional changes in present values are used to evaluate the impact of current decisions that will effect future outcomes: but no financial decision is required for measuring exposure. The approach taken here enables financial decision analysis and exposure measurement to be kept apart: Exposure is a matter of the future, instantaneous covariation of contemporaneous prices and exchange rates either at discrete points of, or continuously over, time. It is the value of hedging that requires present value comparisons."

The implication of the analysis is clear. Examining the impact of exchange rate changes on present values is of little interest. The real issue is the examination of the covariation between the random value of the firm's value at some future point in time and the random exchange rate at some future point in time. This possibility is examined in the following section.

IV.B: Statistical Approaches to the Measurement of Exposure

In the previous section it was argued that neither accounting nor present value techniques were likely to permit the measurement of exposure in a meaningful way. It was pointed out that a measure of exposure should reflect the covariation of future values with future exchange rates. Adler and Dumas [1985] propose that such an approach may be implemented by obtaining the regression coefficient between future values and future exchange rates. This approach is theoretically useful, since measurement can be accomplished, in principle, and the measured exposure may be hedged using forward contracts. Unfortunately, the approach

is unlikely to be operational for a variety of reasons. Firstly, the model is based within a single period context, and multiperiod or dynamic hedging strategies are excluded. Moreover, it is possible that exchange rate changes in previous periods will effect cash flows in the current period. This in turn would imply the use of a multiple regression model. Secondly, without a complete model of the relationship between firm value and exchange rates, it will be necessary to use historical data. This in turn involves assuming that the past is a valid representation of the future. It is unlikely that the processes which influence the value of the firm and the exchange rate are likely to be stationary. Thirdly, the possibility of non stationary processes which may also be non normal violates the assumptions of a regression approach. It was shown in chapter two that this is likely to be the case for exchange rate changes. However, the approach may be useful for hedging portfolios of overseas assets, and this possibility has been examined by Adler and Simon [1986]. As yet, the approach has not been applied to individual corporate stocks.

Unfortunately, the measure of exposure is a statistical decomposition, and there is no underlying theory of the relationship. The approach is similar to the application of the market model, before the capital asset pricing model was conceived. The exchange rate is not a state variable, but an equilibrium price. It is therefore quite possible that the variability of the market value of the firm might be increased rather than decreased by the introduction of a hedging strategy

based upon the regression coefficient. Moreover, in segmented capital markets, it is possible that the firm's optimal hedge will not be unanimously supported. In conclusion, the approach is a theoretical advance on present value definitions of exposure, but is unlikely to be implementable in practice. In the next section, a qualitative approach to the measurement of exposure is examined.

IV.C: Qualitative Measures of Foreign Exchange Risk

It has been shown in the previous two sections that quantitative techniques are imperfect in a number of respects. In this section, a qualitative approach to the measurement of exposure is examined.

Transaction exposures are relatively simple to measure. A transaction exposure as defined by Srinivasulu [1983] is simply an amount of foreign currency which has a regression coefficient of one with exchange rates and the R-squared of the regression equation is also one. In the case of exposures which are uncertain as to realisation, for example an export order in a letter of credit situation, the regression coefficient of the expected amount will also be one and the R-squared of the regression equation will be less than one. This latter observation arises since the regression equation will not explain the portion of uncertainty arising from the possibility of the letter of credit failing to materialise. Alternatively, these transaction and near-transaction exposures are independent of the

exchange rate when stated in foreign currency. This in turn leads to the following definitions of exposure.

A Transaction Exposure is a foreign currency cash flow which has a regression coefficient of one with the exchange rate. Moreover, the R-squared of the regression equation equals one.

An Economic Exposure is any foreign currency cash flow which does not meet the conditions of a transaction exposure, and any home currency cash flow which does not have a coefficient of zero with the exchange rate.

Flood and Lessard [1986] suggest that economic exposure should be separated into a 'competitive' effect and a 'conversion' effect. The competitive effect is due to the effects of exchange rates on the local currency cash flows of the subsidiary or the parent currency cash flows of domestic subsidiaries. The conversion effect arises from the conversion of foreign subsidiary cash flows into the currency of the parent. The issue of real interest is the measurement of the competitive effect. Flood and Lessard [1986, pp.34-35] suggest four types of prototype firm. The first type is the exporter firm which sells its products in global markets, but sources in segmented markets. The second prototype is the local market firm which both sources and sells in segmented local markets. The importer firm purchases in global markets and sells in segmented markets. The global firm is the final prototype and both purchases and sells in global markets. The approach is simply a categorisation of the inputs and outputs of the firm by the degree of tradeability.

It is unfortunate that progress in operationalising the measurement of exposure has advanced so little. It is probably

an indication of the intractability of the area that concepts which are almost fifteen years old have not been operationalised beyond simple qualitative categories.

V: Summary and Conclusions

This chapter has examined the manner in which corporations are exposed to exchange risk. A number of models which have been advanced in the literature were discussed, in order to examine the nature of exposure. In particular it was pointed out that these models are limited, since they adopt a partial equilibrium or ceteris paribus assumption in order to provide some analytical tractability. The models suggest that it is difficult to understand exposure unless one focusses on the activities of individual firms. It was also demonstrated that the purely domestic firm is also exposed to exchange risk. This last insight arises because it was argued that it was the tradeability of the inputs and outputs of the firm will influence the exposure of the firm.

It was also pointed out that common categories of exposure were imperfect and the following definitions of exposure were suggested.

A Transaction Exposure is a foreign currency cash flow which has a regression coefficient of one with the exchange rate. Moreover, the R-squared of the regression equation equals one.

An Economic Exposure is any foreign currency cash flow which does not meet the conditions of a transaction exposure, and any home currency cash flow which does not have a coefficient of zero with the exchange rate.

The measurement of exposure was then examined. It was pointed out that while the measurement of transaction exposure is straightforward, the measurement of economic exposure is not.

A number of different measurement techniques were examined. Firstly, it was shown that accounting reports were unlikely to provide a measure of exposure unless perfect and complete markets prevailed. The sensitivity of the present value of future cash flows to exchange rate changes was also examined. It was argued that an attempt to correlate a certain current market value with a future random variable was ill conceived. A theoretically superior statistical technique was also examined, but it was argued that the approach was unlikely to be operational. Finally, a qualitative approach to the measurement of exposure was examined, and it is probably the only measurement technique capable of immediate practical application.

A number of issues were sidestepped entirely in this chapter.

- i) Taxes were ignored, or assumed symmetric.
- ii) Single period frameworks were used in many cases. These are limited since solutions in a single period framework may not be optimal within a multi period model. Moreover, the existence of incomplete, imperfect markets and the possibility of technical change may become relevant.
- iii) In many cases, models employing a mean variance framework were used, rather than more complete models of capital markets.

CHAPTER 4

MANAGING EXPOSURE TO FOREIGN EXCHANGE RISK

It was argued in the previous two chapters that there were grounds for believing that foreign exchange risk exists, and that corporations are exposed to it. In this chapter, two issues are examined. Firstly, the normative case for the management of foreign exchange risk will be examined. Secondly, having demonstrated a normative case, the techniques which may be used to manage foreign exchange risk will be examined.

I: The Normative Case for the Management of Foreign Exchange Risk

While foreign exchange risk may exist and affect the cash flows of corporations, it is also necessary to demonstrate that corporations should manage it. Dufey and Srinivasulu [1984, p54] summarise the case against managing foreign exchange risk (FER) as:

"FER does not exist: even if it exists, it need not be hedged; even if it is to be hedged, corporations need not hedge it."

The case against managing exchange risk [cf. Wihlborg 1980, p29] is based initially on the premise that the equilibrium relationships outlined in chapter 2 hold, and that real as distinct from nominal exchange risk is irrelevant. This premise is based in particular on Purchasing Power Parity theory (PPP) and the failure of PPP to hold in practice is a sufficient condition for exchange risk to exist, given that deviations from PPP and hence real exchange rate changes are unanticipated.

In chapter 2, it was shown that there is considerable evidence of deviations from PPP.

The maximisation of shareholder wealth is often assumed as the normative goal of corporate financial policy. Early writers such as Solomon [1963], postulated this goal in order to operationalise the concept of profit maximisation. While, such a goal may seem plausible, more recent literature points out that the conditions necessary to demonstrate that a certain policy will be unanimously supported by shareholders, requires restrictive assumptions even within a partial equilibrium context. For example, it is necessary to assume that a decision will not affect the pay offs of other firms or the consumption opportunities of shareholders. In a general equilibrium context, the issue becomes even more complex, and assumptions become so restrictive as to render shareholders indifferent to the firm's financing and investment decisions (for a fuller review of these issues, see DeAngelo [1981]). Moreover, in practice, it is possible that there will be agency (see Jensen and Meckling [1976]) considerations in the development of policies which are 'optimal' from the point of view of the shareholders. Stulz [1984] demonstrates that value maximising firms will pursue active hedging strategies because managerial income is an increasing function of changes in the value of the firm.

There is however one argument against hedging which is inadmissible. Giddy [1976, p100] argues that:

"...exchanging currency via the forward market yields just as much uncertainty as would waiting until the payment date and exchanging currency in the spot market each time."

This argument is an argument similar to that of Aliber [1978]. It is based upon the observation that the average deviation of the forward rate from the future spot tends towards zero in the long run. The approach involves assuming that managers and shareholders are risk neutral, and only concerned about long run expected values. It amounts to assuming that risks with expected values of zero do not matter. Moreover, it may be in the interests of shareholders to have a smooth earnings stream. This may be due to the existence of asymmetric tax laws which restrict the carrying forward or back of losses or progressive tax rates (Smith and Stulz [1985]). There might also be a fear of adverse public attention if profits are seen to be extremely high (cf. Ronen and Sadan [1980]). Finally, regulatory bodies, particularly in the banking sector, may insist on a low foreign exchange exposure.

Having disposed of the zero mean fallacy, the case against hedging in a value maximisation framework is examined.

I.A: Hedging and Value Maximisation

Hedging is simply a technique for altering the currency denomination of the firm's liabilities. This is a useful insight, since the main arguments against hedging are based upon Modigliani and Miller [1958] (MM). The MM model has been extended into the international arena by a number of academics

including Baron [1976], Dumas [1978] and Feiger and Jacquillat [1981]. In an integrated world capital market, hedging is irrelevant. There is no reason why shareholders should not engage in 'homemade hedging'.

Alternatively, the argument may be stated using the capital asset pricing model [CAPM] as enunciated by Sharpe [1964], Lintner [1965] and Mossin [1966]. It is argued that risks which can be diversified away by shareholders are irrelevant to the shareholder wealth maximisation principle. For example, Logue and Oldfield [1977] argue that:

"Most foreign exchange hedging activity is ill conceived and has little or no effect on the value of the firm. [A negative effect may even occur as a result of hedging costs.] It appears then that corporate hedging activity in the foreign exchange market is at best irrelevant and at worst costly."

Even if exchange risks are systematic, Lessard [1981 pp352-356] and Logue and Oldfield [1977] argue that hedging foreign exchange risks is only moving the corporation along the security market line and therefore does not enhance shareholder wealth.

Therefore, it is unnecessary for the firm to hedge since the change in risk profile will be offset by an identical change in its expected return. The logic is simple. The value of a hedged firm will equal the value of an unhedged firm, because the value of a hedge in equilibrium will be zero. However, in order to achieve this outcome, a 'homemade hedging' mechanism is necessary. The case for hedging then rests upon the barriers to homemade hedging, which will consist of either capital market

imperfections or information asymmetries.

The first type of imperfection is the presence of bankruptcy risk. It has been suggested by a number of writers, including Logue and Oldfield [1977], Makin [1978], and Adler and Dumas [1983, 1982], and examined analytically by Smith and Stulz [1985]. The underlying principle may be based on the possibility of the firm encountering short run liquidity difficulties, or breaching bond covenants because of foreign exchange losses. Normally, examples such as the Herstatt bank and the Franklin bank are cited as examples of exchange rate losses leading to the collapse of a firm. Other examples include the debt repayment difficulties of Laker Airways. Unfortunately there has been no rigorous empirical research carried out of this issue and there is evidence that bankruptcy costs may be trivial (Warner [1977a,b]). However, even in the trivial bankruptcy case, hedging will be justified if the costs of hedging are less than the reduction in the expected costs of bankruptcy.

The second possibility is the existence of institutional constraints to 'homemade hedging'. Institutional barriers may consist of barriers to individuals entering the foreign exchange markets or the presence of fixed transaction costs. The essence of this argument is that the shareholder would only wish to transact in small quantities and it is therefore more economical for firms to do so. However, it could be argued that large institutional shareholders are in a position to transact in large

quantities in foreign exchange markets.

The third possibility is that firms may be in a position to mediate risks internally, and maximise transaction cost savings. This possibility is based to some extent on a 'markets and hierarchies' (Williamson [1976]) view of industrial organisation. Prindl [1976] suggested the classification of hedging techniques as either 'internal' or 'external'. The former type of hedge is mediated through the firm or 'hierarchy' while the latter hedge is mediated through markets. Examples of internal hedging techniques might include adjusting intra-firm funds flows to decrease exposure, while examples of market based hedges might include hedging in either forward or money markets. Internal techniques are used because the costs of transacting in markets are too high, or because of the existence of imperfections such as capital market regulations, exchange controls and taxes or because there are no markets.

The fourth type of imperfection is the presence of information asymmetries. Baron [1976] developed a model which used 'homemade hedging', however it assumes the shareholder has perfect information about the output level, and the firm's production and cost functions (both assumed deterministic). The model also assumes zero transaction costs. It would seem reasonable to argue that the firm has an informational advantage in this respect and should therefore hedge on behalf of the shareholder.

Finally, in the presence of transaction costs, leaving exchange risks uncovered may be desirable since shareholders are interested ultimately in consumption and the consumption opportunity set may be exposed to foreign exchange risks (see Eaker [1981] and Feiger and Jacquillat [1981, pp 213-15]). This suggestion may be seen in the context of the Stulz [1981] and Breeden [1979] consumption based asset pricing models. Eaker [1981] suggests the use of a trade weighted index (Kouri and Braga deMacedo [1978]) in adjusting foreign returns. Makin [1981, p441] argues against this position and maintains that:

"Since the optimal real bond differs for each investor with different expenditure patterns, which themselves change over time, management of real risks must be done at the investor level...Information costs suggest that investors may find it easier to diversify real risks on their own while leaving the management of foreign exchange risk to company managers."

In this section, it has been argued that there is a normative case for corporate management of foreign exchange risk. In the presence of an integrated perfect world capital market with no information asymmetries, conditions similar to the MM conditions would hold and hedging would be irrelevant. However, in the presence of market imperfections or information asymmetries, there will be barriers to homemade hedging and corporate hedging may be desirable. A number of imperfections were discussed, including taxes, the presence of regulatory authorities and bankruptcy costs, barriers to capital market entry, the availability of internal hedging techniques and shareholder information asymmetries. In the next section, foreign exchange risk management is examined.

II: Managing Foreign Exchange Risk

So far, it has been demonstrated that foreign exchange risk exists and that exchange rate changes may affect the cash flows of the firm. It has also been shown that there is a normative case for the management of foreign exchange risk. In this section, the techniques which might be used to manage foreign exchange risk are examined. The first part of this section focuses on the techniques which may be applied to the management of transaction exposures. In the second part, the discussion is expanded to the management of all the effects of exchange rate changes on the cash flows of the firm.

II.A: The Management of Transaction Exposure

In chapter three, a transaction exposure was defined as a foreign currency cash flow which has a regression coefficient of one with the exchange rate, and the R-squared of the regression equation is also one.

The management of transaction exposure is the area of foreign exchange risk management which has received virtually all the attention in the literature. By definition, it is much easier to apply operations research models to a transaction exposure than an economic exposure. There are two types of technique which may be used to manage transaction exposures. One could use financial instruments to hedge the exposure (External/Market Techniques), or alternatively, modify operational variables

(Internal/Hierarchy Techniques) in order to prevent transaction exposures from occurring in the first place. The two types of technique are discussed in the following paragraphs.

II.A.i: External Techniques

There are two types of external or market based methods of managing pure transaction exposures. Firstly, one could purchase forward contracts, so that the exposure was partially or totally covered. Alternatively, one could use a combination of spot and money market transactions to achieve the same result. If interest rate parity holds, transaction costs are trivial and taxes are symmetric, then the decision maker would be indifferent when faced with a choice between the two techniques. If these conditions do not hold, then the decision maker must compute the least cost method. Having evaluated the cost of hedging, the decision maker need only decide on the appropriate level of cover. Kohlhagen [1978] developed a model for the selection of the appropriate level of cover without exchange rate expectations. Folks [1973] and Wheelwright [1975] have suggested techniques that managers might use to determine the appropriate level of cover, which incorporate the preferences of the decision maker. Babbel [1983] develops a model which permits the incorporation of deviations from parity conditions. His model is particularly interesting, since in ten of the thirteen possibilities he examines, he finds that knowledge of the decision maker's preferences is unnecessary, providing the decision maker is risk averse. Yang [1984] develops a model of

the value of a forward contract but assumes that international parity holds, and his recommendations are based upon the zero expected value fallacy. Finally, Eaker and Grant [985] use a stochastic dynamic programming approach which decision makers might use when forward contracts are unavailable for long term maturities.

The management of pure transaction exposure using external techniques would seem to be a relatively straightforward exercise if parity conditions hold and it is sufficient to incorporate the risk preferences of the decision maker. Unfortunately, there are few normative solutions once one moves outside of this framework. Indeed the very case for the management of foreign exchange risk presupposes that there are imperfections and frictions. If one is content with the normative case for managing foreign exchange risk, then the measurement of the costs and benefits of hedging should be evaluated from a shareholder's point of view. Benefits will include the ability to take advantage of size barriers and segmentation in foreign exchange markets, different tax regimes, decreases in bankruptcy costs and the presence of information asymmetries. The costs of hedging are equally difficult to evaluate, given the presence of a biased forward exchange rate.

II.A.ii: Internal Techniques

The MNC is also in a position to use 'internal' (Prindl [1976]) techniques to manage foreign exchange risk. The techniques

include netting, altering the currency of invoice (Schwab and Lusztig [1978]), leading and lagging, and altering the denomination of working capital items in foreign subsidiaries. Unfortunately, it is virtually impossible to suggest how the costs of these techniques might be evaluated, since they may include organisational implications in terms of performance evaluation, and changes in the political risk profile of the MNC due to the risk of offending host governments.

One might conclude that if the preferences of the shareholders are shared by the decision maker and parity conditions prevail, then the management of transaction exposure is straightforward. The decision becomes considerably more judgemental when one considers the possibility of deviations from parity, since the costs and benefits of hedging are more difficult to measure, and there may be a case for the use of internal techniques due to frictions and imperfections in foreign exchange markets.

II.B: The Management of Economic Exposure

Unlike examinations of the management of transaction exposure, the management of economic exposure poses considerable problems, since given the difficulties inherent in measuring economic exposure, the possibility of immunising economic exposures is unlikely, and at best one can hope for partial hedges of economic exposure. However, the recent advent of foreign currency options permits immunisation of foreign currency cash flows which are subject to a source of uncertainty which is binomially

distributed. The case of binomial uncertainty is examined in section II.B.i, and all other types of economic exposure are examined in section II.B.ii.

II.B.i: The Management of Economic Exposure: The Binomial Case

The binomial case is a relatively simple type of economic exposure. A foreign currency cash flow would be included in this case if it satisfied the following conditions:

- i) The regression coefficient of the cash flow with the exchange rate is one.
- ii) The R-squared of the regression equation is less than one.
- iii) The residual uncertainty which is unexplained by the regression equation is binomially distributed.

Any foreign cash currency cash flow which is contingent upon a state variable which will be either realised or unrealised, may be included in this category. *Examples would include bidding on foreign currency denominated contracts, offers to purchase foreign firms and orders from foreign customers where a letter of credit had not been received.* The issue of foreign currency price lists might also be included in situations where demand was extremely price elastic.

The external techniques that might be used in the binomial case include foreign currency options and forward contracts. Eaker and Grant [1985] use stochastic dynamic programming to examine

the case of a foreign currency tender. Their solution involves the use of forward contracts and an assumption of an unbiased forward rate and quadratic utility. Using these assumptions, they show that the amount which is covered in the forward market will depend upon the probability of winning the contract. An alternative technique is the use of foreign currency options. In this case, the Eaker and Grant [1985] solution becomes redundant since the decision to use the hedging instrument will be identical to the decision to use a forward contract in the transaction exposure case, because the option permits the total immunisation of the foreign exchange risk. It should also be noted that a foreign currency option may be replicated using forward contracts and delta hedging (see Giddy [1983] and Cooper [1985]). However, the delta hedging technique and the use of options require a model of option prices.

There are a variety of foreign currency option pricing models which are modifications of the Merton [1973] proportional dividend option pricing model. Garman and Kohlhagen [1983], Biger and Hull [1983], Grabbe [1983] and Yang [1985] have developed virtually identical option pricing models for European options. Gemmill [1985] suggests a binomial solution for the pricing of American options. The main differences between these models and the Black-Scholes model are threefold (Grabbe [1983]). Firstly, there will be two interest rates in the equation, a home and a foreign rate. Secondly, the interest rate is assumed stochastic since foreign exchange prices will covary with interest rates, unlike stock prices, where the covariance may be

immaterial. Thirdly, American calls will strictly be worth more than European calls.

As yet, there have been no tests of these models. Gemmill [1985] examined some sterling-dollar options in April 1985 and found that they were mispriced by between six and twelve per cent. Bodurtha and Courtadon [1986] tested the efficiency of the Philadelphia market and concluded that it was efficient. The main barriers to the development of more accurate models of foreign currency options are unlikely until the underlying stochastic process generating exchange rate changes is understood, and the nature of the relationship between the forward rate and the realised spot rate is understood.

The availability of foreign currency options permits the management of economic exposures which satisfy the conditions of the binomial case. Giddy [1983] suggests that foreign currency options might be used to protect the exposure arising from the issue of a foreign currency price list. However, immunisation of the risk will be impossible unless demand is extremely price elastic. If demand is not price elastic, then the quantity to be hedged will be contingent upon the expected vector of prices and quantities. Unfortunately, the application of foreign currency options to situations where the residual uncertainty of the foreign currency cash flow is not binomially distributed have not been examined in the literature. Moreover, apart from the discussion of 'homemade options', the use of internal techniques to manage simple economic exposures has not been discussed in the

literature.

II.B.ii: The Management of Economic Exposure: The General Case

In this section, the management of economic exposure in cases which do not satisfy the conditions of the binomial case are examined. In order to facilitate the analysis, the Srinivasulu [1983] and Hodder [1982] models are used to facilitate the analysis.

Both the Srinivasulu [1983] and the Hodder [1982] analysis assumed that the physical asset position of the firm was fixed for the time period under consideration. By default, the only policy variable available to corporate management is manipulation of financial variables to alter the exposure. This possibility is discussed in section II.B.iii. Alternatively, one may assume that the firm can exercise some control over its physical asset position and thereby alter its exposure. This possibility will be examined in section II.B.iv.

II.B.iii: Financial Strategies for Economic Exposure Management

From the discussion in chapter three, it follows that the firm could alter its exposure by altering the currency composition of its liabilities. The approach presupposes that the decision maker can specify his preferences, and measure exposure by specifying the covariance terms and the weightings.

Both Srinivasulu [1983] and Hodder [1982], do not succeed in linking their 'optimal' solutions to shareholder wealth. This may to some extent be explained by the difficulties involved in specifying international asset pricing models.

If a managerial objective function can be specified, there are still the difficulties of measuring both the covariance terms and the portfolio weights, and the establishment of the stability of these terms. Later in this chapter, it is argued that these problems may prove insurmountable. However the difficulties are self evident when one considers the measurement problems discussed in chapter three.

If both of these problems were overcome, the hedging decision is relatively straightforward. It was pointed out that the main difference between a transaction exposure and an economic exposure is that the amount which is exposed is stochastic. On an expected value basis, the computation of the proportion to be hedged could be evaluated with a modified version of the Eaker and Grant [1985] model. However, complete immunisation would be impossible without a portfolio of foreign currency options. This latter strategy could be potentially costly.

II.B.iv: Operational Strategies for Economic Exposure Management

The firm should not be constrained to using purely financial methods to alter its asset and liability structure. Dufey [1974] posed the question of:

"Could we profitably exist as a purely financial institution?"

He then argued that firms could alter real variables, in an effort to manage economic exposure. Such an approach is consistent with the advantages of firms lying in their production, organisational, marketing and technical skills. Within the approach taken in chapter three, this would imply attempting to alter the covariance and variance terms in the definition of exposure of terminal wealth. The following paragraphs discuss some of these covariance terms individually, and the means by which they may be altered.

II.B.iv.1: Diversifying Internationally

Eiteman and Stonehill [1986, p201] argue that by diversifying internationally, the firm has more flexibility to react to exchange rate disequilibria. This however is also suggested as a panacea for other international business risks. International diversification may involve prohibitive transaction costs if it is used purely as a technique to decrease economic exposure. However, investment and disinvestment are obvious techniques for altering the weightings of the Srinivasulu [1983] exposure equations.

II.B.iv.2: Altering the Structure of the Firm's Operations

This approach is advocated by Shapiro [1986, chap.9] and Cornell and Shapiro [1983] and represents an elaboration of the Dufey

[1974] argument. Shapiro [1986, p245] proposes that there are a number of 'pre-active strategies' which may be undertaken by the production and marketing functions. Among the marketing options available to the firm (Shapiro [1982, chap.9], Shapiro and Robertson [1976]) are:

- 1) Market selection and segmentation: This involves selecting the markets within which to sell products, and the resources to be devoted to the marketing effort in each market. Market segmentation may also be relevant, since exchange rate changes may have real income effects. Markets which are segmented by their income elasticity of demand might be significant. This opportunity assumes that preferences are non identical and non homothetic. This strategy, is however a longer run option and would only be influenced by exchange risk considerations if disequilibria were expected to be persistent.

- 2) Pricing strategy: The ability of the firm to adjust its prices to the effects of inflation and devaluation, was highlighted as a key variable affecting profitability in chapter three. The price sensitivity of the markets in which the firm operates or the price elasticity of demand is crucial in determining optimal strategies, should the firm attempt to maximise profit. In addition, economic exposure may affect strategies such as vintage pricing, market penetration and price discrimination. Finally, real income effects may also affect such strategies. The origin of

competitors is also likely to be important, since it will determine their economic exposure. This could in turn be linked to a prediction of their likely reaction in the wake of exchange rate changes.

- 3) Promotional strategy: Since economic exposure affects other marketing variables, promotional strategy may also be affected, because it will reinforce both pricing and market selection strategies.
- 4) Product strategy: Because monetary factors and product markets are to some extent interdependent, economic exposure may alter optimal product introduction and deletion decisions, such as the timing of such events.

Apart from economic exposure initiatives in the marketing function, the production function may also react (Shapiro [1986, chap.9]). Such initiatives might include:

- 1) Product sourcing and input mix decisions: In chapter 3 it was indicated that economic exposure could be reduced if the firm were able to alter its sourcing of inputs and final products in the light of monetary disturbances. In addition, the scope of foreign competition in the local market and its origin was mentioned in chapter 3. Plant profitability could be enhanced if the firm can take advantage of deviations from the law of one price. Such a policy may be impossible, due to transport costs, or

constrained by local sourcing as a prerequisite for quality control.

- 2) Plant location: Shapiro [1986, pp.255-6] and Srinivasulu [1981] cite some anecdotal evidence of plant location decision which were motivated by economic exposure considerations.

In order to implement these strategies, Shapiro [1986, pp.256-7] suggests planning as the key. The evidence presented in chapter 2 indicates that currency forecasting is a haphazard task. The alternative is the creation of scenarios under the most likely exchange rate changes and their effects on the firm's operations. This would permit analysis of the firm's competitive position under alternative scenarios. Given this information, it is simply a case of designing contingency plans to deal with actual exchange rate changes as they occur.

In a similar vein, Naumann-Etienne [1977] used a simulation model to examine how firms could manage economic exposure. He concluded that management of economic exposure would require:

- 1) Knowledge of the sourcing and sales characteristics of the operation.
- 2) The ability to analyse the effect of unanticipated exchange rate changes on future cash flows.
- 3) The ability to take anticipatory action.

Finally, the Eiteman and Stonehill [1983, p195] argument for flexibility is relevant, since this policy would enhance the ability of the MNC to take anticipatory action and execute contingent plans.

II.B.iv.3: The Portfolio of Currencies

The counter intuitive results of open positions in currencies being superior to fully hedged positions was discussed in chapter 3. This section will be limited to the discussion of the portfolio effects on monetary assets and liabilities. The portfolio method is equally applicable to physical assets however, given both the stickiness and incompleteness of physical asset markets, it is unlikely that one could predict the impact of foreign currency covariances on physical asset prices. The portfolio of currencies concept is also of relevance to the discussion of transaction exposure, since if there is a stable covariance, the naive hedging decision will be sub optimal (see Makin [1978] and Gull [1976]). Walther [1983] has tested this possibility and found that if one sought to minimise risk, a naive hedging model was superior to a portfolio model. It is however an open issue as to whether there are stable covariances between currencies, and if so, how it relates to both market efficiency and the observed distribution of exchange rate changes.

II.C: Summary and Conclusions

In this section, the techniques that may be used for managing transaction and economic exposure were examined. If markets are frictionless, the preferences of the decision maker known and stochastic exposures capable of measurement, then there are a number of financial instruments which may be used to manage foreign exchange risk. If financial markets are not frictionless, then there may be a case for the use of internal techniques rather than external market based techniques. It was also pointed out that in many cases the hedging decision is probably one which requires the use of judgement rather than operations research techniques. In the next section theories of internal organisation are examined, and in the final section, the implications of a theory of internal organisation for foreign exchange risk management are examined.

III: Theories of Internal Organisation

This section reviews the issue of the internal organisation of the firm. It is relevant to the discussion, since it may place constraints on the ability of the firm to manage exposure to foreign exchange risk. In the preceding sections, the firm was treated as a black box, where there was a single preference function which could be applied to a measure of exposure, and 'optimal' hedging decisions could be made. In this section, the internal workings of the black box are examined using markets and hierarchies theory (Williamson [1975]). It was considered

Thiessen [1983], Spicer and Ballew [1982]) and as an explanation of the history of cost accounting (Johnson [1983a,b, 1980]). Cooper [1983], using the Burrell and Morgan [1979] classification scheme, argues that as a framework for management accounting, it fails to take account of more radical social science approaches. Flamholtz [1983] argues that the value of the framework as a historical explanation may be limited by the historical facts selected, while Crawford [1984] has used an alternative framework to examine the development of management accounting.

III.B: Intellectual Pedigree

If the manager of an MNC had unlimited and costless information, unlimited computational ability and unlimited time at his disposal, the foreign exchange risk problem would be significantly easier to solve, since one could follow a method similar to that of Srinivasulu [1983] and suggested by Shapiro [1982], and select the optimum risk return profile. Alternatively, he could select an optimal strategy and hedge in financial markets. This approach may be described as a 'global rationality' perspective. 'Bounded rationality' is behaviour which is (Simon [1961 p.xxiv]):

"Intendedly rational, but only limitedly so."

A useful analogy is the game of chess. If one could compute a complete decision tree, (i.e. global rationality), winning would be easy, but nobody would play. It is a game, because people play in an adaptive sequential way, and examine limited sets of alternatives, playing at most a few moves ahead. (see Simon

[1972, p166], VonNeumann and Morgenstern [1953, p125]). Alternatively, it might be compared to finding one's way in a fog, where one can see only a few yards ahead. It also follows that some environments are foggier than others and that the ability to see any distance in the fog may vary across individuals.

If there were a complete set of contingent claims markets, computational complexity would no longer be a problem, since one would have the computations available in market prices (Williamson [1975, pp.22-23]). Furthermore, limits on language lead to inabilities to communicate task specific information, which in turn leads to learning (March and Simon [1958, chap.6], Simon [1972]). Again, if complete markets existed, this might be overcome, since the information could be traded.

Assuming that the bounded rationality constraint is binding, uncertainty exists, and there are an incomplete set of markets to deal with uncertainty, a rationale for internal organisation begins to emerge. However, these conditions do not provide a reason for not resorting to markets to rent some computational skills. Williamson [1975, chap.2] argues that market mediation may be more costly, if there are small numbers and the possibility of opportunism. The small numbers situation is self evident, since it is similar to the bilateral monopoly situations in introductory textbooks. If the small numbers situation is combined with opportunistic inclinations, hierarchies may be more economical, since they may lower bargaining and maladaptation

costs.

Opportunism [Williamson 1975, p26] arises from individuals being guided by self interest with the addition of "guile" or strategic behaviour. Williamson [op.cit.] argues that this may lead to:

"... selective or distorted information disclosure [and] self disbelieved promises regarding future conduct."

These are the four sufficient conditions for the phenomenon of 'information impactedness'. Given information impactedness, transaction costs arise in market transactions, and it may be possible to lower transaction costs by mediating transactions through heirarchies.

This central role accorded to transaction costs has antecedents in the work of Commons [1934], Coase [1937] and Hayek [1945]. Williamson [1975, p2] argues that:

"...transactional considerations, not technology, are typically decisive in determining which mode of organisation will obtain in what circumstances and why."

This casts his approach in contrast to approaches which consider technology as the most important influence on modes of organisation (see Chandler [1977], Chandler and Daems [1980], Porter and Livesay [1977], Moss [1981, chaps. 6 and 7], Williamson [1980]). Furthermore the application of the framework outside of the U.S. may be doubtful, given the different development of divisionalised companies in the U.K. and Europe (Franko [1974], Hannah [1981])

Apart from the four conditions outlined above, Williamson [1975,

pp.37-38] also admits that 'atmosphere' arises. This author argues that it is the omission of this concept from the main body of the theory which gives rise to differences between the economic approach to internal organisation and sociological views of the organisation. Williamson [1975, p38] admits that:

"The standard economic model...assumes that individuals regard transactions in a strictly neutral, instrumental way."

Williamson [1975, pp.38-9] then examines the possibility that internal modes of transacting may contribute to quasimoral involvements among the parties. Thereafter, the subject receives virtually no mention until the concluding chapter. An interesting example of the issue of non neutral transactions in other approaches to the organisation is illustrated by the 'socio-technical' systems approach. Emery and Trist [1960] stress ideas such as 'belongingness' within a social system as crucial to task performance. Empirical support and further interpretations of this approach may be found in Miller [1975], Rice [1953] and Trist and Bamforth [1951].

Such approaches may not augur well for studying the applicability of markets and hierarchies theory to the study of behaviour within organisations, however Williamson and Ouchi [1981] introduce the possibility of 'soft' (social) contracting within hierarchies as an alternative to 'hard' (economic) contracting. The issue of power is however dismissed.

"...power considerations will usually give way to efficiency - at least in profit making enterprises, if observations are taken at sufficiently long intervals, say a decade."

They then argue that:

"...power explains results when the organisation sacrifices efficiency to serve special interests, we concede that this occurs. But we do not believe that major organisational changes in the commercial sector are explained in these terms. The evidence is all to the contrary."

For some arguments from a sociological and organisational theory point of view which deal with the issues of power and atmosphere, see Bauer and Cohen [1983], Francis [1983], Turk [1983] and Willman [1983].

Contingency theories of organisation design are to some extent similar. For example, Galbraith [1973, 1977] relies on an information processing approach to organisational design, while Lorsch and Allen [1973] rely on the ideas of diversity and interdependence. Both the contingency and the markets and hierarchies approaches do share common ground, since they stress the ideas of efficiency and effectiveness.

Pfeffer [1978] suggests that an alternative approach may be discerned which he refers to as the power based approach. Within this approach, he [op.cit. p.xv] includes the work of Cyert and March [1963], Weick [1969] and March and Olsen [1976]. He argues that these approaches are concerned with control, power and influence rather than efficiency and effectiveness.

Swieringa and Waterhouse [1982] argue that all these approaches are complementary, and that together permit a broader perspective of organisational problems. They attempt to deduce the role of management accounting in each situation.

The traditional or neo classical model assumes that there is a single rational choice and a single rational decision maker. In addition, there is an idea of a 'correct' choice and management accounting produces information on the consequences of each alternative to permit such a choice.

The Cyert and March [1963] behavioural model allows estimates of future costs to be discredited or embraced as aids to negotiation. This is similar to Hopwood's [1980] idea of accounting as an 'ammunition machine' where there is relative certainty about the consequences, but relative uncertainty about the objectives.

The Cohen and March [1974] 'garbage can model' would allow management accounting to receive varying amounts of attention in the process of producing decisions from the can of problems and solutions.

The Weick [1969] organising model would imply management accounting facilitating the process of enacting, selecting, and retaining aspects of the environment. This situation is similar to Hopwood's [1980] 'rationalisation machine'.

The Williamson [1975] model might use accounting information to promote cooperative behaviour and to maintain perceptions of equity in the distribution of rewards.

Having examined the prior applications of markets and hierarchies theory, and its place among alternative theories of organisation design, its implications for internal organisation are examined in the following section.

III.C: Markets and Hierarchies: Implications for Internal Organisation

Williamson [1975,1970] studies the existence of the divisionalised or M-form firm. Due to the conditions of information impactedness and capital market imperfections, the M-form firm may be a superior transaction mode. This is reflected in Williamson [1975 p136] where he maintains that the M-form firm has:

"...mitigated capital market failures by transferring functions traditionally imputed to the capital market to the firm instead."

From a regulatory point of view, the approach may be seen as mid way between the Mont Perlon type view of Friedman [1962] and the other extreme of Berle and Means [1968], Galbraith [1952,1967] and Ackerman [1973].

The representation of the large firm as a miniature capital market is however intriguing. It leads to the following representation of the internal organisation of the firm (Williamson [1970, pp.138-150, 176-77], cited in Williamson [1975, p137]):

"1.The responsibility for operating decisions is assigned to [essentially self contained] operating divisions or quasi firms.

2. The elite staff attached to the general office performs both advisory and audit functions. Both have the effect of securing greater control over operating division behaviour.
3. The general office is principally concerned with strategic decisions, involving planning, appraisal and control, including the allocation of resources among the [competing] operating divisions.
4. The separation of the general office from operations provides general office executives with the psychological commitment to be concerned with the overall performance of the organisation.
5. The resulting structure displays both rationality and synergy: the whole is greater [more effective, more efficient] than the sum of the parts."

The following sections discuss these issues in turn.

III.C.i: Operating Divisions and Autonomy

Operating decisions are contextually specific. Mintzberg [1978, p60] points out that a new product decision in a brewery might be considered strategic, whereas in a toy factory it might be considered operational. Another example might be the pricing decision in a ship yard and in a restaurant.

Self contained units pose problems, since they depend on the nature of product and factor market interdependencies and may therefore be firm specific (Williamson and Bhargava, [1973]). This in turn might suggest that the presence of interdivisional dependencies may be a concern of the general management, since they will require coordination. This might explain for example the presence of centralised transaction exposure management in some MNCs. It might also lead to different coordinative mechanisms in vertically and horizontally diversified firms.

Indeed, this line of reasoning has been pursued by contingency theorists. Lorsch and Allen [1973] argue that co-ordinative mechanisms will be necessary as diversity and interdependence increase. In addition, the Information Processing approach of Galbraith [1973,1977] implies that diversity and interdependence would lead to a need to increase the information processing capacity of the firm. Demands on information processing capacity may be satisfied by:

1. doing nothing or allowing slack
2. creating vertical information channels
3. creating horizontal information channels
4. creating independent units, to minimise interdependence
5. strategic choice; modify the demands for capacity

The creation of independent units is only one possible option within this framework however, divisionalised firms are the only form of organisation in Williamson [1975]. From the point of view of contingency theory, the M-Form represents only one type of contingent form.

In conclusion, specific operating decisions are contextually specific; the divisionalised organisation (creation of autonomous units) is only one type of organisational form; the creation of autonomous units is less likely to be effective and efficient if there are substantial interdependencies between units.

III.C.ii: Management Control and Audit

Within markets and hierarchies theory, management control is perceived as the ability to extract information from subsidiaries, perform internal audits, monitor in an advisory

capacity and the ability to produce superior incentive schemes. The internal capital market is superior since shareholders, particularly if they are widely dispersed, are unlikely to be able to carry out these tasks.

III.C.iii: Planning, Appraisal and Resource Allocation

Resource allocation and planning may pose a problem since decentralisation may be undertaken in order to take advantage of local information. This in turn creates information asymmetries in the headquarters-subsidiary relationship. The existence of opportunism may lead to the distortion and manipulation of information flows to headquarters in order to impede the resource allocation process. A number of formal models have been devised to overcome this problem, which attempt to manipulate the incentive scheme to induce truthful revelation of forecasts (Groves [1973], Groves and Loeb [1979], Weitzman [1976,1980], Gonik [1978]). Unfortunately, these models are single period and therefore, in order to be implemented, must assume that the agent is bounded rational to the extent of seeing only one period ahead.

III.C.iv: The Orientation of the Headquarters

This claim is broadly in line with Allen's [1970, pp22-23] remarks on the headquarter's of conglomerate firms.

"...corporate and divisional executives focused their attention on different segments of their firms' task environments. Corporate contacts with external groups and organisations centered mainly around stockholders, the

financial community, potential merger candidates, and governmental agencies. By way of contrast, top level divisional personnel were concerned mainly with the external groups which affected their ability to develop, sell and produce goods and services in their particular industries."

Lorsch and Allen [1973, p23] also found that headquarters were less formally organised than divisions, placed greater emphasis on financial goals and exhibited a longer time perspective. Lorsch and Allen [1973 p148] examined differences between four conglomerate firms and two vertically integrated firms. They found that the size of headquarters staff was significantly greater in the vertically integrated firms, and that the HQ controlled functions such as purchasing, marketing, and the planning and scheduling of output.

IV: Internal Organisation and Exposure Management.

In previous sections, it was argued that foreign exchange risk should be managed by firms. It was shown in chapter three that exchange risk consisted of a variety of covariance terms. In this chapter, exposure was classified as being either of two types, economic exposure or transaction exposure. In this section, the implications of a theory of internal organisation are examined.

Bounded rationality implies that individuals have limits to both their computational ability and language. This constraint may be overcome if there is a complete set of contingent claims markets. For example, if contingent claims markets were frictionless and complete, foreign exchange risk management would

be relatively straightforward. It would simply require the identification of cash flow streams which were exposed to foreign exchange risk and the choice of the appropriate contingent claim to achieve a risk free position. As such, the only difficulty within a hierarchy would be ensuring that the risk preferences of shareholders were reflected in the decision. However, shareholders might prefer to know that all risks were covered so that they could achieve their own desired exposure to foreign exchange risk. Alternatively, compensation and audit schemes could be created within the hierarchy to ensure that a certain set of preferences was reflected in hedging decisions. However, total immunisation from exchange risk would be possible.

On the other hand, if markets are incomplete (limited to options and forward contracts), then risks will have to be immunised using internal techniques. Moreover, obtaining solutions similar to that of Srinivasulu [1983] will be impossible since the bounded rationality constraint will be binding. Frictions in contingent claims markets will also lead to the consideration of internal techniques.

If internal techniques are used, a number of difficulties may arise. Firstly, in order to take advantage of the covariance terms postulated by Srinivasulu [1983], it will be necessary to centralise the management of foreign exchange risk. This need will arise since transacting in external markets will either be impossible (due to the lack of sophisticated contingent claims contracts) or costly (due to the existence of frictions in

contingent claims markets). Secondly, centralisation will be a costly exercise because of communication and language difficulties, and the potential threat to operating unit autonomy. Language and communication difficulties arise because a transaction exposure requires only the communication of three parameters, an amount, a date and a currency. An economic exposure which satisfies the conditions of the binomial case requires communication of the three transaction exposure parameters and a probability parameter for the binomially distributed contingent variable. An economic exposure requires the same information set, except that a probability density function will need to be specified along with the possible multiperiod interrelationships of cash flows and exchange rate changes. Therefore, economic exposure will be more expensive to centralise than transaction exposure. Moreover, autonomy will be interfered with when internal techniques are used, since optimal action from a subsidiary point of view may be sub-optimal from a HQ point of view, due to the existence of covariance terms. Moreover, many of the internal techniques, in particular pre-active strategies, require that the HQ become involved in operational decision making.

V: Conclusions

This chapter began by attempting to show that there was a normative case for managing foreign exchange risk. The discussion was carried on within the framework of the shareholder wealth maximisation paradigm. It was argued that the case

rested on the existence of barriers to homemade hedging which arose from the presence of size related transaction costs, bankruptcy costs, taxes and information asymmetries.

Some of the techniques which may be used to manage foreign exchange risk were examined. They were classified as being either external/market based techniques or internal/hierarchy based techniques. It was then argued that if contingent claims markets were frictionless and complete, there would be little incentive to use internal techniques. Internal techniques are most useful in cases where either transactions costs are high or there are incomplete contingent claims markets.

Theories of internal organisation were reviewed, and Williamson's [1975] markets and hierarchies theory was invoked as a useful heuristic device. The implications of the theory are clear. If contingent claims markets are incomplete, the bounded rationality constraint becomes binding. In order to take advantage of exchange risk covariance terms, centralisation of foreign exchange risk management is desirable. However, there may be barriers or costs to centralisation, including the costs of communicating complex data sets (including probability density functions) within the organisation, and the possibility that many internal techniques may interfere with operating unit autonomy. This in turn may lead to the centralisation of subsets of foreign exchange risk, which are relatively cheap to centralise. For example, pure transaction exposures require the least quantity of communication and are capable of neutralisation in

contingent claims markets.

In the next chapter, a research methodology is proposed to examine the management of foreign exchange risk in UK MNCs, which takes into account the observations in this chapter on internal organisational considerations.

CHAPTER FIVE
RESEARCH METHODOLOGY

In the previous three chapters, the existing literature on foreign exchange risk and its management was reviewed. On the basis of the review, a research methodology is suggested in this chapter which permits the examination of foreign exchange risk management in practice. The purpose of the examination is to provide data which will be useful in the explanation of foreign exchange risk management in practice, which in turn may be used to suggest how the practice of foreign exchange risk management may be improved.

In the first section of the chapter some stylised facts based on the analysis in the previous chapter are summarised. The role of the stylised facts is to act as a benchmark for the evaluation of previous studies of foreign exchange risk management which are surveyed in the second section of the chapter. In the third section, the research methodology used in this study is examined, and the limitations of the methodology are highlighted. The actual data collection process and methods used are summarised in section four. Finally, the data analysis and the presentation of results are described in section five.

I: Stylised Facts

The basic thrust of this section is that studies which focus on the foreign exchange risk management role of HQ treasurers are

unlikely to reveal how exposures other than transaction exposures are managed. Therefore, studies which have examined the HQ treasury role alone have examined subsets of the foreign exchange risk management task.

Firstly, it was argued in the previous chapter that pure transaction exposures may be the only exposures which are capable of centralisation, due to the costs of communicating and aggregating the parameters of economic and contingent transaction exposures. Moreover, given that contingent claims markets are incomplete, the use of internal techniques will be necessary. However, the use of internal techniques, for example pre-active strategies, will require HQ knowledge of, and HQ interference in operational decision making. This latter observation is inconsistent with the philosophy of the M-Form organisation.

Secondly, given the possibility that economic exposures are most likely to be internalised at a subsidiary level (due to communication and aggregation costs), observation at a subsidiary level will be necessary in order to understand the management of economic exposure.

Thirdly, the majority of previous normative research has focused on the management of transaction exposure, in particular, the use of relevant external techniques. Very few techniques have been suggested which might be helpful in the management of economic exposure. Srinivasulu [1983] and Hodder [1982] focus on the use of external techniques, while Shapiro [1986, chap.9] suggests the

use of internal techniques. However, the prescription of pre-active strategies is based upon introspection rather than observation. It is impossible to know whether the list of pre-active strategies is complete, and whether techniques other than pre-active strategies are available.

Therefore, in order to further knowledge of the management of foreign exchange risk beyond the management of readily centralisable pure transaction exposures, it would be desirable that research methods incorporate the insights from the discussion of internal organisational considerations in the previous chapter.

II: Previous Investigations

This section examines previous attempts at describing foreign exchange risk management in practice. The aim of this section is to highlight the uniqueness of the approach being used by this author, as well as some of the considerations which may arise in the design of an appropriate research method.

The empirical investigation of foreign exchange risk management consists of three tasks. The observation of foreign exchange exposures, the observation of subsequent management action and the explanation of the observed management action. In the following paragraphs, previous attempts to investigate foreign exchange risk management are examined and evaluated in terms of their success or otherwise in completing these three tasks.

II.A: Research Methods in Previous Investigations

'True' experiments (Campbell and Stanley [1963]) have not been used to examine foreign exchange risk management due to the nature of exchange rate changes and the prohibitive costs of manipulating them as an independent variable. Naumann-Etienne [1977] has used a simulation technique to study corporate exposure to exchange risk and his findings were summarised in chapter four. The study is however notable, since economic rather than transaction exposure was examined in the model.

A quasi experimental design was used by Rodriguez [1980] to infer the risk attitudes of HQ treasury managers. She found that the observed management action depended on the forecasted direction of the exposure. Her research design was based upon accounting information on working capital balances by currency to infer both the actual exposures and the subsequent management action. While the design was most appropriate for the study of pure transaction exposures, it is unlikely to be appropriate for the study of economic exposure. This latter difficulty arises, since it is unlikely that economic exposures could be measured in an objective manner, and management action will be more difficult to observe.

Apart from the Rodriguez [1980] study, all other published studies of foreign exchange risk management have used opinion research of one sort or another, since they depended on obtaining

the views of what treasurers or other organisational actors said they did. However, the opinion studies have varied considerably in their approaches, ranging from large sample mail questionnaires to multiple interviews in a few companies.

The large scale mail studies have proved particularly popular among US researchers. The studies include Evans et al. [1978], Jilling [1978], Doukas [1984]. Survey instruments were addressed to the treasurers of US MNCs and were motivated primarily by the impact of US accounting regulations on treasury practices. Blin et al. [1981] and Soenen et al. [1985] surveyed treasurers and examined the management of transaction exposures.

Interviews have been used by Collier and Davis [1985], Earl [1984] and Tran [1980]. While the Collier and Davis [1985] study focused explicitly on HQ treasurers' attitudes toward foreign exchange risks arising from transaction exposures, the Earl [1984] study included interviews with divisional personnel, and resulted in the development of a stage model of foreign exchange risk management.

Unfortunately, none of the aforementioned studies shed any light whatsoever on the management of contingent exposures. Even in the Earl [1984] stage model, the fourth stage of managing economic exposure is purely speculative, and not based upon the practices that were actually observed. Indeed the only study which does examine economic exposure is Hague et al. [1974]. Hague et al. examined the impact of the 1967 Sterling devaluation

on a small sample of firms in order to ascertain the price and quantity effects of devaluation. It is notable that the study focused upon operational rather than financial personnel, however, the results of the study are only of tangential relevance to this study.

II.B: Methodological Limitations of Previous Investigations

Apart from the fact that previous investigations have focused upon the management of transaction exposures at a HQ level, there are also a number of limitations associated with the research methods used in previous studies. These limitations arise from the use of accounts of action, and the difficulties inherent in the use of survey instruments.

II.B.i: The Use of Accounts of Action

None of the studies reviewed by this author directly observed foreign exchange risk management. They all relied on accounts of action, rather than the observation of action. It is quite possible that accounts of action and action may be different. Unfortunately, the observation of foreign exchange risk management is equally problematic. Foreign exchange rate changes are uncertain and it would be impossible to plan a research project which could rely upon sufficient exchange rate variability to permit observation of action in periods of less than a few years. Moreover, MNCs are by definition large and geographically dispersed; the probability of an exchange rate

change affecting more than one part of the organisation is high, and observation would be impossible without a large research team. Indeed these conjectures may go some way toward explaining the dearth of studies based upon observation.

The Rodriguez [1980] study neatly circumvents these difficulties by using archival data which permits the observation of both exposures and their subsequent management. Unfortunately, as pointed out earlier, such data are unlikely to be available for economic exposures.

All of the other studies surveyed relied upon participants' accounts of foreign exchange risk management, although they did differ in their degree of detail and structure. Diesing [1971, p5] stresses that survey and fieldwork are two ends of a spectrum rather than distinct kinds of method. This concept of a spectrum might result in work such as Earl [1984] being placed toward the fieldwork side, and mail surveys (e.g. Evans et al. [1978] being placed close to the other end of the spectrum. Sudman and Bradburn [1982, chap.1] argue that survey responses are in principle verifiable, but that response errors may arise due to memory, motivation, communication and knowledge. The possibility of response errors may be important when the results of studies which surveyed management responses to FAS8 are examined, since there may have been incentives for managers to exaggerate the detrimental effects of FAS8.

The main shortcoming of the survey method is its failure to

assist in explaining the perceived practices. The mail questionnaire may be admirably suited to the enumeration of the foreign exchange risk management techniques at HQs, although none of the surveys have explained why enumerated techniques are used or chosen. Indeed, explanation is entirely absent, and the discussion of sample characteristics is invoked to demonstrate the representativeness of the sample, and then swiftly discarded.

The Earl [1984] study lies toward the field-work end of the spectrum. He uses a stage model to explain the observed practices. His study is somewhat restricted, since it relies upon the participant's explanations of changes in three UK MNCs. There is a degree of triangulation in his study, since multiple interviews were used, but it is impossible to know the extent to which his results were biased by the existence of ex post rationalisations of the ways in which practices responded to certain external events. Furthermore, ex post rationalisations may be confounded by the participants' memories or lack of knowledge of the events. Unfortunately, the study of foreign exchange risk management, due to the aforementioned barriers to direct observation, are going to be inevitably based upon ex post rationalisations rather than ex ante or during-the-event rationalisations.

II.B.ii: Limitations of Survey Instruments

The biases inherent in the design of survey instruments have been

examined by Cronbach [1946]. Many of his criticisms are particularly relevant to mail questionnaires, but also apply to a lesser extent to structured and semi structured interviews.

Firstly, the researcher defines the questions. In an area such as foreign exchange risk management, a researcher immersed in the normative foreign exchange risk management literature would be most likely to focus upon questions relating to pure transaction exposures. This would arise since very little is known about the management of economic exposure, and it is very difficult to know what questions should be asked. This difficulty is compounded by the firm specific nature of economic exposure. Finally, the terminology and discourse of economic exposure is not codified. Researchers differ in their interpretations of economic exposure, and it is unlikely that unambiguous questions could be posed. As such, there is an extremely high probability of semantic misinterpretation of terminology.

Secondly, the researcher defines the available response set. Given the relatively unedifying state of normative research on the management of economic exposure, the response sets are likely to be relatively small. Moreover, the presentation of a response set based upon prior normative research will not reveal innovative management techniques in the empirical domain. A defined response set is likely to hamper progress in an area of study which is by nature primarily inductive rather than deductive.

Thirdly, survey instruments are invariably sent to HQ treasury staff. It is highly unlikely that such studies will reveal anything other than the management of exposures which are capable of centralisation. This may be particularly disturbing for UK MNCs, since a recent study by Collier and Davis [1985] revealed that the majority of UK MNCs do not manage the pure transaction exposures of their overseas subsidiaries at the HQ. The implications of this result are examined more closely in chapter six.

In conclusion, despite the dearth of prior research on what MNCs actually do, the majority of studies have utilised highly structured survey instruments. Inevitably, such surveys will tend to reinforce models that are currently advocated in the normative foreign exchange risk management literature and vindicate the preconceptions of the researcher. Such surveys are unlikely to provide insights on the other factors which may be important in the management of foreign exchange risk, or permit the development of descriptive theories of foreign exchange risk management.

III: Research Methods in this Study

In the following chapters, the results of an investigation of foreign exchange risk management in UK MNCs by this author are examined. The aim of this section is to summarise the actual research methodology used, along with its advantages and limitations. In particular, it will be argued, that apart from

providing a cost effective technique for replicating the results of other UK studies, the methods also permit the examination of the aspects of foreign exchange risk management which are decentralised.

The main justification for the study is pragmatic. No attempt is made to justify the method by reference to either epistemological or ontological criteria, since it is the opinion of this author that they represent metaphysical criteria, rather than provide descriptions of what researchers do. The choice of ontology has been to some extent side-stepped by adopting a research method which may accommodate either an objective or a relatively interpretive view of reality. However, an empiricist stance has been adopted which implies that this author considers empiricism desirable. Moreover, the research approach is explicitly managerial in ideology and a functionalist theory (Markets and Hierarchies Theory) was adopted as a heuristic device in the previous chapter.

The study is primarily inductive since it is concerned with the development of a descriptive theory of foreign exchange risk management. From the point of view of the previous paragraph, it follows that this author believes that there are commonalities in the foreign exchange risk management practices of MNCs. These preconceptions have been stated explicitly since an inductive technique which is not subject to preconceptions of one sort or another is probably an unattainable goal. However, the adopted research methods are consistent with alternative sets of

preconceptions, and hence permit the alteration of preconceptions during the course of the study. Such an approach may be considered more desirable than an approach which does not permit the modification of preconceptions. The remainder of this section examines the research design and methods used in this study.

III.A: Research Design

The aim of the research design is to produce a richer description of foreign exchange risk management in practice. It is suggested that the availability of richer descriptive data is more likely to permit the development of descriptive and explanatory theories of foreign exchange risk management. Three types of theory may be envisaged. Firstly, it is possible that all MNCs with the same type of exposure use the same management strategies and techniques. Such a finding would be consistent with the view that foreign exchange risk management is determined primarily by the nature of the exposure. It is equally likely that firms with the same types of exposure pursue entirely different strategies. Such a finding could be consistent with either a contingency theory formulation or alternatively, the interaction of organisational actors and their interpretations and definitions of the situation. A final alternative might be a professionalisation approach to actual practices, where practices are the outcome of power and disciplinary struggles within organisations. In the following paragraphs, the basic research design which will be used to provide descriptions of

practice is summarised. The issue of theory development is then examined.

Earlier in this chapter, it was pointed out that if foreign exchange risk management is dispersed throughout the MNC, then there may be considerable problems in describing foreign exchange risk management using anything other than structured survey methods, due to the enormous size and geographical dispersion of the MNC. If structured survey methods are inappropriate, then there are only two alternatives available. One possibility would be to observe foreign exchange risk management throughout a MNC. The main barrier to such an approach would be the costs of travelling throughout the world to visit foreign subsidiaries. An alternative approach would be to study a cross section of subsidiaries in a single country. This latter approach has been chosen in this study.

The next step was the choice of an appropriate definition of an MNC. The Stopford [1982] definition of an MNC was chosen for a variety of reasons. Firstly, any definition of an MNC will be arbitrary. Secondly, Stopford and Dunning [1983] have prepared statistics using their definition of an MNC for all MNCs in the world. Finally, the Stopford and Turner [1985] study of UK MNCs is based upon this definition. Therefore, the use of an 'off the peg' definition is justified by virtue of the standardisation it entails, and the possibility of comparing the results of this study with other studies in the international business field. The Stopford [1982] definition yields a list of sixty nine UK

MNCs. Nine of these companies were deleted for a number of reasons including effective state or overseas control, insignificant multinational involvement and the absence of a stock exchange quotation. A full list of the sixty companies in the population, and a list of companies removed from the Stopford [1982] list are included in Appendix One.

In order to make the best possible use of available resources, a random sample (using a random number generator) of twenty multinational companies was chosen. The choice of a sample of twenty was based upon two factors. Firstly, twenty companies represented a manageable number of companies in that they could be examined in depth. Secondly, twenty companies was sufficient to permit some degree of inference of population proportions, and hence increase the external validity of the study. The inferences are based upon the use of a hypergeometric distribution which is a binomial distribution modified for sampling without replacement. A set of hypergeometric distribution tables were developed for a sample of twenty from a population of sixty; the tables are included in Appendix Two. The choice of a simple random sample was motivated by insufficient knowledge of the characteristics of the MNCs which would render an alternative sampling criterion more appropriate. However, the use of a random sample does permit an assessment of the significance of foreign exchange risks in UK MNCs.

The choice of foreign subsidiary was constrained by time and cost considerations. The Republic of Ireland was chosen as a

suitable location because of its geographical proximity, the lack of language barriers and the author's familiarity with the local environment. Moreover, from the point of view of foreign exchange risk management, the Irish and British currencies were identical until 1979, and the study represented an opportunity to examine how the Irish subsidiaries of UK MNCs were affected by, and responded to the presence of foreign exchange risks.

However, it should be pointed out that there may be systematic differences between foreign exchange risk management in Irish subsidiaries and other foreign subsidiaries because of the geographical proximity of Irish subsidiaries, the absence of a language barrier and the absence of exchange risk until 1979. If such systematic biases exist, then they represent a major limitation to the study.

In order to alleviate this limitation to some extent, the HQ of the companies was also examined. The aim of visiting the HQ was to evaluate the involvement of the HQ in the management of foreign exchange risk, as well as permitting the documentation of possible differences between the management of the Irish subsidiary and other foreign subsidiaries. Finally, other studies have focused exclusively on the role of the HQ treasury function, and the investigation of HQ activity permits the results of this study to be related to the results of other studies.

The foregoing research design may be considered superior to other

research designs, since it permits the results of other studies to be replicated, as well as permitting the study of the management of exposures other than transaction exposures. The research methods were chosen so that the development of a descriptive theory would be possible. In order to guide the choice of method and the analysis of data, a grounded theory approach was adopted. The idea of theory grounded in data would seem admirably suited to the task of explaining foreign exchange risk management since its creators (Glaser and Strauss [1967]) argue in their opening paragraph that:

"Most writing on sociological method has been concerned with how accurate facts can be obtained, and how theory can be more rigorously tested. In this book we address ourselves to the equally important enterprise of how the discovery of theory from data - systematically obtained and analyzed in social research - can be furthered."

As an approach, it stresses the discovery of the concepts and hypotheses that are relevant to the area being researched. Indeed, the approach has been endorsed as being a method of restoring balance in business and accounting research by Buckley et al. [1976, pp.49-50] and Otley [1984]. Glaser and Strauss [1967, p7] aim to make "generation a legitimate enterprise" by suggesting methods of grounding theory in data and providing the:

"Ingredients of a defense against internalised professional mandates dictating that sociologists research and write in the verification rhetoric."

The grounding of theory in data may be legitimated by arguing that (Glaser and Strauss [1967, p4]:

"Theory based on data can usually not be completely refuted by more data or replaced by another theory."

This in turn leads to two fundamental tenets of grounded theory.

Firstly, there is the principle of the chronological primacy of data over ideas; data should lead to the idea. Secondly, rather than using statistical sampling, Glaser and Strauss [1967, p45] argue that theoretical sampling should be used. They define theoretical sampling [op. cit., p45] as the:

"Process of data collection for generating theory whereby the analyst jointly collects, codes and analyses his data and decides what data to collect next and where to find them in order to develop his theory as it emerges ... the initial decisions are not based on a preconceived theoretical framework."

It would seem that the concept of theoretical sampling is at odds with the research design set out in the previous paragraphs. However, this probably reflects a broader tension associated with the use of grounded theory. Miles [1979, p591] points out:

"... much has been written about developing "grounded theory," "being open to what the site has to tell us," and slowly evolving a coherent framework rather than "imposing" one from the start. But the need to develop grounded theory usually exists in tension with the need for clarity and focus; research projects that pretend to come to the study with no assumptions usually encounter much difficulty. We believed that a rough working frame needs to be in place near the beginning of fieldwork ... the risk is not that of "imposing" a self blinding framework, but that an incoherent, bulky, irrelevant, meaningless set of observations may be produced, which no one can (or even wants to) make sense of."

Within this study, a tension does exist. It could be argued that the tension could be mitigated by remaining true to the concept of theoretical sampling and maintaining a more fluid research design. However, the nature of the research problem (examining the HQs (in London for the most part) and foreign subsidiaries of MNCs) dictated the use of a well planned research itinerary. Moreover, given that the subjects being interviewed were relatively senior individuals, there was little or no

opportunity to develop the theory as it emerged on particular sites.

Having resolved the issue of data collection, the next step is the analysis of data. Sieber [1976] surveyed seven respected textbooks on field methods and found that the texts devoted only 5 to 10% of the pages to data analysis. He pointed out [op.cit., p1]:

"Methodologists obviously prefer to spend more time on such matters as gaining access, interviewing, choosing informants, handling reciprocities, and so on, rather than on the intellectual work of analysis."

The basic techniques available for the analysis of data is called the 'constant comparative method' by Glaser and Strauss [1967]. The basic concept of the technique is that one set of data is tested on a second set of data which maximises the differences between the two sets of data. This in turn implies focusing on outliers rather than adopting a verificationist approach.

One very real practical difficulty with the grounded theory technique is the difficulty of simultaneous data collection, coding and analysis in the field. Indeed, both Glaser and Strauss [1967] and Glaser [1978] stress the idea of theoretical pacing and withdrawing from the field during research studies. This was a major problem with the research design used in this study because of the need to visit geographically dispersed locations.

Miles [1979] discusses this issue and suggests (Miles [1976],

cited in Miles [1979]) that retrospective analysis of data may be undertaken by proceeding through the data in the order in which it was collected, attempting to produce generalisations from the data, attempting to find evidence which supports the generalisations, and evidence which refutes the generalisations. When generalisations have been found, one should attempt to produce and test predictions within the data. To a certain extent the presence of statistical sampling may facilitate the retrospective analysis of data since there is more likely to be a broad cross section of data for testing predictions and hypotheses within the data.

III.B: Data Collection Methods

Given that both the empirical observation of foreign exchange risk management will be problematic, and the use of large scale survey instruments inappropriate, the remaining available methods might include interviews, archival data and unobtrusive measures. The two methods which were used were interviews supported by archival data. In the first part of this section, the use of interviews is discussed. In the second part, the archival data is discussed.

III.B.1: Interviews

If direct observation of foreign exchange risk management is not feasible, then one must examine the extent to which interviews may act as surrogates for observation. Becker and Geer [1957]

compare the use of the 'interview conversation' (see Blum [1942]) and participant observation. They describe the interview conversation as:

"In this kind of interview, the interviewer explores many facets of his interviewee's concerns, treating subjects as they come up in conversation, pursuing interesting leads, allowing his imagination and ingenuity full rein as he tries to develop new hypotheses and test them in in the course of the interview."

The differences between the interview and observation are attributed to two interacting forces, the kinds of words and acts of the people under study that the researcher has access to, and the kind of sensitivity the researcher has to the problems and data produced by the informant, due to the lack of a rich experiential context. Trow [1957] argues that Becker and Geer [1957] fail to address the issue of:

"What kinds of problems are best studied through what kinds of methods; ... how can various methods at our disposal complement one another."

Using the criteria of 'adequacy' and 'efficiency', Zelditch [1962] suggested that certain methods were most suited to certain types of information. He distinguished three types of information. The first type of information one might seek would be a frequency distribution. If this were the case then enumeration or a sample would be best. If one sought an incident history, then participant observation was most suitable. However, if one sought to establish institutional norms and statuses, then an interview would be the superior research method.

If one were studying foreign exchange risk management, then data

on the most frequently used hedging technique might be collected using an enumeration or a sample. Interviews might be sufficient as sources of information on the reasons for choosing particular techniques, while participant observation might be best suited to examining the emergence of new policies.

However, there may be limitations to the use of interviews as a technique, since it is quite possible that errors in interviewee's responses may arise from memory, motivation, communication and knowledge (see Sudman and Bradburn [1982]). This in turn may lead to the researcher being a victim of rationalised accounts of exchange risk management, packaged for public consumption. Moreover, VanMaanen [1979, p544] argues that:

"A central postulate of the ethnographic method is that people lie about the things that matter most to them"

This difficulty is overcome to some extent by the use of multiple interviews in the same organisation as well as the availability of alternative data to uncover and perhaps explain such lies.

Apart from the difficulties of using interviews as a surrogate for observation, there are a number of biases which may arise in interviews including the race (Athey et al. [1966]) and age (Riesman and Ehrlich [1961] of the interviewer. These observations prompted Webb et al. [1971] to argue:

"If we heeded all the known biases, without considering our ignorance of major interactions, there could be no such thing as a 'simple' survey. The understandable reaction by most researchers has been to ignore these biases and assume them away. The biases are lawful and consistent, and all research employing face to face interviewing or

questionnaire administration is subject to them."

One might conclude that interviews are by no means a perfect research method. In particular, there are limitations to the use of interviews as surrogates for observation. Moreover, there are biases inherent in the use of interviews, which are extremely likely to arise. Denzin [1970] discusses the concept of triangulation. The aim of triangulation is to use more than one source of data, so that by combining independently collected sets of data about the same subject, one can locate a more accurate account of reality. In order to overcome biases in interviews as a research method, multiple interviews were used along with archival data which is discussed in the following section.

III.B.ii: Archival Data

In order to permit triangulation, archival data was used as a supplement to interviews. The archival data collected came from two sources. Firstly, all relevant publicly available information was located. This was used to act as a guide to interviews and also shed some light on the exposures of the sample companies. This in turn permitted the comparison of the interviewer's and the interviewee's perceptions of exposure which it was hoped would prove helpful (see Downey and Ireland [1979], Tinker [1976]). Secondly, an attempt was made to obtain copies of relevant company documents, at any rate, to be permitted to see the documents.

It might be argued that the use of pre-interview information might bias the interviewer's perceptions of corporate practice and directly contradict a grounded theory approach. In order to overcome this problem, it was decided that all specific questions which had arisen from the analysis of archival data would be deferred until the very end of the interview.

III.C: Summary

In this section some of the conceptual issues arising from the research design and methods were discussed. A population of sixty UK MNCs was defined and a random sample of 20 companies was chosen. It was decided to focus on foreign exchange risk management activities at both the HQ and the Irish subsidiaries of the sample. A grounded theory approach was invoked as a method to guide both the data collection and the data analysis. However, it was pointed out that for practical reasons, an adoption of the grounded theory approach was necessary. The research methods were guided by the notion of triangulation, which consists of using a variety of complementary methods in order to establish a description of foreign exchange risk management which may be closer to reality than a single data collection method. The main research methods being used to triangulate were archival data and interviews. In the next section, the actual data collection process is described.

IV: The Data Collection Process

It was argued in the first section of this chapter that both foreign subsidiaries and the HQ of MNCs would need to be the two objects of investigation of a study of foreign exchange risk management. In the first part of this section, the data collection process used for the Irish subsidiaries is described. In the second part, the data collection process in the UK is described.

IV.A: The Irish Subsidiaries

There were three basic stages to the data collection process at Irish subsidiaries. They were the pilot study, the collection of publicly available information and the interviews with the subsidiary personnel. Each stage is dealt with in the following paragraphs.

IV.A.i: The Pilot Study

The first step in the collection of data on the Irish subsidiaries was interviews in seven companies in March 1984. The seven companies were all subsidiaries of MNCs in the random sample, and it was established that access would not be a problem. One problem which did emerge at this stage was that the author was not sufficiently familiar with either the companies or the environment in which they operated to benefit completely from the interviews. One local economist, the Irish

Tourist Board, The Central Bank, The British Embassy, the Industrial Development Authority and a representative of the Confederation of Irish Industry were also contacted at this stage.

'Cold' telephone calls were used to establish initial contacts. Normally, this resulted in being passed from secretary to secretary, until eventually (usually after a number of telephone calls), contact was established with the finance director. In many respects, the process was analagous to selling life insurance. Once contact was established, interviews were relatively easily arranged, and all interviewees interviewed at this stage expressed a willingness to be interviewed again.

All interviews were approached with the stated aim of documenting the effects of the break with sterling on their operations, in order to avoid confusing the issue with terms such as 'economic' exposure. Moreover, the break with sterling might be a subject that seemed more immediate and of more direct relevance. It was stressed that the author was attempting to establish if the right questions were being posed, and interviews were allowed to proceed in a relatively unstructured manner.

The first two companies contacted were asked if they would allow interviews to be taped. They were both unwilling to do so. A notepad was used to record interviews and the notes were then elaborated after the interviews. In fact, the notepad emerged as a useful device for allowing the interviewer some time to

consider the interviewee's points.

The main implications of the pilot study were that interviews would provide the required information on exposures and their management, that establishing access to interviewees could be achieved by telephoning prospective interviewees directly and that the taping of interviews would restrict the extent to which interviewees would express themselves freely. Finally, the need for an intimate knowledge of both the companies and their environments became apparent.

IV.A.ii: The Archival Data

The collection of archival data commenced in June 1984. Three types of data were collected, exchange rate information, government statistics and company specific information.

The collection of exchange rate information had two aims. Firstly, the calculation of purchasing power parity deviations for the Punt against Sterling, the Dollar and the Deutschemark, in order to isolate time periods which were particularly critical in terms of deviations from purchasing power parity. The IMF 'International Financial Statistics' were used for this purpose and the resultant calculations are included in Appendix 3. Secondly, all newspaper and magazine articles on the Punt were summarised, in order that a summary could be made of the attitudes of various interest groups towards exchange rate changes and to be aware of expectations prior to exchange rate

realignments.

Several types of government statistics and publications were examined, in order to obtain information on a variety of issues. UK data on overseas investments by UK residents was examined in order to establish any peculiarities in UK investment in Ireland. The most significant feature of this analysis was that the majority of UK investment was in the food, drink and tobacco sector and that there was virtually no investment in extractive industries in Ireland, due to the lack of natural resources in Ireland. Irish balance of payments and census of production data were also examined, particularly for industries where sample firms were dominant. Unfortunately, it proved impossible to discern any immediate relationship between purchasing power parity deviations and balance of payments data. The census of production data were used to establish the inputs used in various industries and this in turn would permit analysis of the possible effects of exchange rates on costs, given that some types of input are more likely to be tradeable than others. Finally, the regular reports of the Irish National Prices Commission were surveyed for price increases awarded to firms in the sample in order to establish how exchange rate changes were incorporated within the price control mechanism. A representative of the National Prices Commission was interviewed in order to get further information on this issue.

Finally, the Commercial Library in Dublin press cutting collection was used to trace information appearing in the press

on particular companies. The author was very pleasantly surprised by the amount of information which was available dealing with individual companies. Apart from information about new products, new investments, promotions, closures, appointments and resignations, there was a considerable amount of 'gossip' information in business magazines. In addition to this information, some of the Irish subsidiaries published annual reports. The parent company annual reports were also examined for information relating to Irish subsidiaries.

All of the archival data were used to prepare pre-interview notes which would be used as examples of economic exposure during the interviews. The basic guide used in the construction of pre-interview notes is contained in Appendix Four.

IV.A.iii: Interviews

Interviews were conducted in September and October 1984, and two interviews were conducted in December 1984. Of the twenty MNCs in the sample, four companies had no Irish subsidiary. However, a number of companies had more than one subsidiary, and twenty two interviews were carried out. There were more than twenty two Irish subsidiaries, but no interviews were carried out in subsidiaries which were effectively controlled and responsible to another Irish subsidiary. A summary of the size of the subsidiaries visited, along with the personnel interviewed are presented in Appendix Five.

The structure of the interviews was relatively straightforward. Interviews were scheduled to last about one hour. The first three quarters of an hour was allocated to allowing the executive to describe the effects of the cessation of parity between the Irish and UK pounds in his firm, along with the responses of his firm to the break. The author attempted to keep his interference to a minimum and many of the Blum [1942] guidelines were used. In particular, the author found that his comparative youth was extremely useful in using interpretations of the narrative as a non directive technique. Changes of subject were only used where interviews seemed to be getting out of control. There were only two cases of interviews getting out of control, the first interview in the pilot study and an interview with a particularly difficult subject during the main interview phase.

When the main unstructured portion of the interview was complete, the interviewer asked specific questions arising from the analysis of archival data, which had not been dealt with during the interview. Following the coverage of issues arising from the archival data, interviewees were invited to make additional comments or ask the interviewer some questions. The success of this period varied from case to case, sometimes, it was extremely rewarding, while in other cases, it did not provide any useful information and became a social conversation. For the most part, interviewees reacted extremely positively to the interview and were impressed by the author's apparent knowledge and understanding of their companies which had emerged during the

section of the interview devoted to specific questions.

The Irish interviews were rewritten and elaborated upon the completion of the interviews. The original interview schedule was rewritten in order to code the data, and theoretical memos (Glaser [1978]) were maintained during both the collection of archival data and the interview phase. A summary of the results of the interviews was sent to the interviewees in July 1985. The aim of sending the results was to provoke further discussion with the interviewees, and act as a validation of the findings. Unfortunately, this exercise was a dismal failure, and there was no response whatsoever from the interviewees. A number of interviewees were contacted who were most likely to be interested in the summary, but they had nothing to add.

IV.B: Data Collection in the UK

A similar process was used in the UK when the HQs were approached. Sixteen of the MNCs were investigated during November and December 1984, three companies in May 1985 and one company in March 1986. In many respects, access to the UK companies was considerably easier than obtaining access to the Irish subsidiaries, although it was extremely difficult to arrange mutually suitable appointments with the UK personnel. There were three phases to the UK interviews. Firstly, pre-interview notes were constructed for each company using both archival material, and material collected at the Irish subsidiaries. Secondly, interviews were conducted with the

treasurers of the UK MNCs, and finally, a case study of a single company was conducted. Each phase is dealt with in the following paragraphs.

IV.B.1: Archival Material

The London Business School Library was the main source of archival material used. The data included financial analysts reports, newspaper and magazine reports, financial reports and other ephemera.

Financial analysts' reports were located for all of the companies, and where possible reports were examined from a variety of brokers from 1979 to 1984. These were particularly useful in revealing the risks which analysts perceived different firms faced. They were also useful in highlighting the financial analysts' views of exchange risk. Some of the analysts' reports were of a very high quality and revealed considerable amounts of information which were not available elsewhere.

Newspaper and magazine reports relating to particular industries and companies were also examined. Unfortunately, cuttings were available only for the previous three to twelve months and the analysis was limited to this period. However, cuttings were located for a number of companies for periods prior to 1984.

Finally, various documents issued by companies were examined

including financial reports, press releases and in house magazines. The 'Review of Operations' in the financial reports was often quite helpful in providing data on the exposures of individual businesses.

The archival information was then consolidated with the material from the Irish subsidiaries to produce the pre-interview notes. In virtually all of the cases, the Irish subsidiary was not informed of the impending visit to the parent company, and the parent company was not informed of the visit to the Irish subsidiary. This policy was used in order to protect the informants in the Irish subsidiaries, while at the same time, guaranteeing openness from the Irish informants.

IV.B.ii: Interviews

The structure of the interviews was similar to the Irish interviews. Invariably, the interviewee had the job title of either 'Treasurer' or 'Assistant Treasurer'. In larger companies, there was an Assistant Treasurer charged with the management of foreign exchange risk, whereas in companies with a smaller treasury function, the treasurer was interviewed. In one company, there was no treasurer, and the financial controller was interviewed. Interviews lasted three quarters of an hour on average. The interviews were carried out in three stages.

The first stage dominated the interview. The treasurer was informed that the aim of the study was to examine both the

management of transaction exposure and economic exposure in UK MNCs. He was then asked to describe foreign exchange risk management at the company and the role of the HQ treasury in the management of foreign exchange risk.

The second stage consisted of a series of specific questions based upon the pre-interview notes and proved most informative. In most cases it led to the emergence of significant new issues and facts.

The third stage was a period of general discussion. It normally became an extension of the second stage and, in a number of cases, led to a revision of the pre-interview notes used in later interviews.

In some respects, the quality of the theoretical memos and coding deteriorated relative to the Irish interviews. This arose because of the inordinate amount of time spent travelling to interview sites and to the London Business School. However, by this stage the quality of note-taking at interviews had improved sufficiently to permit virtual transcriptions of the interviews to be produced. Moreover, the coding which took place within the interviews was also substantial. In order to facilitate the analysis of the UK data retrospectively, a microcomputer database management system was used to sort the coded data. Unfortunately, the technique was not particularly successful, due to the size of the data file, and the difficulty of remembering the context of statements on particular topics. Eventually, the

original interview texts were resorted to during the retrospective analysis phase.

IV.B.iii: Case Study

During the interview phase, it emerged that three companies were in the process of reviewing their foreign exchange risk management policies. Unfortunately, two of the companies were located outside London, and involved a day's journey from Glasgow. For this reason, it was decided to commence a case study of the London based company. The reason for focusing on a company which was in the process of changing its policies was the ability to find out the stated reasons at the time for the adoption of a particular policy. It was hoped that the examination of the process of altering the policy would complement the other data which had been collected.

In all, six days, over a period of one year were spent in the company. During each visit a number of the individuals involved in the review of policy and the implementation of a new policy were interviewed. The data from each visit was then re-examined in order to produce theoretical memos which would highlight points to be pursued at the following meeting. Documents which had been circulated among the individuals involved in the decision were also inspected. Information was also gathered on the company's reaction to exchange rate changes during the course of the year.

The case study proved extremely helpful and influenced many of the ideas in the ensuing chapters. However, the case study has not been published, since much of the data collected was of a sensitive nature, and the identity of the company would be obvious.

V: Analysis of Data and Presentation of Results

Whilst the grounded theory approach guided the data collection process, it was pointed out in section three that it fails to address the issue of data analysis. Moreover, the presentation of results has received no attention in this literature. This latter issue only became apparent when the data analysis was underway. In this section, the analysis and presentation of the data are discussed.

V.A: Data Analysis

Three different approaches were used to analyse the data. Firstly, the data were analysed on a case-by-case basis. A 'case' refers to either a single foreign subsidiary or a single HQ. This analysis was carried out both in the field and, to a lesser extent, retrospectively. The analysis of the management of transaction exposure was based primarily on interview data whilst information on transaction exposures was derived from both archival and interview data. The analysis of economic exposure and its subsequent management was based upon archival data, and interview data were used to verify this analysis.

Secondly, a topic-by-topic analysis was employed to analyse the data retrospectively. The results of this analysis are presented in the following four chapters. The HQ treasury role in the management of transaction exposure is discussed in Chapter Six. This represented a natural starting point, since it was the subject-matter of previous studies. In Chapter Seven, the HQ treasury role in the management of economic exposure is examined. Textbook treatments of foreign exchange risk management (e.g. Eiteman and Stonehill [1986] and Shapiro [1986]) argue that the HQ treasurer should be involved in the management of economic exposure. Foreign exchange risk management at a subsidiary level is summarised in chapter eight. Finally, economic exposure for the MNC as a whole is described in Chapter Nine.

Thirdly, a MNC-by-MNC analysis was carried out. This permitted some conclusions to be drawn on the management of foreign exchange risk in the MNC as a whole.

V.B: Presentation of Results

The author encountered considerable difficulties in deciding upon a method for the presentation of results. This issue has received very little attention in the literature, and it is difficult to know how one might choose among alternative methods of presentation. Two criteria guided the presentation of results in this thesis. Firstly, the need to ensure that the

results of the study were defensible and that the reader could be convinced that results were not plucked from the air. Secondly, the conflicting requirement of maintaining the anonymity of both the individuals and the companies involved in the study.

The issue of defensibility is critical, and given the dearth of prior accounting research using inductive techniques, there is no generally accepted rhetoric available for the presentation and evaluation of this form of research. Indeed, this observation supports Otley's [1984] claim that accounting studies which have used an inductive technique have been clothed in a deductive rhetoric. Otley suggests that case studies may be an appropriate research technique, although presenting case studies becomes problematic if it is necessary to maintain the anonymity of both companies and individuals. This issue was of considerable importance in this study since the population was relatively small, and most of the companies are highly visible. Moreover, in a study using multiple cases, it is necessary to explicate issues which are common to cases.

Given these considerations, the results presented in Chapters Six to Nine use a topic-by-topic style of presentation. In order to maintain the anonymity of the participants in the study, Greek letters have been used throughout these chapters to denote individual companies. In addition, descriptions of corporate practices and attitudes have been described in a manner which minimises the probability of revealing the identity of the participants. In order to maximise the defensibility of the

study, the author has attempted to introduce significant amounts of original data in order to highlight the origins of assertions, statements and hypotheses. It is hoped that by presenting these data, the interested reader may be able to challenge, or offer alternative formulations of, these assertions, statements and hypotheses.

Unfortunately, it proved difficult to reach many general conclusions about the management of foreign exchange risk in UK MNCs at the level of the sample, since the conclusions are necessarily (due to exposure being company specific) based upon individual companies. In order to articulate the issues arising in Chapters Six to Nine, the main findings of the study have been incorporated within a decision support model in Chapter Ten. The decision support model is useful since it highlights both the decisions relevant to the management of foreign exchange risk, and the data necessary to make those decisions. Moreover, the model is inductively derived by synthesizing the literature review in the previous three chapters and the discussion of actual foreign exchange risk management in the following four chapters.

VI: Summary and Conclusions

In this chapter the research methods used in this study and the justification for the methods has been discussed. It was pointed out that the foreign subsidiary may play a key role in the management of foreign exchange risk and that to date, this

issue has been ignored by researchers.

The research design used in this study was based upon an examination of foreign exchange risk management at both the HQ and the Irish subsidiary of UK MNCs. It was also argued that mail questionnaires were inappropriate for this research problem. Since field research of some description was considered most appropriate, a random sample of twenty companies was chosen as the basis for the study. A variety of research methods were used to achieve a degree of triangulation. The research methods included a case study, interview-conversations and descriptive data concerning the companies. Exchange rate data, and a variety of government statistics were used as a supplement to this information.

The analysis of data was guided by the concept of grounded theory and the use of the constant comparative method. In the following chapters the outcomes of this analysis are summarised.

CHAPTER 6

TRANSACTION EXPOSURE AND THE HQ TREASURER

In chapter 5, it was pointed out that previous empirical studies had focused on the HQ treasury as the nucleus of foreign exchange risk management activity in the MNC. In the present chapter, the results of this study concerning the management of transaction exposure are compared with earlier studies, and a descriptive theory of the management of transaction exposure is developed.

Previous UK research (Davis and Collier [1985], Earl [1983]) would suggest that the management of transaction exposure is the key foreign exchange risk management (FERM) task of the HQ treasurer. Davis and Collier [1985] examined the hedging of transaction exposure in UK MNCs which centralised the FERM function while Earl [1983] attempted to predict the future direction of HQ treasury involvement in FERM. In this chapter, it is argued that the presence of transaction costs may explain the nature of HQ treasury involvement in FERM, and the predictions of the hypothesis are similar to the findings of Earl [1983].

In the first part of this chapter the transaction exposure management role in the 20 sample companies is summarised and compared with the results of Collier and Davis [1985]. Excerpts from interviews with HQ treasurers are used extensively in order to justify the classification of HQ involvement, and to describe

the treasurer's perceptions of the chosen mode of central intervention. An analytical framework is used in section II in order to synthesize the material presented in section I, and to provide a rationale for the practices described in section I. Finally, some of the implications of the rationale are discussed in section III.

I: The Role of the HQ Treasurer: Transaction Exposure

The management of the exchange risks arising from foreign currency denominated transactions would seem to be the main day-to-day involvement of HQ treasury in foreign exchange risk management. Indeed, this observation is consistent with the views of treasurers. Eighteen treasurers commenced by describing this function when asked to describe their FERM role. The other two treasurers maintained that they were not concerned with FERM since the HQ had little or no transaction exposure. The latter two companies (Theta and Kappa) are described in the following paragraph.

Neither of the companies had much trade between the UK and overseas and the two companies had the lowest exports as a percentage of sales in the sample. Theta's exports amounted to 1% of sales, while Kappa had virtually no exports. Kappa's treasurer described their attitude toward FERM in the following way:

"The overall criterion is the size relative to the business...we were very hard put to find an export figure for our accounts under the old Companies Act."

Theta was in a similar position and also had a policy of reinvesting dividends in its overseas subsidiaries. The remaining eighteen companies in the sample all has some trade related transaction exposure. The remainder of this chapter deals with these companies.

I.A: Classification of Practices

The practices of the eighteen companies were classified in a manner similar to Collier and Davis [1985]. The Collier and Davis classification distinguishes between foreign currency transactions which arise in foreign and UK subsidiaries. This distinction is necessary, since they found that HQ treasurers are more likely to be involved in foreign currency transactions which are generated by UK subsidiaries. Apart from identifying the source of foreign currency transactions, it is also necessary to classify the degree of HQ involvement in the management of the risks and costs of foreign currency transactions.

McRae and Walker [1980] suggest that the following degrees of involvement of the HQ treasury in the transaction exposures of operating units could be distinguished.

1. Setting overall exposure management guidelines.
2. Making specific decisions on each operating unit's exposures.
3. Taking exposure management action.

Unfortunately, these categories were not sufficiently fine for the classification of the companies observed by this author. Two extra degrees of involvement were added to this list, both of

which are considerably weaker than the setting of overall exposure management guidelines. The five categories and the criteria used to classify corporate practices are described in the following paragraphs.

The first category is one of no involvement whatsoever. This was essentially a default category, and was used when the weakest conditions in the second category were not satisfied.

A second category was used when the HQ treasurer had a liaison role with treasurers in the domestic and foreign subsidiaries. The following situations were classified as liaison roles:

- 1) The HQ and subsidiary treasurers agree to act in a specific way in the foreign exchange markets (e.g. cover dollars forward), and agreement is voluntary.
- 2) The HQ treasurer expects to be kept informed of large exposures in foreign currency but may not interfere with the subsidiary's hedging decision.

The third category of overall exposure management guidelines was interpreted in a manner similar to McRae and Walker [1980]. It included:

- 1) Instructions to operating units to cover all transaction exposures.
- 2) Policies which required operating units to ensure that exposures in certain currencies did not exceed specified

amounts.

- 3) Companies where the treasurer could have some input into the degree of cover which an operating unit might have on transactions, but would not be in a position to alter or overrule the subsidiary's decision.

The issue of specific directives by central management is the fourth category of HQ intervention. This category includes:

- 1) Issuing advice which the subsidiaries are expected to comply with
- 2) Instructing subsidiaries to take specific actions in specific currencies.
- 3) Subsidiaries which were expected to contact the HQ for further instructions when a transaction exceeded a specified amount.

The fifth and final category is where the HQ actually makes decisions as to the degree of exposure and takes the appropriate action on behalf of the subsidiary.

The results of the twofold classification system are displayed in table 6.1. Each cell in Table 6.1 represents the number of companies with a particular configuration of involvement in overseas and UK transactions.

Table 6.1: Degree of HQ involvement in Transaction Exposures

	Degree of Involvement	Overseas				Total
		None	Liaison	Guidelines	Directives	
	None	2				2
UK	Liaison	1	1			2
	Guidelines	2				2
	Directives	3			1	4
	Action	2	5			1
	Total	10	6	0	1	18

In common with previous UK studies, it may be seen in Table 6.1 that there is significantly less involvement in transactions generated by overseas subsidiaries. Moreover, this represents a practice which is significantly different from results reported by US researchers. For example, Jilling [1977,1978] reported that the majority of US MNCs were centralised. This finding would suggest that there is a systematic difference between the practices of UK and US MNCs. However it is also possible that this result arose from an inadequate research methodology. These inadequacies are discussed in the following paragraph.

Soenen and Aggarwal [1985] conducted a survey of the FERM practices of European companies and reported that of a sample of 59 large UK companies, 68% of those companies reported that foreign exchange risk management was centralised at the HQ. Similarly, Demirag [1985] using a sample of 105 UK firms found that 72.3% of the respondents had either centralised or relatively centralised foreign exchange risk management. Examination of Demirag's survey instrument revealed that there was no distinction made between transactions arising in UK and overseas subsidiaries. Similarly, Jilling [1977,1978] made no distinction in his survey instrument, and it is also possible that no distinction was made in the Soenen and Aggarwal [1985]

study, since it was not reported in their results. Rather than concluding that there is a difference between foreign exchange risk management in the UK and the US, it might be helpful to use a similar survey instrument in both countries. In addition, the fact that no distinction was noted by these researchers may suggest that questionnaire respondents are inclined to overestimate the degree of centralisation and that HQ personnel are ethnocentric since they see 'centralised' and 'centralised in the UK' as virtually identical terms.

In order to validate the results in Table 6.1, the results were compared with the results of Collier and Davis [1985]. Collier and Davis used a mail questionnaire and respondents were expected to classify themselves using the McRae and Walker [1980] categories of involvement. Since the results of this study used five categories rather than four, the categories of 'Liaison Role' and 'General Guidelines' were merged. It should also be pointed out that the Collier and Davis [1985] study was based upon 87 firms, whereas this study used only 18. The comparison of the two studies is tabulated in Table 6.2.

Table 6.2: Degree of HQ Involvement compared with Collier and Davis [1985]

	UK %		Overseas %	
	Collier et al.	This Study	Collier et al.	This Study
None	11%	11%	32%	55%
Liaison & Guideline	25%	22%	39%	33%
Directive	17%	22%	21%	6%
Action	46%	44%	8%	6%
Total	99% (1)	100%	100%	100%

Note: (1) Difference arises due to rounding

The first important point about Table 6.2 is the remarkable

similarity between the results of this study and those of the Collier and Davis [1985] study with respect to UK transactions. Moreover if one takes the 'Directive' category and the 'Action' category as constituting 'Centralised' then the percentage of firms which are centralised for UK transactions in both this study and the Collier and Davis [1985] study is remarkably similar to the proportion of firms which reported centralised foreign exchange risk management in the Soenen and Aggarwal [1985] study and the Demirag [1985] study. Moreover, the results are reassuring since they are all to some extent similar.

Secondly, there is a considerable difference between the results of this study and the Collier and Davis [1985] study for transaction exposures arising in overseas subsidiaries. The similarity between the results for UK transactions would suggest that the criteria used for categorising companies in this study yields results which are similar to the categories chosen by respondents in mail questionnaires. However, since identical criteria were used for classifying the treatment of overseas transactions, one would expect similar results. There are two possible explanations. Firstly, it is possible that executives overestimate their involvement in the management of transaction exposures arising in overseas subsidiaries. Alternatively, since the Collier and Davis [1985] study may have included a number of smaller companies with a small number of overseas affiliates, greater central control was exerted.

I.B: Description of Individual Practices

In the following paragraphs, the degree of centralisation in each company is described. In order to aid the reader, each company has been named and the names are used throughout chapters six to nine. The Greek alphabet has been used to name the companies, and the company names in each category of Table 6.1 are displayed in Table 6.3. The data used in this section was based upon interviews with HQ treasurers.

Table 6.3: Degree of HQ involvement in Transaction Exposures: Company Names

	Degree of Involvement	None	Overseas Liaison	Guidelines	Directives	Action
	None	ζ ψ				
UK	Liaison	ν	ρ			
	Guidelines	δ γ				
	Directives	β λ φ			μ	
	Action	ο α	τ ω ε ι			π

I.B.i: Autonomous Management of both UK and Overseas Transactions.

Zeta and Psi were the two companies in this category. Coincidentally, both companies had been extremely profitable, family dominated enterprises until the end of the 1970s. However, Zeta was a vertically integrated company with a relatively narrow product range, whilst Psi was an extremely diverse conglomerate (the most diverse company in the sample).

Zeta had hired a firm of consultants and, at the time the

interview was carried out (late 1984), was about to introduce a system to manage UK exposures. The proposed system was a system where the HQ would take action on behalf of the subsidiaries. The treasury department had only commenced operating in 1981, and the liberalisation of exchange controls, the maturation of the company and the increasing cost of money were suggested as reasons for its initial foundation. The main benefits sought from a centralised transaction exposure management system were:

1. Transaction cost savings from netting.
2. The advantages of having personnel specialising in managing exchange risk rather than managing exposure on a half-day per week basis.
3. Economies of scale, since only one division was large enough to have a full time person employed in foreign exchange risk management.

Given the benefits of centralisation from a HQ point of view, it is interesting to note that the treasurer had received a positive response from the operating units:

"We had a very positive response from the subsidiaries...they were quite happy to see someone else take away a 'risk'... we say you've got a receivable, and we tell them it will be worth so much sterling"

The treasury staff realised that they depended ultimately on the goodwill of divisional staff, and that unless the divisions were willing to participate in a centralised transaction exposure system, there would be little value in setting up the system in the first place. In fact the interviewee pointed out that there

was a major tension between the centralised management of foreign exchange risk, and divisional profit responsibility.

"A central treasury is up against a wall, particularly because of the way the group is going ... [moving towards] a more decentralised management style ... a centralised treasury is against the way this is going ... divisional managers are responsible for divisional profitability and it is then pushed down the divisions ... we feel that if we try to impose in that sort of a climate, it won't work; it might have worked five or 10 years ago ... the system needs to be driven by the businesses ... it must be something that they want to do."

*The conflict of centralised management of foreign exchange risk with the decentralisation of operational decision making was a recurring theme in the interviews. Indeed, in Psi, this was probably one of the main barriers to centralisation. The treasurer described the company in the following way.

"It is a diverse company and therefore there is a limit to the extent to which they would want to or could centralise ... traditionally it has been a decentralised group and we give total autonomy to the operating companies ... the finance people in the businesses know more about day-to-day foreign exchange risk management ... here at the centre we are concerned with long run finance."

Apart from not taking central action, there was no information system for monitoring exposures, or indeed, no knowledge at the centre of either the nature or denomination of foreign currency cash flows. Occasionally, the centre might be informed of extremely large transactions (at least £10 mln.). The treasurer realised that there were considerable opportunities to net certain currencies at the centre, but he felt that the actual initiation of a system could be problematic given the attitude of the divisional finance managers.

"They all appreciate that they are part of a large group ... they want to be told clearly what we want from them ... if we mess them around, they won't like it ... therefore we

are unlikely to see a big bang"

In conclusion, it may be seen that the decentralisation of operational decision making may be perceived to be a key reason for the absence of a centralised foreign exchange risk management capability even when it is acknowledged that there may be substantial transaction cost savings with a centralised transaction exposure management system.

I.B.ii: Liaison with UK Subsidiaries: Autonomous Overseas Subsidiaries

Nu was the only company in this category. The treasurer described the management of transaction exposure in the UK in the following way:

"We get kept informed and give guidance and may in certain circumstances take it on here rather than the subsidiary taking it on with a local bank ... this mostly arises when there is an opportunity to match it with another subsidiary ... we could intervene, but we wouldn't intervene as a matter of course ... we tend to operate on a decentralised basis and interfere as little as possible ... only if we saw exposure increasing on a vulnerable currency would we take action ... if there's a conflict between decentralisation and treasury management then decentralisation get it ... they are responsible for their own destiny."

Again, it may be seen that while opportunities for transaction cost savings were acknowledged to exist, there was no formal mechanism for realising the savings, and the treasury had no methods of altering the risk positions adopted by the subsidiaries.

I.B.iii: Guidelines to UK Subsidiaries: Autonomous Overseas Subsidiaries

Delta and Gamma were included in this category. Delta's treasurer described UK transaction exposure management in the following way:

"We leave this up to the individual operating companies. It's decentralised at the moment but we intend centralising it ... we control the treasurer ... he is really just a financial accountant at [name of a division] and we tell him to hedge everything ... all the UK subsidiaries have a long standing rule ... to cover everything ... its not their business to deal in currency but to make things ... the foreign subsidiaries either deal in their own currency or if they are off shoots from the UK then we would invoice them in local currency."

The main reasons given for the intention to centralise the management of transaction exposure were:

1. Transaction cost savings since the centre would not use local banks, and would also have more up to date information and better quotes.
2. The opportunity to net.

The treasurer was then asked what the impetus for managing transaction exposure at the centre was:

"Well, it started when I came 12 years ago and I said that it was about time that we should do it ... its a major problem in a group that preaches autonomy ... this in turn leads to one saying that one should not interfere in transaction exposure because its day-to-day ... details have to be worked out ... in principle we are going to work as their banker."

Gamma, the other company in this category, was in the same industry, but the role of the treasurer was somewhat different.

He described himself as 'the animal of the business' rather than the business being the animal of the treasurer. He described his role as:

"I wouldn't create paper chases and I've kept away because intervening in the transmission of cash isn't wise. I could argue at the extent of cover, maybe, but that would be all because the transaction is between [name of a division] and its overseas subsidiaries."

It is also noteworthy that Gamma was essentially an exporter to its own marketing subsidiaries overseas, and that very few materials were imported from overseas, hence the opportunities to net were extremely restricted.

I.B.iv: Directives to UK Subsidiaries: Autonomous Overseas Subsidiaries

There were three companies in this category, Beta, Lambda and Phi. All three insisted upon the UK subsidiaries contacting them if a transaction exceeded a certain amount. The limit in Beta was £100,000, £50,000 in Lambda, and all transactions in Phi. When a transaction exceeded these limits, the subsidiary would contact the HQ and was advised on the action it should take. Possibly the most interesting aspect of these companies was the reasoning lying behind their positions.

Lambda intended centralising the management of transaction exposure, and had retained the services of a management consultant. On the other hand, Beta had been more centralised until relatively recently. Lambda was concerned about the lack of information at the centre on both transaction exposures at a

subsidiary level and their subsequent management. In addition, there was a possibility of netting opportunities arising, however the treasurer was most concerned about the subsidiary's view being different from the HQ view.

Beta had had a more centralised system in previous years but had moved to a position of specific directives. Seemingly, there were very few opportunities to net, and transaction costs were minimised by reaching an agreement with a large clearing bank to offer preferential rates to subsidiaries dealing with local branch banks. Moreover, the treasurer claimed that when the centralised system was in operation:

"One tended to scabble around in a crisis ... if there was a change in the exchange rate of 2%, there was intense activity gathering information and going into the market and picking up bad rates ... this way [i.e. decentralised] it averages out."

Phi also had very few netting opportunities. For the most part, it was an exporter from the UK with virtually no imports from abroad. Moreover, exports accounted for only 8% of group turnover. Their approach to transaction exposure was described in the following way:

"We manage it as soon as we are aware of it and cover it, but sometimes we may not do so ... we are not closely monitored by the board and we use the forward exchange market. We require the subsidiaries to do the dealing for themselves by contacting us."

I.B.v: Centralise UK Subsidiaries: Autonomous Overseas

Omicron and Alpha were included in this configuration. Both companies had significant exports and imports from the UK.

Omicron described their policy in the following way.

"Any exposure that is greater than \$5 mln. is referred to the HQ and we would take the covering decision here. Otherwise, the divisions have the option to take spot or forward from the centre and then we would act as a banker. But there are some penalties if they don't buy forward ... if they sell a receipt that doesn't arrive, then we give them flexibility if it is, for example, a month late ... it's a sweetener to the divisions, but if they buy spot, they must do it at the ruling rate."

Alpha's treasurer described its policies in similar terms.

"We are responsible for managing foreign exchange risk in the UK and we act as a bank to our UK subsidiaries ... but we won't accept the risk until they have a firm commitment. As soon as they do, they pass it on to us and we take the appropriate action ... we just make it normal policy to hedge firm transactions and they pass them on to us."

It is also interesting to note how the treasurer viewed the centralisation of the foreign exchange risk management function.

"In treasury, maybe we could decentralise foreign exchange but we would have to keep borrowing control here. However, we are essentially a banker and we provide a cheaper service and a better rate than they would get elsewhere; in fact, I am absolutely sure about that."

Finally, the treasurer described how foreign exchange risk management in Alpha had changed over time.

"We've gone through the phase of seeing currency as distinct and separate from everything else ... its part of the wider management of each business unit ... it is an illusion to think that you can centralise one aspect of a decentralised decision making system ... now we have our cake and eat it with centralised hedging and the rest of exchange rates are an integral part of the businesses."

I.B.vi: Liaison with both Overseas and UK Subsidiaries

Rho was the only company in this configuration. Interestingly, rather than perceiving the HQ treasury as a 'Banker' to

subsidiaries, this company described itself as a 'Central Banker' to the whole group. The Central Bank role was described in the following way:

"Hedging is a trading decision. They are responsible for budgeted profit and if they feel that they can reach this comfortably, they're not going to jeopardise it ... they can ask us or their banks for advice ... the decision is so important that we might counter it ... but this is quite rare ... it's their own decision but its our business."

For the most part however, if there was a difference of opinion between the HQ and the divisions, then the HQ would buy forward contracts on its own behalf in order to achieve the desired HQ risk posture. The treasurer was fully aware that this was a costly exercise, however, he argued that:

"We don't want to interfere with decentralisation. The strength of decentralisation is enormous here - we couldn't run a [plant] at all well. People are already doing quite well and the strength of the business is to allow this to continue and it is no use attempting to co ordinate them."

However, whilst the treasurer was dedicated to decentralisation, he also pointed out that:

"Despite the desire to control subsidiaries, we grew by acquisition and many of them were publicly quoted, and long established and so they all have reminiscences of independence."

I.B.vii: Centralise UK Subsidiaries: Liaison with Overseas

There were five companies within this category, Tau, Sigma, Omega, Epsilon and Iota. In this section, the practices of the five companies are examined in turn, and it will be pointed out that the extent of the liaison with overseas subsidiaries differed considerably, whereas an in-house banking arrangement

was used for the UK subsidiaries.

Each of the companies operated on a geographical basis, with a treasury centre in each country. The treasury centre in each country acted as a banker to the subsidiaries in that particular country, and HQ treasury acted as a banker to the UK subsidiaries, and had some liaison with overseas subsidiaries. For the most part, liaison was confined to Europe and the US, with virtually no contact with other foreign subsidiaries.

Iota described the structure in the following way:

"We don't like the operating companies doing their own thing so we act as a banker to them. So we insist on the companies coming to us. The foreign subsidiaries have their own local centres ... the local centres are responsible for their own hedging and we don't get exposure information from them because of things like exchange controls."

The actual banking relationship operated in the following way:

"When the operating company contracts, they come to [HQ] to buy or sell foreign exchange ... the spot forward decision depends on the payment terms e.g. if it's due in 90 days, we would do it for them. At the centre, we take all these, and they often balance out, and we get a net trading position. Exports are approximately equal to imports ... we give them a contract note, just like a bank. We get our rates straight from Reuter ... indeed many of the companies have their own Reuter screen for commodities and this means that they can see that they are getting a fair rate. We sometimes have problems where they might quote newspapers at us and they would complain [that] they weren't getting a fair rate. They seem to think that we are out to get them."

Liaison with overseas subsidiaries had been modified to some extent two months prior to the interview. The aim of the changes was to centralise the management of exposure on a European basis. An informal committee was formed of the

treasurers of the larger European operations, and initially at any rate, they aimed to reach a joint decision on whether they should stay long or short in particular currencies. The committee also discussed the raising of finance, and seemed to function as a method of decreasing the costs of raising finance. However, there was no liaison with subsidiaries outside Europe.

Tau had a similar relationship to the UK and overseas subsidiaries:

"It is a small operation in the UK ... and we act as an in house bank as well as having some contact with the overseas divisions. All of the UK subsidiaries have no bank or treasury function. Overseas, it depends on the size of the company, but it should be pointed out that in Germany, France, Italy and Spain, we have a liaison function. In each [overseas] company, the finance director and the treasury executive are the same person. We operate a cash pooling arrangement in each country and we concentrate the banking with local banks. The US now accounts for 33% of turnover. It has its own finance HQ (a satellite) and they do the day to day management there and would have a dotted line [relationship] with us here. We liaise with them, particularly in respect of short run financial and commercial paper."

Sigma was in a similar position. The treasury department was responsible mainly for the UK. A netting system was operated using currency deposit accounts and the treasury acted as a banker to the divisions by using forward contracts. The company had a significant proportion of its business in the US, and the finance HQ in the US was responsible for doing forward cover in the US. They hoped to move to a current account situation between the US and the UK but liaison was confined at the time of the interview to using know-how from the US companies and applying it in the UK. The treasurer summed up the conversation

in the following way:

"But, it is really just the UK and we have just one FX dealer ... the divisions ring him and he sells them a forward contract ... the divisions are obliged to do so ... the main reason for this is to achieve economies of scale."

Epsilon had an active policy of maximising the foreign currency receipts and payments at the centre by using a re-invoicing company. Daily contact was maintained between the treasurer in each significant European country. Every morning, agreement was reached on the extent of cover which should be maintained in over twenty currencies between levels of 25% and 75%. Receipts and payments were sold to the HQ at a forward rate. The forward rate used was not necessarily related to forward rates available in the market place. Contact was also maintained with the US subsidiaries.

Omega also operated as a banker to the UK subsidiaries. Receipts and payments originating in the UK were sold to the centre at the forward or spot rate and a similar treasury function operated in the overseas subsidiaries. The policy with respect to overseas subsidiaries was stated in the following way:

"The basic position that we have now reached is ... Firstly, the centre would like you to be neutral but we realise that there may be local knowledge which would mean that taking an exposure would be superior ... Secondly, you should realise that you are doing it ... Thirdly we should know about it."

Given the information on exposures the HQ could then either contact the local board and suggest that a position should be rendered neutral, or alternatively, take the opposite action at the centre.

I.B.viii: Directives to both UK and Overseas Subsidiaries

Until relatively recently, the only company in this category (Mu) had had an extremely centralised exposure management system. However, the most important currencies had recently been floated, and so, centralised trading became more difficult because the subsidiaries were located in distant time zones. The system used had been modified by allowing all subsidiaries in both the UK and overseas to engage in their own trading. However, specific limits were set in each currency which local treasurers were not permitted to exceed. The actual levels of exposure permitted in each currency depended on the quality of the treasurer, the relationship with the local banking community and the forecastability of the currency. Moreover, all subsidiaries were expected to submit monthly reports of their positions, and the limit could be altered in order to change the exposure. It should however be pointed out that the bulk of this company's business was overseas in a relatively small number of countries. Moreover, there was no opportunity to net and the debt ratio of the company was extremely high.

I.B.ix: Centralised Management of Overseas and UK Subsidiaries

Pi, the most highly centralised company, managed all European transaction exposures from the Centre. The parent company only had a 33-50% stake in all other overseas subsidiaries. A re-invoicing vehicle was based in the UK, using a sophisticated

European computer network. The system operated in the following way:

"If one subsidiary has a receipt or payment in a foreign currency, they input it into the data-base and then we apply the forward rate in the local currency of the company against the invoice currency."

Timely exposure reports were then available in order to allow the UK treasurer to net currencies, as well as being able to treat EMS currencies as a bloc. Moreover, it was possible to take a consistent view on exchange rate forecasts, and apply it to both actual and forecasted positions. Finally, since this information was available at the centre, leading and lagging using financial instruments was possible.

I.C: Conclusions

In this section, the involvement of HQ treasuries in the management of transaction exposure was classified and compared with the results of previous studies. Each company was then examined individually, using excerpts from interviews with HQ treasurers. In the following section, this data is interpreted and an attempt is made to explain the practices within a transaction cost framework.

II: Explaining the Management of Transaction Exposure

In this section an attempt is made to explain why different companies have different degrees of HQ involvement in the management of transaction exposure. In section II.A,

the management of transaction exposure in a world with no transaction costs is examined. The analysis is then extended to a world with transaction costs in section II.B, and the results of the analysis are compared with actual practices in section II.C.

II.A: Managing Transaction Exposure with Trivial Transaction Costs

Assume:

1. A unique exchange rate and forward rate for each currency.
2. A unique worldwide real cost of capital, and the Fisher effect holds.
3. Each individual in the organisation has identical risk-return preferences.
4. There are no information asymmetries in the organisation.
5. The organisation does not have superior forecasting ability.
6. All individuals are risk neutral.

Assumption 1 implies that there are no bid-ask spreads in foreign exchange markets, and that at any point in time the exchange rate in any location, for any size of transaction will be the same. Assumption 2 implies that borrowing and lending rates will be the same in all currencies after allowing for expected exchange rate changes and correction for biases in the forward rate, and that there are no barriers to capital market entry. Assumptions 3,4 and 5 ensure that there are no internal control problems and

assumption 6 is a convenient simplifying assumption. If all six assumptions hold, then there would be no HQ involvement in the management of foreign exchange risk. Moreover, positions would be left uncovered, since the use of the forward market may involve a risk premium. In the following paragraphs, the implications of progressively relaxing these assumptions are discussed.

II.A.i: Risk Averse Individuals

If the individuals in the firm are equally risk averse, then they will need to decide whether they wish to hedge transaction exposure. Under assumptions 1 and 2, the costs of a forward market and a money market hedge will be identical and the costs of hedging will depend on the risk premium included in the forward rate. The costs of internal techniques will be evaluated relative to this risk premium and netting will not be used as an internal technique since the risk premia will cancel one another out. In this situation, there is no role for HQ involvement since risk preferences are identical throughout the organisation. The only internal technique which would require central intervention is netting and this would not result in any cost savings.

II.A.ii: Non-Identical Risk Return Preferences

Even if the risk preferences of the subsidiary differ from those of the HQ, there is still no role for central intervention in

FERM. Since there are no information asymmetries, the HQ will know the subsidiary exposures and the extent to which these exposures have been hedged. The HQ may attain its own desired risk-return preferences by either purchasing or selling currencies forward.

II.A.iii: The Presence of Information Asymmetries

If there are information asymmetries, then there is a justification for a liaison role, since the HQ will need information about subsidiary exposures in order to attain its preferred risk-return position.

II.A.iv: Superior Forecasting Ability

If the firm has superior forecasting ability, then it will be necessary to ensure that this information is communicated throughout the organisation. However, there is no justification for increasing central intervention beyond a liaison role since, in the absence of transaction costs, HQ and subsidiary units may communicate forecasts and exposures by liaising with one another, and the desired risk-return preferences of the HQ may be attained without interfering with subsidiary autonomy.

II.A.v: Conclusions

In the previous paragraphs, it has been argued that there is no

scope for central intervention in the management of transaction exposure beyond a liaison role, if there are no transaction costs in foreign exchange markets. This proposition holds even if risk-return preferences differ, there are information asymmetries, and the firm has superior forecasting ability. There is one possible caveat to this result, the costs of liaising and internal communication may be non-trivial. However, one would expect that the costs of liaising are less than the costs of increased central intervention.

II.B: Managing Transaction Exposure in the Presence of Transaction Costs

It was argued in section II.A that central intervention in the management of transaction exposure, beyond a liaison role, is unnecessary if the following conditions hold:

1. There is a unique worldwide exchange rate
2. There is a unique worldwide real interest rate, and the Fisher effect holds.

In section II.B.i, the implications of a non-unique exchange rate are examined. The possibility of non-unique exchange rates is discussed in section II.B.ii.

II.B.i: Non-Unique Exchange Rates

Non-unique exchange rates manifest themselves in a number of

ways. Firstly, in order to facilitate trading and intermediation in foreign exchange markets, there will be bid-ask spreads. Secondly, the bid-ask spreads, as a percentage of the amount traded, may be greater for smaller amounts. Finally, due to communication costs, rates may vary spatially. For example, rates available in regional banks may not be as competitive as the rates available in major financial centres. There are two cases which are of particular interest, the MNC with no netting opportunities and the MNC with netting opportunities.

II.B.1.a: The MNC without Netting Opportunities

If the MNC has no netting opportunities, then there may be a justification for moving beyond the liaison role. The presence of bid-ask spreads implies that the centre may not be prepared to offset the actions of subsidiaries in order to attain its own desired risk-return profile. One would expect that the issue of general guidelines would facilitate the centre's desire to articulate its risk-return preferences. Moreover, if transaction costs vary spatially or are a function of size, there may be a case for consolidating exposures at the centre in order to achieve economies of scale and access to the most competitive market prices.

While the presence of bid-ask spreads explains the presence of general guidelines, and the existence of transaction costs which are size related or vary spatially, it is difficult to understand the use of specific directives. There are three possible

rationales for the use of specific directives. Firstly, the firm may have superior forecasting ability and wish to ensure that corporate forecasts were reflected in hedging decisions. However, in this situation, it would be equally possible to communicate a forecast rather than a directive. Secondly, by requiring operating units to contact the centre when transactions exceed a stated amount, the centre may be ensuring that the subsidiary has located the most competitive exchange rates available. Thirdly, directives to take specific actions in specific currencies may simply reflect the centre's desired risk-return preferences, since some currencies are more volatile than others.

II.B.i.b: The MNC with Netting Opportunities

The case for centralised action is strengthened considerably by the presence of netting opportunities. If it is possible to net exposures arising in autonomous operating units at the centre, then the MNC can economise on the bid-ask spreads. One would expect that centralised action is more likely if intra-subsidiary netting opportunities are available.

II.B.ii: Non-Unique Interest Rates

Non-unique interest rates may manifest themselves in a variety of ways. Firstly, there may be differences between lending and borrowing rates. Secondly, the difference between borrowing and lending rates may be greater for smaller transactions.

Thirdly, there may be geographically segmented money markets. It is quite possible, under these circumstances, that there will be a rationale for HQ interference in the management of transaction exposure, since the HQ may find the money market hedge more economical than the forward hedge.

II.B.iii: Conclusions

In this section, it has been argued that the presence of transaction costs may represent a rationale for increased HQ involvement in the management of transaction exposure. This rationale is based upon the ability of the HQ to economise on transaction costs by netting exposures, consolidating exposures and the use of hedging techniques other than the forward market. It was also argued that the use of specific directives and general guidelines ensures that HQ risk-return preferences are reflected in operating unit decision making. It should be pointed out that increased central involvement may not be costless. Costs will include communication costs and the intangible costs of interference with sub-unit autonomy. In the following section, this analysis is compared with the description of practices in section I.

II.C: Implications of the Analysis

In the previous section, three motives (netting, consolidation and hedging technique) for increased HQ involvement in FERM were suggested. In this section, each of these motives is examined

with respect to observed practices. The costs of centralisation are then examined and an attempt is made to explain why there is less HQ involvement in transactions arising overseas.

II.C.i: The Netting Motive

It was asserted in section II.B that centralised action is unlikely in cases where there is no opportunity to economise on transaction costs at the centre. In this section, it is shown that practice is consistent with this hypothesis. In table 6.4, the opportunity to net and the presence of centralised action for exposures arising in the UK are summarised.

Table 6.4: Netting opportunities and Centralised Action

	Netting Possible	Netting Unlikely	Total
Centre takes Action	8	0	8
Subsidiary takes Action	5	5	10
Total	13	5	18

Using the Fisher Exact Probability Test, the probability of observing this occurrence, if centralised action were a random event, is 2.9%. One might conclude that there is a relationship between the presence of netting opportunities and centralised action. However, this relationship becomes more convincing when one examines the five companies which did not take centralised action but did have netting opportunities.

The treasurers in Zeta, Delta and Lambda all intended

centralising the management of transaction exposure. Both Zeta and Lambda were in the process of altering the degree of central involvement and had retained the services of management consultants. The treasurer in Delta had been trying unsuccessfully, for the previous twelve years, to increase the involvement of the treasury.

The two companies which had access to netting opportunities but did not intend centralising were Nu and Psi. Whilst Nu did not have a formal centralised system, the treasurer argued that there were only sporadic netting opportunities and that the HQ did attempt to locate intra-subsidiary netting opportunities when the need arose. Psi was the most diverse company in the sample, and no attempt had been made at the centre to facilitate intra-subsidiary netting.

II.C.ii: The Consolidation Motive

The consolidation motive was cited by many of the companies using a centralised facility as another reason for centralising the management of transaction exposure. However, there was no company which had used centralised action and did not have netting opportunities (see Table 6.4). Two companies (Mu and Beta) did not have netting opportunities but had operated a centralised system in earlier years. Both companies now use a system of specific directives. Beta had reached an agreement with its bank which permitted realisation of the consolidation opportunities without using a regime of centralised action.

The agreement with the bank granted preferential rates on small transactions to Beta's operating units. Mu had been in a position of obtaining better rates in the London market than its foreign subsidiaries could obtain in local markets, but when the currencies of its operating subsidiaries were floated, the benefits decreased considerably.

II.C.iii: The Technique Motive

The technique motive was not evident in any of the interviews, however, seven of the companies (Tau, Sigma, Omega, Epsilon, Iota and Pi) which used centralised action made extensive use of both money market instruments and forward contracts for hedging. The choice between the two techniques depended upon both international money market conditions and tax considerations.

II.C.iv: The Costs of Centralisation

There are two types of cost which may act as barriers to centralisation. Firstly, there are the costs of communicating both policy and exposures within the organisation. Secondly, if there is central involvement beyond a liaison role, operating unit autonomy may be decreased. Whilst the former cost was trivial for UK transactions, interference with divisional autonomy was a recurring theme in the interviews (see excerpts in section I). The issue of minimising interference with operating unit autonomy is discussed in the following paragraphs.

All of the companies which operated a regime of centralised action used an in-house bank mechanism. The mechanism permits the decoupling of operating decisions and transaction exposure management considerations. In many respects, it is similar to a transfer pricing mechanism since exposures are transferred at market prices (Epsilon was the only company which did not use market-based prices) to the central treasury. Moreover, communication costs are minimised since the sub-unit would incur similar costs if it transacted externally, and the treasury need only insist upon transactions being executed internally in order to impose the HQ's risk-return preferences on the management of foreign exchange risk. While the in-house bank may be consistent with the M-Form hypothesis, subsidiaries were required (in all cases but two) to purchase forward contracts. This was justified by the need to maximise netting opportunities by altering the timing of cash flows.

II.C.v: Overseas Subsidiaries

As pointed out in section I, thirteen of the sample companies had greater HQ involvement in exposures arising in the UK. One would expect that there would be considerable transaction cost savings arising from global foreign exchange risk management. The main barriers to global FERM arise from political, geographic and informational considerations. However, it is also argued in section II.C.v.d that a number of companies have used re-invoicing tactics to minimise the exposure of their overseas marketing affiliates.

II.C.v.a: Political Considerations

Political considerations may be important for a number of reasons. Firstly, the parent may only have a 50% stake in foreign subsidiaries, and any attempt to interfere with the day-to-day running of the subsidiary may be frowned upon by the local shareholders. Many of the companies had subsidiaries in countries which required local participation (e.g. India, Nigeria and South America), and there were also operational reasons for non wholly owned subsidiaries. Secondly, host governments may view a HQ involvement in local subsidiaries as unnecessary interference and a threat to domestic policy. This would be particularly likely if the local government was attempting to enforce exchange controls, or alternatively if the local government suspected that transactions were not being translated at an arms length rate.

II.C.v.b: Informational Considerations

Informational considerations arise since it is quite possible that local subsidiaries have superior forecasting ability. This may be the case where the currency in which the local subsidiary operates constitutes only a small proportion of group exposure, but a significant proportion of the subsidiary exposure. It is highly unlikely that scarce HQ resources will be allocated to the task of forecasting an insignificant currency.

Apart from poor HQ forecasting ability, virtually all of the MNCs had virtually no exposure reporting system for foreign subsidiaries, and the resources available at HQ were often inadequate. For example, Nu used manual procedures to consolidate its annual accounts, while Gamma invoiced in Sterling if possible because its computer could not cope with foreign currencies. Omega and Pi were the only companies with formal international exposure information systems. Pi used a European computer network to facilitate a sophisticated European re-invoicing system (see section I.B.ix) and European exposure reports were available on a daily basis. Omega introduced a reporting system while the research was in progress, and some of the difficulties they encountered are summarised in the following paragraph.

Omega decided that it was necessary to gather information on the exposures of foreign subsidiaries, as a first step towards managing exposure on a global basis. It was decided that information should be collected on the foreign currency denominated assets (including stocks) and liabilities (including forward contracts) of each subsidiary on a quarterly basis. The first problem encountered was that following the initial request for a report, the information did not begin to materialise for a considerable time. Three months after the initial request and a reminder, one or two subsidiaries had not yet provided the information. Moreover, there were considerable difficulties reconciling the numbers in the ad hoc report to financial accounting information provided by the subsidiaries. For

example, the financial accounts suggested an exposure of one subsidiary of about \$250,000, and the reported exposure was \$1.5 billion. In addition, the HQ had only allowed for numbers of up to 7 digits in the software. As it turned out, exposures of some subsidiaries in some currencies exceeded seven digits. Furthermore, semantic problems arose because a foreign currency asset to the HQ may not be a foreign currency asset to a subsidiary operating in that currency. Finally, the treasury department did not know how to interpret or use the information once it became available.

The treasurer of Tau had considered the introduction of worldwide netting, however his attempts came to nought because of informational and political considerations.

"It's a chicken and an egg without full information on each company's exposures, can't do much and don't know every detail ... it would require too much information and also [named industry] exports are sensitive politically, and therefore [we] would need to exclude some and this would mean that we could not introduce netting ... also there were strong in house objections to it ... we don't have a lot of two way flows."

II.C.v.c: Geographic Considerations

Geographical considerations will influence the costs of communicating with the HQ. If the internal bank mechanism is used, there may be significant costs in communicating with HQ in order to purchase and confirm the purchase of a contract. These problems will be exacerbated by factors such as differences in time zones and language differences. An alternative might be to

report exposure on a periodic basis to the HQ, but this could also be a costly exercise.

II.C.v.d: The Foreign Marketing Subsidiary

Eleven companies used wholly-owned foreign marketing subsidiaries to sell products manufactured in the UK. Six of these companies (Lambda, Alpha, Omicron, Pi, Delta and Epsilon) invoiced their foreign marketing affiliates in foreign currency while the other five (Gamma, Iota, Tau, Beta and Rho) invoiced foreign affiliates in Sterling. Three of the six companies (Alpha, Delta and Epsilon) were primarily UK based manufacturers, and the use of invoice policy resulted in the UK accounting for a disproportionate amount of the MNCs' transaction exposure.

II.D: Conclusions'

In this section, an attempt was made to explain why different MNCs have different degrees of HQ intervention in the management of transaction exposure. It was argued that if there were no transaction costs in foreign exchange markets, then a liaison role would ensure that the desired risk return preferences of the HQ could be attained. In the presence of transaction costs, it was argued that there would be three motives for increased centralisation, the consolidation, netting and technique motives. However, it was also argued that centralisation may be costly, since it will entail increased communication costs and interfere with divisional autonomy. The data in section I were used to

examine this hypothesis, and it would seem that the netting motive dominates. It was also shown that companies which use centralised action chose an in-house bank structure which minimises interference with divisional autonomy. The fact that there is less HQ involvement in transactions arising in overseas subsidiaries (see Table 6.1) was attributed to geographical, political and informational considerations. However, it was also argued that the degree of involvement in transactions arising in overseas subsidiaries may be underestimated in Table 6.1 since a number of companies invoice their foreign marketing subsidiaries in foreign currency.

III: Implications of the Netting Motive

In this section two issues are discussed. Firstly, in the previous section it was argued that the sample of companies acted as if they were minimising transaction costs. Obviously, it would be premature to accept this finding, given that it was based on a limited sample of multinational companies. In the first part of this section, the prospects for testing this hypothesis are examined. Secondly, apart from explaining why companies behave in a certain manner, it is also necessary to attempt to predict how they will behave in the future. In the second part of this section, some predictions which are consistent with the hypothesis are examined.

III.i: The Testability of the Hypothesis

The basic hypothesis is that ceteris paribus a relationship exists between centralised action and transaction costs. Therefore, centralised action is unlikely to be found in situations where transaction costs are trivial. Conversely, when transaction costs are material, one would expect to observe a greater degree of centralised action, provided that netting opportunities existed, in order to produce cost savings.

The main variables one might attempt to observe would be the availability of netting opportunities, and the degree of central action. This could then be tested using cross sectional data. In order to examine the impact of transaction costs, the study could be extended to MNCs located in different countries with different levels of transaction costs. One would expect to observe a greater degree of centralised action in countries where transaction costs are highest.

III.ii: Predictions Consiste

Of the 18 companies with significant transaction exposures which were surveyed, 50% of the companies were in the position of either intending to increase the amount of centralised action, or alternatively, in the process of increasing the amount of centralised action. Soenen and Aggarwal [1985] found that 54% of the UK companies that they surveyed expected the degree of centralisation to increase. The results are therefore broadly

similar.

Given that transaction costs are expected to remain constant, and netting opportunities have not altered, one would expect that the surveyed companies expect the costs of a centralised facility to decrease. This is probably quite a realistic assumption, given the impact of more efficient and less costly communications technologies. However, it is based on the assumption that market transaction costs have not altered. One would expect that more efficient and less costly communication technologies would also have an impact on the transaction costs in financial markets. The real issue will be the extent to which the cost benefit equation will change. If transaction costs (fixed transaction fees and bid ask spreads) fall substantially in foreign exchange markets, one would expect that the companies with relatively low netting opportunities should revert to a decentralised system. Conversely, if the cost of the central facility decreases substantially, then a greater degree of centralised action would be expected. Therefore, an increase in the amount of centralised action in the future is not necessarily a foregone conclusion.

IV: Summary and Conclusions

In this chapter the role of the HQ treasury in the management of transaction exposure has been examined. The practices of a sample of 20 UK MNCs were summarised and the results were found to be similar to those of Collier and Davis [1985]. A set of

criteria for identifying the degree of HQ treasury involvement was suggested, and the classification system used was justified by using excerpts from interviews with HQ treasurers.

The degree of HQ involvement was explained by using a transaction cost framework. It was argued that there are three motives for centralisation, netting, consolidation and the availability of alternative hedging techniques. However, there may be costs to increased centralisation arising from the need to communicate exposures and directives, and the possibility of interference with operating unit autonomy. In practice, it would seem that the netting motive dominates the centralisation decision and that the possibility of interference with sub-unit autonomy is ameliorated by using an in-house bank. It was also shown that there was less central involvement in transactions arising in overseas subsidiaries, and it was argued that this was due to the existence of political, geographic and informational considerations.

It was also claimed that the netting motive was capable of verification using cross sectional data. In addition, it was argued (if the netting motive is valid) that despite treasurers' desires to increase the degree of centralised action, there may be a case for decreasing the degree of centralised action, should market transaction costs decrease in the future.

CHAPTER 7

ECONOMIC EXPOSURE AND THE HQ TREASURER

In the previous chapter, the role of the HQ treasurer in the management of transaction exposure was discussed. In this chapter, the roles of the HQ treasurer in the management of economic exposure are identified. In the first section of this chapter HQ treasury involvement in the management of economic exposure is described. It is argued in the second section that HQ treasury involvement is minimal and some of the barriers to treasury involvement are discussed.

I: The Management of Economic Exposure

In this section, the role of the HQ treasury in the management of economic exposure in the twenty companies is examined. In chapter 3, it was pointed out that foreign currency options permit the immunisation of some forms of economic exposure. Corporate uses of foreign currency options are described in section I.A. One might also expect that treasurers may have some input in both financing and investment decisions which influence the economic exposure of the MNC. This issue is examined in section I.B. It was also found that some treasurers had attempted to manage economic exposure explicitly, and their experiences are described in section I.C.

I.A: Corporate Uses of Foreign Currency Options

Rather than the treasurer being involved in the management of foreign currency denominated transactions only after they arise, it has been suggested (e.g. Kenyon [1981]) that the treasurer should become involved in transaction exposures before they are realised. The advent of foreign currency options might be expected to facilitate this process, since binomial economic exposures may be protected with foreign currency options. In this section, the use of foreign currency options for the protection of foreign currency tenders, foreign currency price lists and other contingent exposures is discussed.

I.A.i: Foreign Currency Tenders

Tendering is obviously limited to companies involved in large supply contracts. Only four companies were involved in contracting which would involve tenders (Psi, Sigma, Gamma and Beta), and Psi confined itself to UK contracting. Moreover, Gamma was the only company involved in contracts which were sufficiently large and long term that an adverse change in exchange rates could have catastrophic effects on the firm. In the following paragraphs, the practices of the companies are described.

Sigma had a centralised in-house bank. The company had commenced selling foreign currency options to its subsidiaries, and sold them in a similar way to forward contracts. The

treasurer described the use of options in the following way:

"We provide them to the divisions for hedging risks. This is for uncertain cash flows ... mostly it is in bidding situations and also for some foreign earnings and we don't lay them off ... it's really like an insurance policy but we would look at each one individually ... We don't use the Black-Scholes model, but there may be opportunities ... We send out instructions [to the divisions] on how to deal with foreign currency and we have a lot of personal contact ... there are a lot of misunderstandings and there is also a lot of bank hype ... We use them mainly for tendering ... We would have equipment sourced from everywhere and use options on both sides and there has been no occasion where we have laid them off in the market."

Beta (which used specific directives for transaction exposure) realised that currency options could be potentially applied in tender situations but felt that they were currently too expensive; for this reason, no options had been purchased to date. One of the difficulties with the use of options in Beta (as far as the HQ was concerned) was that exposure was not deemed to arise until a firm contract existed.

Gamma undertook extremely large foreign currency denominated contract work. The company used options sporadically for contracts, however they also used internal techniques to minimise the period of exposure. The internal technique consisted of not setting a foreign currency price until the company had been shortlisted for the tender, and including an expiration date in the bid document. The company would then purchase an option to protect itself during the period of exposure. The treasurer could not say if the policy of minimising the exposure had an adverse effect on the company's competitiveness, since there were many considerations other than price in an overseas tender and one never knew when a tender was lost whether one was second or

twelfth.

Gamma also had a policy which required that all foreign currency contracts should be examined by the treasurer. This policy ensured that the treasurer had examined the foreign currency aspects of the contract. In general, all contracts were covered in the forward market if the bid was successful. The role of the treasurer was essentially advisory and he did not have the power to interfere with divisional decisions.

One might conclude by saying that foreign currency options have not been used in the classic tender situation. This is due to the relatively recent availability of foreign currency options, the difficulties of incorporating options within a system of specific directives and the availability of internal techniques. However, there was only one company in the sample that was extremely dependent on tendering, and it is possible that it is unrepresentative of other companies in a similar situation.

I.A.11: Foreign Currency Price Lists

In many respects, foreign currency price lists are similar to foreign currency tenders since they involve setting a price in foreign currency and receiving an uncertain amount of foreign currency at some future date. However, the period of exposure arising from a price list may be a year long, but sales to a single country are unlikely to form a significant proportion of sales or profits. It was argued in chapter four that a single

foreign currency option will immunise the exposure arising from a foreign currency price list only if demand for the product is extremely price elastic.

The use of price lists varied from company to company, since some companies were involved in markets where there was no such thing as a price list, or alternatively where there was a world market price and the firm was a price-taker. Six companies issued price lists in foreign currency, but none of the treasurers had any involvement in pricing decisions. Only two of the six treasurers (Alpha and Phi) realised that options could be used to immunise this form of exposure, and both companies were selling products which were relatively price elastic. However, whilst both treasurers realised that there was a potential use for options in this situation, neither treasurer had operationalised the concept. For example, the treasurer in Alpha described the problem in the following way:

"With a lot of the exposure, it is much more fuzzy than academics, management consultants and bankers make out. For example, when we are selling to Sweden, we must invoice in local currency. We have to react to the customers. Unlike what people like you say, we don't have any choice in the matter. Therefore as soon as we draw up a price list, we are exposed, but we don't have any orders yet so at that moment the business is carrying the risk, but we won't accept the risk until they have a firm commitment ... We may be able to use options as the market develops, but this may prove expensive, so we will probably leave the purchase of options up to the commercial units ... but this will be reviewed as the need arises."

He added that:

"We don't get involved with them on price lists ... that is a risk for them ... it is part of being in business."

The evidence would suggest that foreign currency options had not

been used for covering foreign currency price lists, but it is possible that since the field work was carried out, they have been applied in some of these companies.

I.A.iii: Miscellaneous Applications

A number of companies were considering applying foreign currency options to exposures other than price lists and foreign currency tenders. The applications included the sale of subsidiaries, uncertain orders and the use of options as an alternative to forward contracts. Each of the applications is considered in the following paragraphs.

I.A.iii.a: Disinvestment

Omicron had recently agreed to sell a relatively large overseas subsidiary to a local entrepreneur. The treasurer was considering the use of an option in order to protect the company until the host country government consented to the sale. Agreement had been reached to sell the subsidiary once before and the host country government had not consented to the sale. It was likely to be three months before the host government would make a decision and the sale was denominated in US dollars.

I.A.iii.b: Uncertain Orders

The treasurer of Delta saw a potential role for options in coping with uncertain orders.

"It [options] also interests us where we have an annual schedule of orders but we don't know when during the year and options would make sense for a part of this business and then [we would] replace [them] with forward contracts on the actual ... [this is] very important because the schedules have a fixed foreign currency price. We would centralise this because the divisions wouldn't understand it."

In many respects, this application is similar to the use of options for foreign currency tenders and price lists, except that only a subset of the orders would be used as a basis for determining the quantity of options to purchase.

I.A.iii.c: Options as Substitutes for Forward Contracts

Two companies (Omega and Omicron) were considering selling foreign currency options to operating units as a substitute for forward contracts, and as an instrument to cover contingent exposures.

Omicron's treasurer described his position in the following way:

"We have not told the divisions about options, but we may start it up as a service to the divisions and write options ... it's where the money is, like insurance ... but [we would] need to be sophisticated ... for example, I have no real time information on our exposure."

Omega had purchased software to generate option prices in order to sell foreign currency options to operating units, however sales of options had not commenced. Omega was also considering the use of options to protect dividend payments from foreign affiliates in order that there would be some upside potential.

I.A.iv: Conclusions

While the advent of foreign currency options offers significant new opportunities for corporate treasurers to become involved in hedging economic exposures, there was little evidence of their widespread use in FERM at the time the interviews were conducted.

I.B: The Investment and Financing Decisions

In the long run, the investment and financing decisions may be used to alter the exposure of the MNC (see chapter four). In this section, the involvement of the treasurer in the financing and investment decisions is described, and the incorporation of exchange rate considerations within these decisions is also examined.

I.B.i: The Investment Decision

In this part, the inclusion of exchange rates in investment decisions is discussed. One would expect that treasurers might be concerned about investment proposals which had a considerable degree of economic exposure. For the most part, companies seemed to be guided by general strategic considerations, rather than the output of investment models. Involvement of the treasurer varied from none whatsoever to some input into the process.

In some companies, there was little or no knowledge of how investment decisions were made. For example, one treasurer replied:

"We do have an investment controller, but there is very little interplay between me and him. I'm not even sure how investments are justified ... it's probably crude."

[Omicron]

Alternatively, exchange rates were seen as an insignificant factor in the investment decision process.

"It depends on the investment ... we look at the investment ... the choice of location and the exchange rate may come in later ... but the main market will be the main consideration ... if it were the US market then we would go to the US and we wouldn't locate in the UK and sell 90% to the US. If it were a world market, we would look at different locations ... but the main rule is to locate where the market is. The exchange rate is not a major factor but it is a factor."

[Delta]

Similarly, another treasurer said that:

"The company sees needs for investment and we don't have choice as to location"

[Beta]

Another treasurer described investment decisions:

"[It is] not incorporated ... the exchange rate is very low down ... see it as a long run investment."

[Rho]

Some companies maintained that exchange rate considerations should be incorporated in investment decisions:

"Exchange rates are always part of the process ... now with the increasing volatility of exchange rates, we will pay more attention to them, for example, the vulnerability of the currency and the ability to remit profits."

[Zeta]

These excerpts are representative of the vast majority of the companies in the sample. When treasurers were asked about the investment decision, they were either unsure about the techniques used or maintained that it was a strategic decision. Even firms which used technically sophisticated appraisal techniques failed to incorporate exchange rate effects other than the effect of exchange rate changes on the translated value of expected dividends. Only two companies (Phi and Sigma) attempted to incorporate more sophisticated exchange rate analyses into capital investment appraisal.

Phi's investment appraisal system included a sophisticated financial model for evaluating the effects of exchange rate changes on the sourcing and financing of capital investments. However, the results of the analysis were not fully incorporated into the investment decision. For example, the treasurer described how an investment was made in a South American country which was adversely affected by exchange rate changes.

"They [the investment appraisal techniques] were sound. We used DCF ... we include country and exposure risk in the cost of capital but [name of country] could not be assessed. [The exchange rate change was unexpected] ... we built in some devaluation but there were political problems with the plant and political disagreements and people in the organisation had an interest in this."

Sigma was the only company which explicitly incorporated the effects of exchange rate changes on project cash flows into the analysis of prospective investments. The treasurer was asked about a particular recent investment in the US which had been badly affected by the strength of the dollar.

"The [treasury] team work with corporate planning ... the

worst business is [a US subsidiary] ... there is import penetration and decreased exports, leading to rockbottom prices. There is not much that we can do ... it is just an economic fact of life ... there are a lot of assets in the US and we benefit from the cash flow from this in dollar terms ... though if we had [fore]seen this, we may not have invested in it [i.e. US subsidiary]."

The treasurer was then asked about the investment appraisal techniques which were used:

"We do sensitivity analysis and so on ... it is very important to be sophisticated in our business and we include inflation and exchange rate scenarios in our analysis ... we just didn't foresee such a scenario ... We are also assessing the competition much more ... it's a subjective thing."

One might conclude by saying that cases may arise where the investment appraisal process is a ritual and the decision has to large extent been made in terms of whether the proposal may be integrated with existing strategies. In cases where financial analysis is used to guide investment decisions, the actual treatment of exchange rate changes is limited to the effects of exchange rate changes on translated cash flows to the parent. Even when sophisticated financial analysis is used unanticipated exchange rate changes may occur which were not incorporated into the investment decision process in the first place.

I.B.11: Exchange Rate changes and the Financing Decision

In chapter four, it was pointed out that both the Hodder [1982] and the Srinivasulu [1983] models relied on alterations in the denomination of debt as techniques for the management of economic exposure. In this part some of the considerations in the currency of denomination decision are examined.

The basic policy guiding the currency of denomination decisions for borrowings was to match local assets and liabilities. In all, thirteen companies pursued this basic strategy. Seven companies made some use of this policy, but it was then modified to take account of specific local conditions such as exchange controls, local inflation, interest rates and taxes. One company was attempting to move from the basic matching position, to a position which would optimise on as many counts as possible.

There were many reasons for the adoption of the policy of matching assets and liabilities. For example, one company had an extremely highly publicised financing mismatch in the seventies. Considerable losses had been made due to the mismatch, and their current policy was described in the following terms.

"We hedge the balance sheet through borrowing .. we do not seek publicity"

[Tau]

More often than not, debt policy was not actively managed, and was solved as a sequential problem on a piecemeal basis.

"We look at the consolidated balance sheet and try not to borrow unless there are equivalent assets [in that country] ... we would not touch Swiss Francs ... we used Deutsche Marks for a major acquisition in Germany ... in the US we used dollars ... we also balance dollar borrowings with dollar assets ... we had some dollar borrowing from pre exchange control days for Australia and South Africa ... the links between these currencies are more tenuous now so that when the US acquisition came up we re-assessed our position vis a vis the dollar borrowing."

[Zeta]

Even companies which claimed that they were unconcerned with

translation exposure pursued a policy of matching assets and liabilities.

"We don't cover it [translation exposure]. Stockholders know that we have overseas operations when they buy our shares and so we must ask if they would want us to lay off the risk. They want involvement in overseas countries. We do try and get an overall world gearing ratio and we try to maintain this in individual countries ... we look at our borrowings relative to our assets and hedge if they were above or below a certain level. Of course this is also concerned with economic exposure ... however, we are not concerned with paying cash to protect a reported position."

[Alpha]

Some companies did however modify the matching rule for a variety of reasons. For example, two companies (Kappa and Phi) were relatively exposed to hyper inflationary economies. They still pursued the basic matching rule but modified it in the following ways.

"Companies in Israel can borrow hard currency, dollars, sterling and DM and then service it out of Shekel earnings and this leads to a sensible interest coupon ... also 'linkage' in Israel ... borrowing is linked to the inflation index. Therefore it is a mix of linkage and US financing ... living with inflation is a problem."

[Kappa]

"We try to match borrowings and assets ... in the States this is 90% ... it is too much and it is due to the fact that we are starting up there. In [two named countries], we have limited matching because it is easier to get dollars there than local currency. Therefore, we match 75% if possible."

[Phi]

Another barrier to matching was the existence of exchange controls.

"The main exposure is in [a foreign currency], however we can't cover this because of exchange controls in [foreign country]. Therefore we try to circumvent this by decreasing net worth. [We intend] to change the credit

terms between the UK and [foreign country] so that [foreign currency] borrowing will increase and therefore decrease exposure."

[Lambda]

A number of other companies attempted to minimise financing costs by modifying the matching rules to take account of taxes, interest rates and exchange rates. For example, one company was prepared to consider altering financing if exchange rates changed.

"The exchange rate is fundamental to financing. The broad rule is to match ... no rule is immutable and if the dollar stood at two point four we might look at it differently."

[Psi]

Another company was prepared to go a stage further and take positions.

"In the long run we don't hedge the balance sheet because we are a true multinational with manufacturing around the world ... therefore we leave the currency exposure in any currency and gear up the subsidiaries to the same level ... but this varies for tax and exchange control reasons and within this we take a view ... we have confidence in our ability to forecast in the long run, but not in the short run."

[Sigma]

However, it would be fair to conclude that by and large, companies were not concerned with exposure considerations when financing decisions were made. Decisions were guided by the assets in particular countries, with adjustments to the basic policy in order either to adapt to host country conditions, or in two cases, to take positions in foreign currencies. One treasurer was keen to go out on a limb on financing, but had not done so to date:

"I prefer to have aggressive treasury management: take a

view on currencies ... for example, DM finance would be more successful in the last three years ... stable interest rates ... so we might get into DM, but there were the lessons of the early seventies. The DM is extreme and we shouldn't be constrained because our assets are in the US."

[Rho]

However, this decision was guided by the minimisation of financing costs rather than the management of foreign exchange risk. While the debt policies of the companies may appear relatively unsophisticated, there was considerable sophistication attached to the ways in which debt was raised, once the financing decision was made:

"For example, if you have a Japanese factory to be built and you don't want to raise the money locally, we would buy tranches of Yen when we thought the DM was good. Therefore everytime it reached 3.3, we would buy Yen; there is a known requirement of exchange."

[Tau]

Omega was the only company that was considering the introduction of a strategic plan to manage its debt equity ratio:

"Previously, finance was just a by product ... we will look at the management of the balance sheet and the income statement and tax management ... foreign exchange will be implicated in them all."

This plan included using debt as an instrument to minimise transaction exposure.

However, possibly the main reason for pursuing the convention of matching assets and liabilities, was a fear of the consequences if it were not followed. Gamma was primarily an exporter and decided to hedge expected sales to the US. Debt was rejected as a technique to decrease the company's economic exposure because of the impact it might have on the debt equity ratio:

"There is a tendency to use the forward market and then to use bank accounts to increase the flexibility with respect to timing. But there is the problem of volumes. For example, we have \$100 million [sales] in the US and our total borrowing is about \$60 million, and so we couldn't do it without mucking up the balance sheet."

To conclude, all of the firms in the sample used relatively conventional financing techniques and attempted to match assets and liabilities in individual countries. Borrowing policy as an exposure management technique was constrained by custom, institutional factors and corporate policy. Marginal modifications were made to borrowing policies in order to reflect exchange control, inflationary, tax and interest rate considerations. Very few treasurers were prepared to consider 'taking a view' on borrowings and only one company intended relating borrowing directly to the firm's foreign exchange exposure.

I.C: Managing Economic Exposure

The majority of the treasurers interviewed had no understanding of economic exposure and 'foreign exchange risk management' and 'the management of transaction exposure' were seen as synonymous.

In Table 7.1, treasurers' perceptions of foreign exchange risk are classified as either transactional or economic. Treasurers were classified as 'transactional' if they viewed exchange risk purely in terms of transactions, without reference to the influence of exchange rate changes on prices, costs and volumes. Conversely, treasurers that did incorporate the effects of

exchange rate changes on prices, costs and volumes were categorised as 'economic'.

Table 7.1: Treasurers' Perceptions of Exchange Risk

<u>Transactional</u> (14 MNCs)		<u>Economic</u> (6 MNCs)
Theta	Omicron	Lambda
Phi	Rho	Tau
Nu	Zeta	Omega
Sigma	Kappa	Epsilon
Alpha	Psi	Pi
Beta	Mu	Gamma
Delta	Iota	

All of the companies which had transactional outlooks focused almost exclusively on foreign currency denominated items which were certain with respect to amount. Zeta was one of the few companies in this group which may have been prepared to become involved in economic exposures:

"We will also talk to them about prospective exposures, for example their budgets and forecasts and if they feel they want to talk about it we will do it then and then later take it on as a specific item if it does occur. It is possible that some areas may not be confident enough to hedge until they have received or placed an order. But I can't see the centre taking a flier on a possible future order."

Six treasurers acknowledged the presence of economic exposure and had attempted to incorporate it within FERM activities. Each company is examined in turn in the following paragraphs.

I.C.i: Epsilon

The treasurer maintained that the company was exposed until prices could be increased in local markets. While he claimed that this was the exposure which was managed, his description of

the management of foreign exchange risk seemed to be based upon transaction exposures.

I.C.ii: Pi

Pi (the company with the European computer network) assumed that prices were fixed for two years. Exposure was measured as a rolling forecast of foreign currency cash flows over the following year. The forecasts of foreign currency cash flows (updated monthly) were then used as a basis for hedging decisions, and leading and lagging was used to minimise transaction costs.

I.C.iii: Gamma

Gamma (as described in section I.B.ii) had sold dollars forward over two years in order to protect exports to the US. The aim of the exercise was to ensure that the firm could export profitably in the future, should sterling strengthen against the dollar (at the time of the interview, the exchange rate was \$1.1). However, only a percentage (between 40% and 60%) of the anticipated sales were covered, and this percentage had been determined following discussions between senior HQ management, divisional management and the treasurer.

I.C.iv: Lambda

Lambda was considering using a similar tactic:

"At the moment we are uncertain as to the US and we may lock in a year's sales if the dollar climbs again ... 50% or so ... I don't understand why they won't do 100% e.g. lock in at \$1.5 or whatever ... there would be a good profit if they did lock in but they could be even better ... there is no rationale except the budget exchange rate. The big problem at a senior management level is trying to work out what companies are trying to do."

I.C.v: Tau

The treasurer in Tau had participated in the Earl [1983] study and had questioned transactional approaches to foreign exchange risk:

"The theoretical situation on forward cover ... maybe there is very little benefit of 100% forward cover, for example when does the exposure arise from [named country] or [named country] ... there is added value there ... but if it's sold to a third party, then part of the UK is also added value ... and so what should be covered forward ... [what is the] economic exposure ... we have tried to do so with third party [sales], irrespective of the invoice ... but it does give way to accounting problems, for example, reaching budget targets and this is very important to [the] companies."

This comment is most interesting since management accounting systems are suggested as a barrier to the management of economic exposure. This issue is explored more fully in section II and chapter 9.

I.C.vi: Omega

A committee was appointed in Omega to examine the management of economic exposure. The committee had contacted all of the divisions over a two year period and obtained descriptions of each division's economic exposure. The division which accounted

for the largest proportion of sales and profits was a company which sourced in global markets, and sold its products in locally segmented oligopolistic markets. There was a degree of added value in each local market, and the local markets were extremely uncompetitive in terms of price competition. The main economic exposure was the inability to increase prices in the short run, despite fluctuations in exchange markets leading to fluctuations in the price of its raw materials.

The definition of the problem became an accounting issue. The division's materials were denominated in a currency other than sterling, and the profitability of the subsidiaries depended upon the level of the exchange rate in the short run. The committee became involved in a debate similar to the inflation accounting debate. If replacement cost accounting were used to measure subsidiary performance, then the cost of goods sold would reflect the opportunity cost of raw materials. It was also realised that if historic cost accounting were used, then it would result in entirely different hedging practices in the subsidiaries. Moreover, the policy adopted would have a considerable influence on Omega's published financial statements, and the transition from the existing policy to a new policy could influence the exchange rate. Finally, if the treasury function had the discretion to alter the policy in response to anticipated exchange rates, substantial benefits could accrue. However, this last policy would involve interference with performance evaluation and the firm's tax position, and in essence the centralised management of economic and transaction exposure.

The historic versus replacement cost debate continued for nearly three months. Eventually, it was realised that if the functional currency of the company was changed from Sterling to another currency, the problem would be resolved. The proposal involved ceasing to use Sterling for accounting and planning purposes. It was also suggested that shareholders were aware of the exposure of the company and that financial reports should be presented in the functional currency, and then translated into Sterling at the year end. Dividend policy would be based upon the results denominated in functional currency. In short, the functional currency accounting system resolved the performance evaluation issue, but could affect the company's tax liability, share price and banking relationships.

The board turned down the proposal, and also rejected the proposal of a centralised system. The management of economic exposure was rejected, simply because the tax and accounting issues could not be resolved. The position of the treasury had reverted to the management of transaction exposure:

"Now we realise that the responsibility lies with the businesses because they create the exposure in the first place, therefore we should get them thinking."

The result of the attempt to manage economic exposure had come to nought. The process had only led to a refinement of the treasury role in the management of transaction exposure. A global information system was developed for transaction exposures (see chapter 6) and the UK in-house bank had created clones of itself in the largest overseas subsidiaries which liaised with

one another. Economic exposure was only recognised to the extent that the time taken to obtain a price increase was included in the exposure reporting system.

I.C.vii: Conclusions

Economic exposure has not been examined in the majority of sample companies. Seventy per cent of the treasurers saw FERM and the management of transaction exposure as synonymous terms. Six companies had attempted to progress beyond viewing FERM in terms of transactions and this process had manifested itself in a variety of ways. Three types of response were identified, relating exposure to the time required to increase prices, using the forward market to cover anticipated cash flows and analysing the economic exposure of the company with a view to managing it.

II: Discussion

The aim of this section is to discuss some of the issues arising from section I in order to highlight the barriers to HQ treasury involvement in the management of economic exposure. Three alternative approaches to the management of economic exposure are discussed. Firstly, financial instruments may be used to manage economic exposures. Secondly, the MNC could examine its economic exposure and alternative techniques to decrease the exposure. Finally, the treasurer could ensure that foreign exchange considerations were incorporated within operational decisions. Each approach is discussed in the following

paragraphs.

II.A: Financial Instruments and Economic Exposure

In this section, the use of forward contracts and foreign currency options to manage economic exposure is discussed. Given the comments in section I.B.ii, borrowing is not discussed as a technique since corporations seem reluctant to use it.

II.A.i: Forward Contracts

Forward contracts were used by Gamma, and were being considered by Lambda, as a technique to manage economic exposure (see sections I.c.iii and I.C.iv). Delta was in the same industry as Gamma, and the treasurer was asked if he would consider a similar tactic:

"It's a gamble ... two or three years out just on expectation ... it's a thought though ... if there was a regular flow, it might be justified ... but I am talking about a relatively low number of machines."

This statement highlights the main difficulty with the forward hedge, the anticipated cash flow must be relatively stable and certain. Both Gamma and Lambda had a relatively stable, certain demand for their products in the US. Indeed, demand for Lambda's products was so stable that:

"The main way of identifying exposure is the budget, but as they depart from the budget, for example re-equipment, it won't identify the source of the equipment or the sourcing of the [raw material] could be in Germany, the US or the UK."

The fact that budgets were used as a tool for measuring exposure

and that deviations arose from re-equipment rather than a failure to attain sales targets serves to demonstrate the degree of certainty in Lambda's product markets. Gamma had only covered forward for one division which exported luxury, highly differentiated consumer goods. The other divisions which exported to the US manufactured capital equipment and had not covered anticipated sales.

The basic problem arises from the certainty of forward contracts, and the contingent nature of foreign currency cash flows. Treasurers were, by and large, reluctant to have such mismatches. For example:

"[Three years ago], we had a 66 million dollar contract from a [named country] ... it was sold three years forward at 1.96 and it led to horrific losses. It was before I arrived ... it was my predecessor who did it. The contract was cancelled and it generated huge losses."

[Omicron]

It is probably no coincidence that the treasurers in both Gamma and Lambda did not make the final decision on the forward hedge. The companies which used an in-house bank were reluctant to become involved in such exposures:

"So we are going for the global management of exposure but we are also saying that the onus is on the businesses to analyze their exposure ... the idea of responsibility is important ... they create the exposure ... we don't want to feel foolish if we advise them wrongly."

[Omega]

The advantage of more decentralised systems is that responsibility for the outcomes of decisions is dispersed throughout the organisation.

In conclusion, forward contracts may be an appropriate tactic for reducing economic exposure if foreign currency cash flows are relatively stable and if responsibility for the decision cannot be attributed to a specific individual.

II.A.ii: Currency Options

While the corporations in the sample had made very little use of options (see section I.A), they may be potentially useful techniques for the management of economic exposure. All of the companies with an in-house bank were either considering the use of foreign currency options, or selling them to operating units (Omega and Sigma). Foreign currency options are easily integrated into the bank structure since they are simply another product that the bank sells to the subsidiaries. Moreover, if the centre is able to net the contingent exposures, the treasury becomes more profitable. Finally, the possibility of undesirable exposures if cash flows fail to materialise is avoided.

There are a number of difficulties with foreign currency options. Firstly, they are costly and therefore unsuitable for low margin products. This will become particularly important if companies have to purchase options in the marketplace rather than netting them internally. Secondly, options are complex financial instruments and operating units may not understand the nature of options. Moreover, no techniques have been suggested for the

measurement of economic exposure in practice. This in turn implies that it is impossible to know the quantity of options to purchase, except in the simplest situations (i.e. binomial exposures). Thirdly, companies which have formulated their FERM policies in terms of transaction exposures may be unable to accommodate options in existing policies.

II.A.iii: Conclusions

There are limits to the use of financial instruments as techniques for the management of economic exposure. Borrowing seems to be institutionalised and inflexible, forward contracts may be suitable if cash flows are stable and responsibility can be dispersed, and options are costly, difficult to use and difficult to accommodate within systems which utilise policies based upon transactions.

II.B: Comprehensive Systems

The treasurers in Omega and Tau attempted to systemise the management of economic exposure in their companies (see section I.C.v and I.C.vi). Both attempts were unsuccessful because they were radical and interfered with existing systems of performance evaluation.

II.B.i: Radical Change

The management of economic exposure may involve radical changes

in existing practices for companies which have used transactional concepts of foreign exchange risk. An analysis of economic exposure may require a change in the currency denomination of debt of the MNC, since the matching of assets and liabilities may be inappropriate. This in turn may alter the company's tax liability and financial statements. Moreover, financing practices in individual countries may fail to comply with local norms. Changes in the functional currency of the company, or particular divisions, may also be appropriate. Epsilon was the only company which used a functional currency other than sterling for one of its divisions. Omega's treasurer had attempted to alter the functional currency but it had been rejected by the board since it represented to great an upheaval.

Based upon a sample of two, radical changes in corporate practices, which may be necessary if the firm alters its definition of exposure, may have consequences which cannot be anticipated. For this reason, inertia is likely to prevail.

II.B.ii: Performance Evaluation and Accountability

Systems of performance evaluation and accountability may also be affected by changes in FERM policies, because of operating unit interdependencies and performance evaluation criteria.

Operating unit interdependencies are relevant since (as in the case of Tau) the amount which should be covered in each operating unit may not be optimal from an operating unit point of view,

even if the firm had a policy of eliminating all foreign exchange risks.

If operating costs are likely to be volatile due to exchange rate changes (unless the functional currency is altered in order to decrease volatility), then replacement cost systems of performance evaluation may be more appropriate. This in turn may modify operating unit behaviour since operating units will be subject to funds flow rather than profitability targets.

II.B.iii: Conclusions

Comprehensive approaches to the management of economic exposure may involve substantial organisational upheavals. Unfortunately, there was no company in the sample which had attempted to implement a comprehensive system, and this result is somewhat speculative.

II.C: The Operational Involvement of Treasurers

Treasurers were reluctant to become involved in operating decisions. This may be attributed to the transactional approach which dominated their views of FERM and the fear of losing professional credibility.

Risk aversion seemed to dominate advice given to subsidiaries:

"But the treasury department does operate as a service company ... for example if they [the businesses] get a complex order and they need help to sort it out, we would talk them through it and attempt to explain why we

recommended a particular course of action. This helps to educate them. Some companies do call us and say they are in a position to invoice in dollars or sterling ... we always recommend that they contract in sterling if possible because it is our base currency ... but I think that we only find out what they're up to by default ... but we are attempting to educate these people."

[Iota]

Moreover, treasurers were extremely reluctant to pass forecasts to operating units other than the budgeted rate, or externally purchased forecasts:

"I merely have an asset called money. We will advise on currencies ... buy in strong, sell in weak."

[Epsilon]

"I don't have any control over the [divisional staff] but they may ask us for opinions. Currency is only a small part of it and I do not have any fresh opinions. We use an outside body for advice and get an opinion. This means that I can ensure that there is no simultaneous conflict of exchange rate expectations between divisions."

[Mu]

In fact, there was little or no evidence of treasury involvement in operational decisions, such as pricing, investment or sourcing decisions.

III: Conclusions

The majority of HQ treasurers are preoccupied with transactional definitions of foreign exchange risk. Only 30% of the treasurers had made any attempt to come to grips with exposures other than transaction exposures. However, it is possible that the availability of foreign currency options may lead to a realisation that economic exposures exist.

Treasury involvement in operational decision making was minimal (e.g. investment, pricing and sourcing decisions). One company had used forward contracts to cover economic exposure, but it was argued that it was unlikely to be a popular tactic since it could only be applied to relatively certain exposures and individuals may be reluctant to accept responsibility if exposures failed to materialise. Foreign currency options overcome this latter difficulty, however due to their complexity, their potential had not been realised. Borrowing policies seemed to be very inflexible and the companies seemed reluctant to apply policies other than matching.

Two companies had attempted to take a systematic approach to the management of economic exposure. In both cases, the attempts were unsuccessful. This lack of success was attributed to organisational fears of the consequences of radical changes in policies and the implications of such changes for systems of accountability and control.

It is possible that economic exposure may be trivial. This in turn would explain the lack of HQ involvement. The economic exposures of the sampled companies are examined in chapters eight and nine. It will be shown that the economic exposures of some MNCs are considerable. A model is proposed in chapter ten which permits the measurement of economic exposure in a straightforward manner. It may then be used to examine the effects of alternative FERM strategies and tactics, and hence assist treasurers to anticipate their consequences.

CHAPTER 8

EXCHANGE RISK AND THE FOREIGN SUBSIDIARY

The role of the HQ treasurer in the management of foreign exchange risk was examined in the previous two chapters. It was shown that the majority of UK MNCs are not involved in the management of foreign exchange risks which arise in foreign subsidiaries. In this chapter, the management of foreign exchange risk at a foreign subsidiary level is examined.

In chapter five, it was pointed out that four of the MNCs in the sample had no Irish subsidiaries (Nu, Mu, Gamma, Psi). However, of the sixteen remaining MNCs, a number of the companies had more than one Irish subsidiary. In all, personnel at twenty two subsidiaries were interviewed. The characteristics of the subsidiaries, and the personnel interviewed, are summarised in Appendix Five.

The notation used to denote the names of subsidiaries in this chapter is somewhat more complex than the previous two chapters. Some of the companies had more than one Irish subsidiary, and individual subsidiaries may have had more than one product group. Thirty one product groups were defined and are displayed in Table 8.1. If a company has more than one product group, then if the company were called 'Upsilon', the product groups are described as 'Upsilon1', 'Upsilon2' and so on.

Table 8.1
Details of Irish Subsidiaries

<u>Company Name:</u>	<u>Subsidiaries Visited:</u>	<u>Product Groups:</u>
Alpha	2	2
Beta	1	1
Gamma	0	0
Delta	1	1
Epsilon	1	4
Zeta	1	1
Theta	2	2
Iota	1	3
Kappa	1	1
Lambda	1	2
Mu	0	0
Nu	0	0
Omicron	1	1
Pi	1	3
Rho	2	2
Sigma	1	1
Tau	3	3
Phi	1	2
Psi	0	0
<u>Omega</u>	<u>2</u>	<u>2</u>
Total	22	31

In the first section of this chapter, the immediate impact of the cessation of parity between the Irish pound (the Punt) and the UK pound is examined. The management of transaction exposure at a subsidiary level is discussed in the second section. Finally, the nature of economic exposure is discussed.

I: The Immediate Impact of the Break with Sterling

In December 1978, exchange controls on transactions between the UK and Ireland were introduced by the Irish Central Bank. The introduction of exchange controls was motivated by the Irish decision to join the European Monetary System (EMS), and the possibility that the Irish Punt would no longer be at par with Sterling. In the first part of this section, the nature of the

exchange controls and their implementation is examined. In the second part, the response of firms to the introduction of exchange controls is discussed.

I.A Irish Exchange Controls

In this part, the nature and implementation of exchange controls are examined. While exchange controls were perceived by the interviewees as a constraint on hedging practices, it is argued in this section that a number of firms had successfully negotiated concessions from the Central Bank. Moreover, the advent of 'Hedge' contracts allows firms to circumvent exchange controls completely. The nature of Irish exchange controls is discussed in section I.A.i. In section I.A.ii, the regulation of forward contracts is examined. Finally, the implementation of exchange controls is described.

I.A.i: The Nature of Irish exchange controls

The stated purpose of Irish exchange controls is to protect Irish reserves and to regulate the effects of capital movements on the Irish exchange rate (Exchange Control Act 1954). Exchange controls are operated in the Republic of Ireland under the Exchange Control Acts 1954 to 1978. Prior to December 18 1978, transactions between Irish residents and UK residents were exempted from this legislation. Capital transactions are restricted under the legislation, while current transactions are supervised.

Capital transactions were restricted between the UK and the Irish Republic following the introduction of exchange controls. Prior to the introduction of exchange controls, Irish financial markets were extremely underdeveloped since the London markets were freely accessible. This in turn meant that the Irish inter-bank market was insignificant, and that the Irish Stock Exchange was equivalent to other UK provincial exchanges in Manchester, Belfast and so on. Restrictions on capital transactions implied that portfolio investment and inter-bank lending had to be done in Dublin rather than London. Moreover, specific permission had to be sought for transactions between the Irish subsidiaries of MNCs and non-residents for capital transactions, and in seeking such permission, it would have to be demonstrated that the transaction was being undertaken for productive purposes. Indeed, if a resident were owned or controlled by a non-resident, local currency loans from residents would also require Central Bank permission.

Current transactions, by contrast, are merely supervised. In order to make a payment to a non-resident, one must provide evidence of purchase and the value of the goods, evidence that the goods have been either imported or are in transit, and complete an exchange control form giving details of the transaction. Special permission must be sought for advance payments which will be granted if it can be shown that it is normal practice. Similar provisions apply to exports, save that special permission must be sought for exports with credit

periods of more than six months. Finally, foreign currency hold accounts may be permitted if a resident is engaged in both import and export. However, evidence must be provided of the frequency and size of the foreign currency transactions, and the account should preferably be held with an authorised dealer.

L.A.11: Hedging Instruments

Forward cover is available if there is a firm contract either to pay or receive foreign currency which is trade related. Cover is only available for periods of more than twenty one days and less than one year. Initially, forward cover had to be entered into within thirty days of the risk arising. In January 1983, amid expectations of a devaluation of the Punt, this period was reduced from thirty to fifteen days. Newspapers [Irish Press and Irish Times, January 28 1983] suggested that this move was a response to leading and lagging, and that there were amounts of up to 400 million Punts which were unexplained in the Balance of Payments statistics. Initially, the Central Bank was the sole provider of forward cover. In July 1980, 14 banks created an inter-bank forward market under the supervision of the Central Bank.

'Hedge' contracts became available in 1984. The 'Hedge' contract was based upon similar contracts which had been made available when exchange controls were enforced in Australia (Cocks [1982]). A 'Hedge' is a contract between two parties where one party agrees to pay to the other party at a future date

an adjustment in Irish Pounds. The adjustment represents the difference between the amount of foreign exchange specified in the contract at the 'Hedge' contract exchange rate and the rate of conversion at the settlement date. The contract was introduced by the Bank of Ireland (a local clearing bank), and may only be settled at the end of a month. The availability of the 'Hedge' contract permits foreign exchange exposures to be covered which could not be covered under exchange controls. The 'Hedge' contract avoids exchange controls since it is an Irish Punt transaction between two Irish residents.

In conclusion, Irish exchange controls place considerable restrictions on transactions of either a capital or non trade related nature. Financial transactions which are trade related are only subject to supervision, but, until the advent of the 'Hedge' contract, there were considerable limitations on the uses to which forward cover might be put. In the following section, the implementation of exchange controls is examined.

I.A.iii: The Implementation of Exchange Controls

While the nature of exchange controls in the Republic of Ireland is relatively straightforward, the application of exchange controls was far from straightforward. Authorised Dealers and Banks were charged with the task of administering the application of exchange controls to trade related items. Moreover, the restrictions on the availability of forward cover also hampered the activities of firms.

The banks which were charged with the administration of exchange controls were, initially, extremely rigid in the application of exchange controls. This was probably due to learning on the part of the participants in the administration of exchange controls, since the Central Bank was also applying Exchange Controls quite rigidly, and was reluctant to permit the use of foreign currency hold accounts. By 1984, the system was running more smoothly, and foreign currency hold accounts were normally permitted. However, one interviewee in a rural area did report that his local bank manager was unfamiliar with the application of exchange controls.

By 1984, the system had become considerably more discretionary. Larger companies found that the Central Bank was more flexible if it believed that it could trust the firm and if the firm was well established. For example, one company which found the paperwork necessary to comply with exchange controls too burdensome, persuaded the Central Bank to allow them to use an audit certificate which stated that they were complying with exchange controls.

The main difficulty relating to exchange control was the availability of forward cover. Some of the sample companies had transactions which either matured in less than twenty one days or more than one year. None of the firms had successfully negotiated a concession on the former issue, but some firms had obtained permission to hedge for periods of more than one year.

The application of this rule was however haphazard, since a number of other companies reported that they were not granted permission to obtain forward cover for a period of more than one year. Similarly, one company had obtained an extension of the purchase of foreign currency within fifteen days of the risk date while others had not.

While all of the sample firms maintained that they adhered to exchange controls, one company (Rho2) had an informal arrangement with its UK division to borrow foreign currency on its behalf. One interviewee (Iota) also reported that there were a number of firms which had created documentation in order to take advantage of forecasted changes in the Punt exchange rate.

In conclusion, the implementation of exchange controls in Ireland is somewhat different from the nature of exchange controls in Ireland. It would seem that provided there are bona fide commercial reasons and that a firm is well established, it is possible to obtain Central Bank permission for forward exchange transactions outside the scope of exchange controls. The only area where there would seem to be very little flexibility is for forward cover requirements of less than twenty one days.

I.B: The Reaction of Firms to the Break

Surprisingly, there was very little reaction from companies following the announcement of exchange controls, and the inevitable break with Sterling. Two types of change took place,

changes in the internal organisation of the subsidiaries, and changes in the financing of subsidiaries. Each type of change is discussed in the following paragraphs.

I.B.i: Changes in Subsidiary Finances

Earlier in this chapter, it was pointed out that the financial markets in Ireland were relatively undeveloped until the advent of exchange controls. Eleven of the companies (all of which were manufacturing companies), had raised debt on the London market. The main reason for the use of UK debt had been lower rates (up to 1% less) in London. Upon the announcement of Ireland's entry to the EMS, all of these companies, commenced switching their debt to the Dublin market, and covered any remaining Sterling debt in the forward market. It is most likely that this reaction was prompted by fears of an exposure to foreign exchange risk, since there were expectations at this stage that the Punt might rise or fall against the Pound. Moreover, at this stage, forward cover was available from the Irish Central Bank at parity.

I.B.ii: Internal Organisational Changes

Prior to the break, a number of companies ran their Irish subsidiaries under the auspices of the relevant UK product groups, and the Irish subsidiary was treated in a similar way to the Irish subsidiary. Upon the introduction of exchange controls, financial management was decentralised to the Irish

subsidiaries by either appointing treasury staff to the Irish subsidiaries, or, in one case, setting up a regional financial office in Dublin.

Four companies introduced local treasury management in their Irish subsidiaries. In three of these cases (Theta1, Theta2 and Lambda), the finance director assumed responsibility for the administration of Irish finances and working capital. In the fourth case (Omega2), the firm changed from being a branch of the UK division to a subsidiary. Prior to the break, there was no local financial function whatsoever.

Iota introduced a regional office to administer the accounting, taxation and financial affairs of the Irish subsidiaries. As such, it amounted to a matrix organisation structure, since the operating companies were responsible to both the Irish geographical organisation, and their respective product groups in the UK. A treasurer was recruited to the regional office and was responsible for raising debt for the Irish subsidiaries, and managing the liquid assets and foreign exchange risks of the Irish companies.

Apart from changes in the financial management of some of the Irish subsidiaries, there were also some changes in the operational characteristics of the Irish companies. For example, a number of firms reported increased local autonomy with respect to pricing. In order to ensure that there was a unified pricing structure in both the Republic and Northern Ireland,

Epsilon⁴ became responsible for both territories. The reason for this reorganisation arose from the fact that they were low volume high value products, and therefore susceptible to parallel importing. Iota had not resolved a number of operational problems by December 1984. These difficulties arose since Iota³'s products were marketed in Northern Ireland by both the Irish and the UK subsidiaries under different brand names. The Irish Region wished to continue marketing in the North of Ireland, whilst the UK product group wished to sell only the UK brand in the North of Ireland.

Finally, it should be noted that eleven of the sixteen MNCs with Irish Subsidiaries had more than one Irish subsidiary (see Table 8.1). Despite the scope for rationalising the financial management of these companies, very few of the companies had done so, apart from treating their Irish subsidiaries as a group for tax purposes. Lambda and Pi had always had relatively centralised management structures, since subsidiaries had been acquired by the Irish HQ. Tau had an arrangement between its subsidiaries whereby cash balances were pooled, but there were no other financial relationships. Iota, as mentioned earlier, had adopted a matrix structure following the break with sterling. Of the remaining seven companies, four companies were marketing subsidiaries. However three of the MNCs had Irish subsidiaries which were relatively large in their own right (Theta, Rho and Omega) and one would expect considerable benefits to be derived from a unified financial structure.

I.B.iii: Conclusions

For the most part, the break with sterling had very little immediate impact on the Irish subsidiaries. As such, there were very few changes in the way in which the firms were organised or financed. Firms with UK debt switched their debt to the Irish market and firms without local treasury management introduced local treasury management. In one case, a matrix type organisation was introduced. It was however pointed out that some companies had not rationalised their Irish subsidiaries, despite the scope to do so.

II: Transaction Exposure and the Foreign Subsidiary

In the previous section, the nature of Irish exchange controls and the immediate impact of the break with sterling were reviewed. In this section, the management of transaction exposure in the Irish subsidiaries is reviewed. Having examined the management of transaction exposure at the level of the foreign subsidiary, the management of transaction exposure in the foreign subsidiary is related to the management of transaction exposure in the HQ in the second part of this section.

II.A: Managing Transaction Exposure: The Subsidiary

Given the existence of transaction exposure, the subsidiary has a number of choices. The exposure may be modified by altering the invoice currency, or alternatively left unmodified. The

remaining exposure may then be left open, covered completely, or actively managed. Each of these choices is examined in turn in the following paragraphs, and a summary is presented in Table 8.2. However, in order to manage exposures actively, information is necessary on both the extent of the exposure and the forecasted change in the exchange rate. The information gathering practices of the firms which actively manage exposure are also summarised.

Table 8.2
Managing Transaction Exposures in Ireland

<u>Alter Invoice Currency</u>	<u>Rule of Thumb</u>	<u>Active Management</u>
Alpha2	Epsilon1	Pi2, Pi3
Delta	Omega1	Alpha1, Zeta
Epsilon2	Tau1	Theta1, Theta2
Epsilon3	Sigma	Iota1, Iota2
Epsilon4	Rho1	Iota3, Kappa
Pi1	Beta	Lambda1, Lambda2
Zeta	Delta	Rho2, Tau2
Phi1		Tau3, Omega2
Phi2		
Omicron		
Total: 10 .	7	16

II.A.i: Altering the Invoice Currency

Four companies (Alpha, Delta, Epsilon and Omicron) had a policy of invoicing their overseas marketing affiliates in local currency. This in turn meant that they had no sterling exposure in the Irish subsidiaries. Under Irish exchange controls, it was probably worthwhile from a parent point of view to use this strategy, since the parent could net the Punts against other EMS currencies, as well as avoid the provisions of Irish exchange

controls. Therefore, six of the product groups in this category had no transaction exposure due to parent company policy. In the remaining four product groups the Irish subsidiaries were responsible for altering the currency of invoice.

The staff in Pi's Irish HQ decided to persuade Pi1's suppliers in the UK to invoice Pi1 in Punts. The industry was subject to government supervision of gross margins, and the HQ staff decided that net margins might be maximised by avoiding the administrative costs of managing exchange rates. The company successfully persuaded its suppliers to invoice in Punts, hence eliminating Pi1's transaction exposure.

Zeta adopted a speculative position. It sourced many of its raw materials from the UK parent, and exported a significant percentage of its products back to the UK parent. It spent over two years persuading the parent to invoice raw materials in Punts but finished goods continued to be invoiced in sterling. The subsidiary management believed that this strategy would ensure that their costs of production would be more certain, as well as ensuring that the subsidiary would gain if the Punt were to devalue against the Pound.

Finally, Phi1 imported finished goods from the UK parent and simply charged its customers on the basis of sterling converted at parity into Punts, plus a surcharge to adjust the price to reflect the average exchange rate in the previous month. The

managing director believed that this tactic had not affected sales adversely, and that as far as he was aware, his competitors used a similar tactic. He did however report that customers simply did not pay the surcharges relating to goods (Ph12) which had been manufactured in Ireland but made use of UK raw materials.

II.A.ii: Rules of Thumb

There were two types of rule of thumb which were used: leaving all transactions uncovered, and covering all transactions forward. Seven of the thirty one product groups used rules of thumb.

Four of the product groups (Tau1, Beta, Omega1 and Delta) were relatively small marketing subsidiaries with between twenty and fifty employees. Beta and Omega1 had a rule of hedging everything. The rule was probably used in these two instances due to a lack of expertise and the costs of pursuing an alternative strategy, as well as the risks of using the spot market. Tau1 and Delta used a rule of thumb of not hedging at all. Delta's accountant maintained that they would cover forward if forward cover were available for periods of less than twenty one days. Tau1 was subject to government regulation of gross margins, and any losses arising from foreign exchange transactions could be recouped.

The remaining three subsidiaries (Epsilon1, Sigma and Rho1) were

larger companies engaged in manufacturing. Epsilon1 was involved in the processing of commodities priced in dollars and perceived the dollar as too risky. However, the managing director also believed that it was company policy not to speculate.

Rho1 was subject to a divisional policy of hedging everything forward. Interestingly, other divisions in the same MNC (e.g. Rho2) adopted more speculative strategies. One possible explanation might be the fact that the MNC had a policy of managing exchange risk at a divisional level, and the particular division had a relatively low volume of foreign currency transactions. However, margins in this particular industry were extremely low and it was a high volume low value product.

Sigma also had a policy of hedging all foreign currency transactions forward. The accountant explained that the company was regulated by the National Prices Commission and that any gain or loss would be compensated in the subsequent review of the prices of this monopolist. Moreover, the use of forward contracts facilitated the price control process since one knew in advance what costs would be and the way in which they would be classified. Therefore, there was no incentive to become involved in the administrative costs of adopting a more active foreign exchange risk management strategy.

II.A.iii: Active Management of Transaction Exposure

Sixteen product groups were engaged in the active management of transaction exposure. However the degree of activity and risk aversion varied considerably from company to company. All of the companies normally covered transactions relating to the purchase of capital equipment. However, practices varied with respect to trade transactions, and one factor which explained this was currency of denomination. In table 8.3, details of the average percentage of transactions covered in each currency are presented.

Table 8.3
Average Proportion of Transactions Covered

Company Name:	Currency:		
	Sterling	EMS	Dollar
Pi2	75%	10%	100%
Pi3		10%	
Alpha1		10%	100%
Zeta	50%	10%	50%
Theta1	75%	10%	90%
Theta2	50%	10%	70%
Iota1	75%	10%	100%
Iota2	75%	10%	100%
Iota3	75%	10%	100%
Kappa	50%		100%
Lambda1	50%		
Lambda2	50%	10%	
Rho2	50%	10%	70%
Tau2	70%		
Tau3	70%	10%	
Omega2	40%		40%
Average:	61%	10%	83%

It may be seen from Table 8.3 that all of the companies were most likely to cover dollar transactions and least likely to cover EMS denominated transactions. All of the companies with EMS exposures said that they did not cover EMS transactions unless a

devaluation was imminent. However, when devaluations were imminent, it was extremely difficult to procure reasonably priced forward contracts. The dollar was perceived as an extremely volatile currency, while the Sterling hedging was based upon forecasts. If the volatility of Sterling was perceived to be low (for example no more than +/- 2% in the next month), the exposures were left uncovered. If a large exchange rate change was forecasted with respect to direction, then forward cover or leading and lagging were used to take advantage of the exchange rate change.

These findings on the risk preferences of corporate treasurers are similar to the results of Collier and Davis [1985]. They found that long term exposure horizons (e.g. capital equipment), irregular currency flows, few matching opportunities and the volatility of currencies were the main factors influencing the hedging decision. Certainly, this study supports these findings with respect to long periods of exposure, and the volatility of currencies.

In the following paragraphs, the hedging instruments used and the information system used for hedging are examined.

II.A.iv: Hedging Instruments

Forward contracts were the most popular hedging instrument for trading transactions. However, both Omega1 and Tau2 reported obtaining favourable rates using the 'Hedge'. However, the

'Hedge' had only been available for a few months before the study was carried out. It is quite possible that it has become more popular in the intervening two years.

Leading and lagging was also a popular technique, and used extensively by these companies for the payment of dividends to the parent, the settlement of other accounts with the parent and the management of foreign currency hold accounts. This observation is probably due to the non-availability of forward cover for non-trading items.

II.A.v: Exposure Information Systems

There are two aspects to the exposure information system. Firstly obtaining information on the exposures which have been generated, and secondly, obtaining forecasts of exchange rate changes.

Smaller companies used the accounting system to obtain information on exposure. In smaller companies, the management accountant came across exposures when foreign currency invoices were received or dispatched and on the basis of this information, made a decision either to cover or leave the exposure open. Forecast information was normally generated from newspapers and other publicly available information.

Larger companies with stable operations used the budget (sometimes up to three years in advance) as a source of

information about exposures and used this information as a basis for hedging decisions. The only relevant information not contained in budgets was purchases of capital equipment and their sourcing. The issue of capital equipment is examined later in this chapter. Larger companies with stable markets also used publicly available information in order to generate forecasts and relied on the advice of banks.

Larger companies with unpredictable exposures relied on a variety of mechanisms for gathering exposure information. Theta2 was the only company which used formal weekly exposure reports from operating units. Iota used irregular exposure reports from operating units. The remaining companies insisted on operating units contacting them upon the creation of an exposure, although in one case (Lambda), it was only necessary to contact the Irish financial HQ if the exposure exceeded 25,000 Punts.

Forecasts in the larger companies with unpredictable exposures were also more sophisticated. Two of the companies used their own in-house forecasting services. Lambda employed an economist and forecasts based upon fundamental variables were produced. In Theta2, the treasurer collected exchange rate information and applied chartist techniques to the data. Other companies with large unpredictable exposures used publicly available information together with the advice of banks and the services of a firm of economic consultants in Dublin.

II.B: Subsidiary - HQ Relationships

The management of transaction exposure in the Irish subsidiaries of the UK MNCs was summarised in the previous paragraphs. However, the next issue is the extent to which the HQ is involved in the formulation of subsidiary policy. In chapter six, the involvement of the HQ treasury in the exposures of overseas subsidiaries was examined. This in turn leads to two issues. Firstly, the extent to which the HQ Treasury is actually involved in the transaction exposures of foreign subsidiaries. Secondly, the extent to which line management from the HQ is involved in the management of foreign exchange risks at the subsidiaries.

II.B.i: The Subsidiary and the HQ Treasury

In chapter six, it was shown that while the majority of UK treasuries are not involved in the management of transaction exposure in foreign subsidiaries, some companies maintain that they are involved. In the following paragraphs, this role is examined from a subsidiary point of view.

It may be recalled from chapter six that six companies maintained a liaison role with their foreign subsidiaries, Nu issued specific directives and P1 took centralised action on behalf of foreign subsidiaries. Moreover, twelve companies maintained that their subsidiaries were autonomous with respect to transaction exposure. The aim of this section is to investigate

the extent to which these claims were borne out in practice.

Firstly, Nu did not have an Irish subsidiary and Pi only had a 45% holding in its Irish subsidiary. Secondly, of the six companies that maintained a liaison role with their foreign subsidiaries, four companies (Sigma, Tau, Epsilon and Iota) only did so with their largest European and US subsidiaries. Therefore, in these cases, the Irish subsidiary was autonomous.

There was evidence that the remaining two companies (Omega and Rho) which maintained a liaison function with their overseas subsidiaries actually liaised with their Irish subsidiaries. The treasurer of Omega2 had passed information to the HQ and had been consulted when the company was reassessing its FERM policies. The treasurer of Rho2 described the UK treasurer as 'giving directions' which were subsequently ignored because the HQ treasurer saw things from a Sterling point of view rather than a Punt point of view. The Irish treasurer pointed out that this was inevitable because Sterling was in a different exchange rate regime and there were no exchange controls in the UK. This in turn meant that the definition of exposure used in the UK (goods about to be shipped), could not be applied in the Republic, since a firm order was required in order to comply with Irish exchange controls. However, some foreign currency borrowing had been undertaken by the UK treasurer on behalf of the Irish subsidiary.

While the results summarised in this section triangulate with the

results summarised in chapter six, it also emerged that the line management from the UK influenced the way in which transaction exposures were managed in Ireland. This issue is dealt with in the following paragraphs.

II.B.ii: The Subsidiary and the HQ Divisions

While the involvement of the HQ treasury in Irish transaction exposure management was extremely limited, it was found that members of the Irish Board from the UK divisions often exerted considerable influence on the management of transaction exposure.

This process consisted of UK board members issuing specific directives under the cloak of parent company policy. For example, Rho1's UK division had a rule of hedging all exposures. The Irish finance director of Rho1 maintained that it was parent company policy to hedge everything. Another Irish subsidiary of the same company (save that it was in a different division - Rho2) actively managed its exposure. The finance director of Rho1 assured the author that the other Irish subsidiary (Rho2) had to pursue parent company policy as well.

The divisional policy was implemented either formally or informally. Formal mechanisms included a requirement that all hedging decisions be approved by the board, or alternatively that all transactions exceeding a certain limit must be covered, or that exposures in certain currencies should not exceed specific limits. Informal mechanisms included notions of collective

responsibility where the local treasurer would never go out on a limb without the approval of the UK divisional representative, or alternatively, statements to the effect that no praise would be forthcoming for foreign exchange gains and that losses would be penalised. Tau3's finance director described it in the following way:

"Come 1979, imports [of a raw material] increased in price; we were price controlled [by the National Prices Commission] and it is not easy to pass on cost increases because there are irregular price increases [mostly annual] ... so it was a drain on cash and decreased competitiveness. We looked at forward purchases and entered the forward market for brief periods (less than three months) and did reasonably okay - well not too bad - so we discussed this at our regular monthly management meetings and decided that the use of forward cover would help build up a known cost factor. The people from the UK said that we are here for the business and not to gamble on foreign exchange and they felt that we shouldn't go into the long run (more than three months) hedging. Even if we won at three months there would be no praise, but our knuckles would get rapped if we lost."

The extent to which the sample companies' FERM policies were influenced by divisional managers is presented in Table 8.4 (excluding companies invoiced in Punts. Firms were classified as subject to formal, informal or no influence.

Table 8.4: Divisional Influence

Irrelevant	None	Formal	Informal
Alpha2	Beta	Epsilon1	Alpha1
Epsilon2	Delta	Iota1	Zeta
Epsilon3	Theta1	Iota2	Rho2
Epsilon4	Theta2	Iota3	Tau1
Omicron	Kappa	Rho1	Tau2
	Lambda1		Tau3
	Lambda2		Omega2
	P11,2,3		
	Phi1,2		
	Sigma		
	Omega2		
Total: 5	14	5	7

Of the thirty one product groups, twelve were subject to some divisional interference. Moreover, in seven of the twelve cases, this influence was informal and relatively subtle (see Table 8.4). While it is impossible (given the nature of the data) to determine whether this divisional involvement is a good thing or a bad thing, it is necessary to be aware of it. It would also be interesting to know whether this is a deliberate strategy based upon the presumption that the UK divisional representative is the best judge of the ability of subsidiary personnel, or an unanticipated consequence of UK divisional staff on Irish boards applying principles which may be perfectly valid in some exchange rate regimes and not in others.

II.C: Summary and Conclusions

In this section, the management of transaction exposure at a foreign subsidiary level was examined. The different strategies adopted by firms were examined, as well as the information used for active hedging strategies. These data were then compared with the results pertaining to the management of transaction exposures in foreign subsidiaries summarised in chapter six. It was argued that while the roles in the independent data sets were in agreement, UK divisional staff were also involved in the formulation of the transaction exposure management policy in the foreign subsidiary. It was pointed out that it would be interesting to examine whether this was an anticipated or unanticipated consequence of the policy of appointing UK personnel to the Irish Boards.

III: Economic Exposure and the Irish Subsidiary

In this section, the economic exposures of the Irish subsidiaries are identified and the ways in which they are managed are described. A procedure for classifying economic exposure is developed, and the techniques used to manage economic exposure are described. In order to clarify the analysis, the thirty one product groups were classified as marketing subsidiaries, domestic manufacturers and exporters. This classification scheme is presented in Table 8.5 and each class is discussed in the following sections.

Table 8.5
Classification of Product Groups

Marketing Subsidiary	Domestic Manufacturer	Export Manufacturer
Alpha2	Alpha1	Alpha1
Beta	Epsilon1	Zeta
Delta	Zeta	Lambda1
Epsilon2	Theta1,2	Lambda2
Epsilon3	Pi2,3	Pi2
Epsilon4	Iota2,3	Rho1
Iota1	Tau2,3	Rho2
Omicron	Kappa	Tau2
Pi1	Lambda1	
Phi1	Phi2	
Tau1	Rho2	
Omega1	Omega2	
	Sigma	
Total: 12	17	8

III.A: The Economic Exposure of Marketing Subsidiaries

Marketing subsidiaries were chosen as the first class of product groups to be analysed since the effects of exchange rate changes

on the cost structure of the subsidiary is relatively straightforward. The exposures of the twelve product groups are described in this section along with the tactics used to manage the exposures.

The twelve companies were subdivided into a number of groups based upon the tradability of their product and factor markets. In principle, this approach is reminiscent of the Flood and Lessard [1986] paper discussed in chapter 4. However, the theoretical antecedents of the model are more closely connected with the Hodder [1982] model (described in chapter 3), which in turn may be related to the Scandinavian theory of the international transmission of inflation (cf. Edgren et al. [1968]), since commodities are classified as either tradable or non-tradable.

The majority of the marketing subsidiaries used non-traded factors of production since they were forced to purchase from the parent and local costs were non-tradable (e.g. labour, rent and electricity). One subsidiary was free to source from any of the other subsidiaries, and could therefore alter its sourcing policies to take advantage of deviations from purchasing power parity.

The products which the subsidiaries sold were also classified as either tradable or non-tradable. The basis for this classification was the extent to which there was the degree of overseas or local competition in product markets. The degree of

tradability would in turn determine the extent to which the competitive position of the subsidiary could be affected by deviations from purchasing power parity. The results of this analysis are presented in Tables 8.6 and 8.7. Each group is discussed in the following sections.

Table 8.6: Classification of Marketing Subsidiaries

		Product Markets		Total
		Non-Tradable	Tradable	
Factor Markets	Non-Tradable	7	4	11
	Tradable	1	0	1
	Total	8	4	12

Table 8.7: Classification of Marketing Subsidiaries by Name

Non-Traded Products & Factors	Traded Products & Factors	Non-Traded Products & Traded Factors	Non-Traded Factors & Traded Products
Epsilon2 Epsilon4 Omicron Pi1 Phi1 Tau1 Beta		Iota1	Alpha2 Delta Epsilon3 Omega1

III.A.i: Non-Traded Products and Factors

The majority of the marketing subsidiaries were included in this group, since their economic exposure was minimal. All of the companies in this group had a significant degree of market power and four of the companies (Pi1, Epsilon2, Omicron and Tau1) were subject to government price controls.

Companies which are subject to government price controls (The Department of Health for pharmaceuticals, The National Prices

Commission [NPC] for other industries) are likely to face minimal price competition. Importers are subject to regulation of gross margins. The NPC will award price increases, provided that there is documentary evidence of import which shows the currency of the exporter. An appropriate exchange rate is then applied to the invoiced amount. The appropriate rate is based upon bank counterfoils with either spot or forward exchange rates. The NPC encourage the use of forward rates, since costs related to foreign exchange gains and losses are awarded retrospectively. In the absence of documentary evidence, the average exchange rate for the previous three months is applied. It was also reported that there had been requests to produce bank statements for firms which had attempted to mislead the NPC. Techniques used to mislead the NPC included stockpiling, cosmetic alterations to products, transfer pricing and launching new products with inflated costs.

While the presence of government price regulation justifies the inclusion of four of the firms in this category, the three other companies were not subject to price regulation. Epsilon⁴, Phi² and Beta all sold highly differentiated products, which were relatively price inelastic. The markets for all three product groups were relatively small and therefore, not subject to price regulation.

The main effect that exchange rate changes might have on cash flows would be the time lag between an increase in the cost of imported products due to exchange rate changes and the adjustment

of prices to reflect the price change. Companies which were subject to NPC regulation were exposed to the extent that there was a time lag between a change in costs and permission being granted to increase prices. Companies not subject to NPC regulation were only exposed until price lists were revised. Hereafter this form of exposure will be termed 'sticky price exposure'.

The management of sticky price exposure depended on whether the company was invoiced in Punts or Sterling. Pi1, Epsilon2, Epsilon4, and Omicron were invoiced in Punts. Changes in costs could be anticipated at the budget stage, and the sticky price exposure was effectively transferred to the UK division. None of the three companies which were invoiced in Sterling used active hedging techniques (see Table 8.2). Phi1 used a currency surcharge on its invoices which ensured that the time lag between a change in exchange rates and a change in prices was minimised. Tau1 left exposures uncovered since adverse changes in exchange rates could be recouped from government regulatory bodies, whilst Beta covered all transactions since pricing could be based upon forward rates.

It also became apparent that some of the companies were affected by a second type of exposure which arose from parallel importing. Parallel importing consists of purchasing identical branded products in a foreign market where there is a different price structure. This issue has received considerable attention in EEC competition policy (see Dosser et al.[1982]), particularly

with respect to pharmaceuticals. It is relevant to economic exposure since exchange rate changes may lead to short term differences in national price structures, or accentuate existing differences. This form of exposure is discussed more fully in section III.A.iv.

Finally, three companies (Epsilon 4, Tau1 and Phi1) were to some extent exposed to the effects of exchange rate changes on sectoral demand. This issue is discussed more fully in section III.D.

III.A.ii: Traded Factors and Non-Traded Products

Iota1 was the only company in this category. The company was part of a duopoly and subject to NPC regulation. It was identical to the companies described in the previous section save that it had freedom of sourcing. The Irish company had altered its sourcing from the UK to European subsidiaries in order to take advantage of deviations from purchasing power parity (see Appendix 4). The treasurer stressed the importance of regular contact between the purchasing officer and the treasury department in order to ensure that purchasing decisions were based upon the most up-to-date exchange rate information. This change in sourcing policies helped increase profitability, as well as decreasing sticky price exposure (since the EMS currencies were less volatile). However, the company was badly affected by parallel importing (see section III.A.iv) and this was partially attributable to UK subsidiaries having 'freedom of

destination'.

III.A.iii: Non-Traded Factors and Traded Products

There were four companies in this category, and all four companies had significant competitive exposures. This exposure arose since costs were effectively Sterling denominated and competition originated in either the US or European countries. During the period 1979-1983, these companies were at a disadvantage since Irish customers had an incentive to source in the EEC or the US (see Appendix 4).

The managerial response of all four companies was initiated in the UK HQ and is described more fully for three of the companies (Alpha², Delta and Epsilon³) in chapter nine. All four companies had begun to meet local executives more frequently in order to gather more information about competitor activity. Indeed Epsilon had developed a formal system for gathering information on competitors' strengths and weaknesses. The response of the executives was favourable and they felt that it was desirable that the HQ paid more attention to the grassroots. However, the finance director of Delta was somewhat cynical about the actual change.

All of the companies modified their production and marketing strategies. Alpha had concentrated on increasing the differentiation of its products by offering customised products and closing plants which produced commodity products. Delta had

rationalised production and concentrated it on a single site. Furthermore, the plant had been automated and the product range reduced. Epsilon and Omega attempted to cut the European capacity of their industries by reaching agreements with other suppliers.

All of the companies other than Omega1 were invoiced in Punts. The managing director of one of the companies pointed out that there were considerable problems in making the sales force aware of economic exposure, particularly when the local company was invoiced in Punts. He complained that the business managers did not see it as part of their jobs.

Delta's finance director stressed the importance of joint meetings between the finance and marketing functions when foreign competition was affecting market share, in order to strike a balance between price and market share effects. He also pointed out that the effects of exchange rate changes had been mitigated to some extent, since the company had an extensive dealer network unlike its competitors. Unfortunately, the advantage of this dealer network had been eroded due to increased concentration in the retail sector.

III.A.iv: Parallel Importing

While parallel importing is most frequently associated with the pharmaceutical industry, large Irish supermarket chains engaged in parallel importing many branded consumer goods which were low

volume high value items. In some cases, this arose because the supermarket chains were in a position to obtain goods at the same prices as the Irish subsidiaries from the UK divisions. However, it also arose in situations where the Irish marketing subsidiary had hedged purchases in the forward market and based prices upon these exchange rates. However, during the period of the forward contract, if the spot rate changes significantly, supermarkets may commence purchasing in the UK and obtain branded products more cheaply. Apart from large supermarket chains, individuals were also engaged in parallel importing by either going to Northern Ireland to purchase goods, or alternatively individuals from Northern Ireland purchasing products in the South of Ireland. The companies which were selling low volume high value items are shown in Tables 8.8 and 8.9.

Table 8.8: Classification of Marketing Subsidiaries Selling Low Volume High Value Goods

		Product Markets		Total
		Non-Tradable	Tradable	
Factor Markets	Non-Tradable	3	1	4
	Tradable	1	0	1
	Total	4	1	5

Table 8.9: Classification (by Name) of Marketing Subsidiaries Selling Low Volume High Value Goods

Non-Traded Products & Factors	Traded Products & Factors	Non-Traded Products & Traded Factors	Non-Traded Factors & Traded Products
Epsilon2		Iota1	Delta
Epsilon4			
Tau1			

All five could be potentially affected by parallel importing. However, both Epsilon² and Tau¹ were selling patented products in government regulated markets and had ensured that government licensing eliminated parallel importing. Moreover, the government had been persuaded to maintain this relationship because other firms in the industrial association were major exporters. Epsilon⁴ also sold patented products. In order to decrease the susceptibility to parallel importing the Irish subsidiary had taken control of the Northern Irish subsidiary upon the break with Sterling. The objective of this arrangement was to ensure that there was a unitary pricing policy in both Northern and Southern Ireland, and hence force parallel importers to travel to the UK.

Delta had also been affected by parallel importing. The parent had a policy of selling at the same price to the Irish subsidiary and Irish supermarket chains, and so the latter went to the UK to source. Therefore this variant of parallel importing did not arise from exchange rates, but from the parent company pricing policy. Fortunately, for distribution reasons, the Irish company was also responsible for Northern Ireland, and despite individuals crossing the border to buy the firm's products, the Irish subsidiary never lost out. The only difficulty which arose from parallel importing was that sales levels in the North and the South had become more volatile when taken in isolation.

Iota¹ was selling branded consumer products and circulated local retail price lists. In 1982, the company was badly hit by

parallel importing, due to the position it had taken in the forward market. Supermarkets stepped in and began to import the branded products from the UK. The item received considerable attention in the media. Seemingly, an agreement had been reached in 1980 that Irish retailers would source from the Irish marketing subsidiaries of UK MNCs. The IADT (a vociferous association of small retailers) was extremely keen to enforce this agreement since it was not in the interests of their membership to have large multiples selling branded products at anything less than the Irish price list. Moreover, the closure of the Irish marketing subsidiaries would increase their purchasing costs. Iota1 became involved in this debate along with supermarket chains and the Confederation of Irish Industry. Despite the fact that it was only a marketing subsidiary, it controlled other manufacturing companies(Iota2 and Iota3). This in turn meant that it could obtain good copy by pointing out that Irish jobs were at stake. The public debate was terminated abruptly when it was discovered that the existence of such an agreement would be outside the spirit of the Treaty of Rome. A representative from a supermarket chain was contacted. He maintained that it was often difficult to sidestep local subsidiaries, but that parallel importing was possible. He also pointed out that there were certain areas where it was more difficult to engage in parallel importing due to the possibility of adverse attention in the media. For example, he suggested that the importation of sugar (a nationalised industry) would be potentially disastrous. The only management reponse of the Iota1 was to commence collecting information on UK prices in

order to ensure that Irish prices never diverged from UK prices to any great extent.

III.A.v: Conclusions

Economic exposure may be subdivided into four types, sticky price exposure, competitive exposure (traded products and factors), sectoral/macroeconomic exposure and parallel import exposure. In order to minimise exposure, more timely exposure-related information may be gathered and a variety of tactics may be used to decrease the exposure. Sticky price exposure is minimised by decreasing the time lag between exchange rate changes and price changes. Competitive exposure is decreased by making traded products less tradable and non-traded factors more tradable. Parallel import exposure may be decreased by increasing the costs of engaging in parallel importing. Macroeconomic/sectoral exposure is discussed in section III.D.

III.B: The Economic Exposure of Manufacturing Subsidiaries

While the economic exposure of marketing subsidiaries is relatively straightforward, the economic exposure of manufacturing subsidiaries is somewhat more complicated. In order to simplify the analysis the exposure arising from exports is discussed in section III.C. A list of the seventeen companies in this category was presented in Table 8.5, and the companies are classified in this section in a similar manner to the marketing subsidiaries in section III.A. The results of

this classification are presented in Tables 8.10 and 8.11. Each group is then discussed separately.

Table 8.10: Classification of Domestic Manufacturers

		Product Markets		Total
		Non-Tradable	Tradable	
Factor Markets	Non-Tradable	8	3	11
	Tradable	2	4	6
	Total	10	7	17

Table 8.11 Classification (by Name) of Domestic Manufacturers

Non-Traded Products & Factors	Traded Products & Factors	Non-Traded Products & Traded Factors	Non-Traded Factors & Traded Products
Zeta	Alpha1	P12	Iota3
P13	Epsilon1	Iota2	Phi2
Rho2	Theta1		Tau3
Lambda1	Theta2		
Kappa			
Sigma			
Omega2			
Tau2			

III.B.1: Non-Traded Products and Factors

All of the companies in this group (other than P13) were dominant suppliers. Indeed, Lambda1 had a market share of more than 90%. Five of the companies (Sigma, Omega2, Rho2, Lambda1 and Tau2) were subject to NPC regulation and Kappa had been subject to NPC regulation until demand for its products decreased significantly. P13 sold its products to both P12 and third parties, however quality was considered more important than price in its industry.

Kappa had been affected by parallel importing from Northern

Ireland and had closed down its operations in border areas. The company was also adversely affected by changes in government spending and this issue will be discussed in section IILD. In principle, Kappa could have sourced in global markets, however it was part of a bilateral monopoly and if sourcing patterns were altered, the supplier might go out of business or impose sanctions in the future. The only tactic Kappa could use was the threat of importation when negotiating with the supplier.

Apart from Kappa, the companies in this group were only affected by exchange rate changes in two ways. Firstly, the companies had a sticky price exposure, and for the majority of the companies, management of this exposure consisted of ensuring that the time lag between exchange rate changes and NPC permission to increase prices was minimised. Omega2 eventually succeeded in persuading the NPC to consider applications for price increases on a monthly basis. Secondly, capital equipment was one traded factor of production used by these companies. The sourcing of capital equipment is discussed in section III.B.v.

III.B.ii: Non-Traded Products and Traded Factors

Pi2 and Iota2 sourced raw materials in global markets and sold their products in nationally segmented markets. Both companies were dominant suppliers in the Irish market and subject to price controls. As such, the effects of exchange rate changes could be recouped and all their competitors were in a similar position. Iota2 sourced in global commodity markets where there were close

substitutes denominated in different currencies. In order to take advantage of relative price differences in Punt terms, the financial, purchasing and production personnel liaised with one another during the purchase decision. Production personnel were involved since the alteration of input mix involved minor changes in the production techniques. Moreover, the company attempted to source in EMS currencies where possible because of the lower volatility of the EMS prices and the resultant decrease in sticky price exposure. P12 faced a single world price for its materials.

III.B.iii: Traded Products and Non-Traded Factors

Three companies sold tradable products and sourced raw materials locally. These companies were most susceptible to exchange rate changes since none of the firms exported and only local raw materials were used. If the Punt were revalued, firms in overseas countries could compete more easily in the local market.

Unlike the importer companies, these companies were able to compete with overseas imports by pointing out that they manufactured in Ireland. For example, Phi2 took its customers to see its factory. It was the only domestic producer of the product and the promotion received favourable media attention. In addition, the promotion represented an opportunity to argue that UK producers with excess capacity were dumping their products on the Irish market at the expense of Irish jobs in an unemployment black-spot. The managing director found that the

exercise had resulted in a stabilisation of market share. Tau3 and Iota3 also used the 'Guaranteed Irish', 'Foreign Dumping' and 'Jobs at Stake' tactics to decrease import competition. However, it was pointed out that it was necessary to temper the 'Buy Irish' promotions because of EEC competition laws.

Tau3 also used threats of importation to decrease the cost of purchases, despite the fact that the raw material could only be sourced from a single supplier (due to transportation and quality considerations). The tactic was successful and the supplier agreed to bear fifty percent of the effects of changes in the exchange rate.

III.B.iv: Traded Product and Factor Markets

Four companies were classified as both sourcing and selling in global markets. Alpha1 and Epsilon1 were selling a product which could be substituted for overseas products without any difficulty. As such, both companies were exposed to the cost of Irish non-traded factors relative to non-traded factors in other countries. If the Irish Punt were revalued, Irish non traded factors became relatively more expensive, and the firms would be placed at a competitive disadvantage. The other two companies (Theta1 and Theta2), by virtue of their size, sourced raw materials globally and gained a significant cost advantage relative to smaller competitors.

Epsilon1 was involved in processing a commodity with a single

world price. The economic exposure consisted of the Irish value added and the company had become uncompetitive with European producers. In order to compete more effectively, the company invested in new capital equipment and increased volumes and productivity.

Alpha1 was in an identical position but it responded in a totally different way. The company had two plants and all production of homogenous products was switched to one of the plants. The majority of homogenous products were sold under contract to government services. When the government failed to award contracts to the company, and purchased from companies that had a lower amount of Irish value added, the company was able to make well publicised threats to close the plant because the government had purchased imports. The strategy appears to have been successful and the plant was still operating in 1984. The other plant was then used to produce branded products of a marginally higher quality which were packaged rather than loose and advertised in the media. As such, the differentiation of the products helped to decrease the economic exposure of the plant. The company also had freedom of sourcing, but, despite using sourcing policy to take advantage of deviations from purchasing power parity, the accountant was not involved in the decision. However, because of the price elasticity of the market, the exchange rate was incorporated in the production decision and the factory costing system.

Theta1 and Theta2 had an extremely low local value added. The

industry was characterised by a small number of large companies and many smaller companies. Despite a high degree of price competition in these companies' markets, both companies had the resources to source their factors globally, unlike smaller local competitors. There was extremely close liaison between the treasurer and purchasing and marketing personnel. The pricing, sourcing and hedging decisions were made simultaneously. Moreover, the quality of the joint decision was critical, since larger competitors were in the same position. In order to obtain information about potential sourcing opportunities, extensive use was made of international trade fairs.

III.B.v: Capital Equipment

The sourcing of capital equipment is one area where one would expect that exchange rate considerations are important. In most cases there are no supplier dependencies, and given that they involve large sums of money, one would expect that deviations from purchasing power parity give rise to alternative sourcing opportunities.

Unfortunately, in many cases, capital equipment was relatively specialised and in many instances available from only one supplier. One company found that there were opportunities to make savings by contacting the agents in different countries, since some agents were located in countries with less volatile currencies and different agents had different hedging policies. In cases where there was a sourcing choice, German sourcing was

preferred for two reasons. Firstly, German equipment was more competitively priced (see Appendix 4). Secondly, it was possible to obtain favourable Punt-denominated payment terms which was critical to some companies given exchange control restrictions on capital items.

A number of participants also argued that spare parts were often an important factor in the sourcing decision for two reasons. Firstly, there was an incentive to stick with a single manufacturer since one required only one set of spare parts in stock. Secondly, by purchasing from suppliers in EMS countries, the Punt cost of future purchases of spare parts was more certain than spare parts from the US.

Finally, the importance of communication between financial and engineering personnel was emphasised by the interviewees in cases where there was a choice of sourcing and financial arrangements. This might arise if there was a trade-off between the financial arrangements (price, credit period, currency of invoice, payment terms) and the technical specifications of the equipment.

III.B.vi: Conclusions

In this section, the importance of operational and promotional responses to economic exposure has been highlighted. Finance personnel are only likely to be involved in traded factor market situations. Finally, many subsidiaries do not have a traded good exposure.

III.C: The Economic Exposure of Exporting Firms

There were eight firms (see Table 8.5) which relied on exports to a significant extent, and two of these companies exported the majority of their output. The firms are classified in Tables 8.12 and 8.13.

Table 8.12: Classification of Exporters

		Product Markets		Total
		Non-Tradable	Tradable	
Factor Markets	Non-Tradable	3	3	6
	Tradable	0	2	2
	Total	3	5	8

Table 8.13: Classification of Exporters by Name

Non-Traded Products & Factors	Traded Products & Factors	Non-Traded Products & Traded Factors	Non-Traded Factors & Traded Products
Zeta	P12		Tau2
Lambda1	Alpha1		Lambda2
Rho2			Rho1

III.C.1: Non-Traded Products and Factors

The three companies in this group exported extremely differentiated products, which were unlikely to be sensitive to exchange rate changes. Lambda1 and Rho2 were large concerns

producing 'Irish' products which were branded, and both products were brand leaders. Zeta was relatively small (about 200 employees) and had identified market niches in the US and Europe which were not price sensitive. All three companies assumed the most conservative exchange rate in their pricing decisions.

III.C.11: Traded Products and Non-Traded Factors

Three companies sourced locally and sold their products in global markets.

Tau 2 produced branded consumer goods for the parent company. However, the company had to compete with other European subsidiaries for export contracts which were awarded by the divisional HQ. From the HQ point of view, this meant that the company was sourcing in the cheapest locations. However from a subsidiary point of view, the subsidiary was exposed to exchange risk and was only able to compete with UK plants when Sterling was overvalued (in purchasing power parity terms).

Lambda2 and Rho1 produced agricultural products. As such, they competed in markets which approximated perfect competition. At first sight, one would imagine that these companies had the greatest economic exposure, however, the EEC's Common Agricultural Policy isolated the companies by virtue of the system of monetary compensatory amounts.

The EEC Common Agricultural Policy aims to stabilise farm incomes

by setting the prices of agricultural products and absorbing any surpluses or deficits at the quoted prices. Needless to say, this gives rise to an economic exposure since exchange rate changes will lead to changes in these prices in local currency terms. Moreover, since the products are by their nature homogenous, agricultural incomes would be exposed to exchange rate changes. In order to overcome this possibility, the EEC has a system of monetary compensatory amounts whereby trade in agricultural products between countries is subject to a levy or subsidy which is based upon the change in exchange rates since the prices were originally set. This in turn implies that there is no incentive to trade agricultural products arising from economic exposure.

III.C.iii: Traded product and Factor Markets

Pi2 and Alpha1 were included in this group.

Pi2 purchased raw materials in a global market where the law of one price operated. Despite the fact that it produced a branded non price-sensitive product, the parent company had instituted a system of competitive export contracting. This in turn meant that the company had to compete with other European subsidiaries for export contracts, and was exposed to the extent of local value added. In order to overcome the possibility of free market contracting, the company sought to make the award of contracts a political or diplomatic process. The company was only partly owned by the parent and concessions were negotiated

with the parent subject to the award of contracts.

Alpha1 was in a similar position, save that it was responsible for the marketing of its own products. Price was an extremely important factor in the marketing mix and the company's fortunes had depended to a large extent on the degree of local value added and on the exchange rate. In order to minimise its competitive exposure, the company only exported relatively differentiated products and concentrated on supplying 'up-market' retailers.

III.C.iv: Summary

In this section, the importance of differentiated products as a technique to lower traded good exposure has been highlighted. The use of internal tendering schemes within MNCs was noted, as was the impact of the Common Agricultural Policy on economic exposure for firms exporting agricultural products.

III.D: The Macroeconomic and Sectoral Impact of Exchange Rate Changes

In chapter three it was suggested that models of economic exposure were partial equilibrium in nature and focused on the corporate effects of exchange rate changes rather than the macroeconomic effects. Three types of macroeconomic impact were identified; farm incomes, government spending and the export sector. The firms affected by each type of impact are identified in Table 8.14.

Table 8.14: The Macroeconomic Impact of Exchange Rate Changes

Impact:	Farm Incomes	Government Spending	Exporters
	Epsilon4	Epsilon1	Epsilon3
	Kappa	Kappa	Alpha2
	Lambda2	Phi1	Pi3
	Tau1	Phi2	Omega1

III.D.i: Farm Incomes

Farm incomes were adversely affected by exchange rate changes since farm output was effectively denominated in a basket of European currencies ('The Green Pound'), and many farm inputs were Sterling denominated. Given the scenario in appendix three (Sterling overvalued and the DM undervalued in purchasing power parity terms), farm incomes were squeezed. Since agriculture accounts for about a third of Irish GNP, farm incomes are an important factor, particularly for companies which are dependent on agricultural demand. Three of the product lines in the sample were badly affected by the decline in agricultural incomes, and Alpha1 had closed a manufacturing subsidiary because of this factor.

III.D.ii: Government Spending

The government budget deficit was effected by exchange rate changes due to the high level of government debt denominated in foreign currencies. While this factor may have influenced the level of government current account spending and the level of both direct and indirect taxation (and hence disposable incomes),

the effect was felt most sharply in the level of government capital spending. This in turn had a severe impact on the Irish construction industry and four product groups were involved in the construction industry.

III.D.iii: The Export Sector

Four firms sold a significant proportion of their products to firms which were exporters. The managing director of Epsilon3 was particularly concerned about the possibility of a high exchange rate leading to a decreased demand in this sector. However, statements by the Irish Export Board (see Appendix Six) would suggest that these fears were unjustified.

III.D.iv: Managing the Macroeconomic Impact

As such, very little had been done by the affected companies about the macroeconomic impact. On a year by year basis, both agricultural demand and government spending could be forecast with relative certainty and the forecasted values were used in the preparation of budgets. Apart from reflecting the effects in budgets, the only other reaction was to engage in lobbying both as individual firms and through trade associations (see Appendix Six) in the hope of influencing government policy.

IV: Summary and Conclusions

In this chapter, the management of foreign exchange risk in the Irish subsidiaries of UK MNCs was reviewed. It was shown that local exchange controls exerted a considerable influence on the management of transaction exposure. It was also shown that the findings of chapter six of the HQ treasury role in the management of the transaction exposure of overseas subsidiaries was consistent with the findings at a subsidiary level. However, it was also found that divisional managers exerted some influence on the hedging decision in some of the subsidiaries.

The economic exposures of the subsidiaries were then examined using an approach based upon the tradability of factors of production and products. Apart from the exposure arising from traded goods, three other aspects of economic exposure were identified; sectoral/macroeconomic exposure, parallel import exposure and sticky price exposure.

For the most part, the management of economic exposure was characterised by an ad hoc ex post reaction to deviations from purchasing power parity, but it was evident that some companies had learnt from the experiences of the early eighties. However, the tactics used after the event were in many respects similar to the pre-active strategies suggested by Shapiro [1986], once one interprets promotion in a broad sense and incorporates government lobbying. While the evidence does suggest that operational rather than financial responses are used, it would seem that

there is a role for the local treasurer in the operational responses.

Finally, sticky price exposure is closely related to transaction exposure. This is a useful finding, since the management of transaction exposure may approximate the management of economic exposure, if sticky price exposure is the firm's only economic exposure.

CHAPTER 9

ECONOMIC EXPOSURE AND THE MNC

In this chapter, the economic exposure of the twenty MNCs is examined. The material in the previous three chapters is then synthesized to produce a series of guidelines for the management of economic exposure. In order to operationalise the material presented in this chapter, a decision support system is developed in the following chapter.

I: The Economic Exposure of the MNC

The analysis of the exposure of the MNC is somewhat more complex than the analysis of the exposure of the subsidiary, since it is impossible to obtain sufficient information on the activities of the companies. Moreover, since many of the companies are involved in a variety of different businesses, with varying degrees of international involvement, it would be impossible to establish the economic exposure of the MNC without relevant segmental information detailing the extent of activity in different product groups by region. Unfortunately, this information was not available, and in some cases line of business information for the MNC as a whole was unavailable. An attempt was made to classify the economic exposures of the companies using the same technique as chapter eight, and the results are contained in Table 9.1. It should however be pointed out that the classification was based on considerably less information than the classifications in chapter eight.

Table 9.1: Classification of UK MNCs

		Product Markets		Total
		Non-Tradable	Tradable	
Factor Markets	Non-Tradable	10	5	15
	Tradable	2	3	6
	Total	12	8	20

Classification of UK MNCs by Name

Non-Traded Factors & Products	Traded Factors & Products	Non-Traded Products & Traded Factors	Non-Traded Products & Traded Factors
Theta, Zeta	Mu	Pi	Alpha
Psi, Iota	Nu	Omega	Beta
Rho, Kappa	Omicron		Gamma
Lambda, Phi			Delta
Sigma, Tau			Epsilon

I.1: Non-Tradable Factor and Product Markets

Fifty per cent of the companies in the sample were trading in both non-traded product and factor markets. Given the absence of traded good exposure, the key consideration in these companies was the management of sticky price exposure.

Five of the companies (Phi, Kappa, Theta, Zeta, Sigma) were involved in non-tradable products with a high degree of value added, which due to either the costs of transporting the products or the possibility of product deterioration in a short period of time, were unlikely to face any overseas competition.

The remaining companies were involved in branded or patented products of one sort or another and were also unlikely to face

any import competition. In addition, since the products were specific, there was very little opportunity to alter the sourcing of the products.

Two of the companies (Phi and Kappa) were affected by government spending in the countries in which they operated. Phi made considerable use of government lobbying. The company had also encountered considerable macroeconomic problems in one of the countries it operated in, and in order to minimise the impact, purchased a facility in a neighbouring country which would process output from the country which was having economic problems.

Tourist spending in the UK had some impact on the performance of Psi and Rho, however both companies were highly decentralised, and the author was unable to ascertain the tactics, if any, which were used to manage the impact of exchange rates on tourism.

I.ii: Traded factors: Non-Traded Products

Omega and Pi operated in this category. Both companies sourced their factors in markets where the raw material had a single dollar price. As such, both companies had no opportunity to alter the sourcing of their products in response to deviations in purchasing power parity. Therefore, the main issue with both of these companies was the time lag between a change in material prices and the reflection of the change in product prices.

I.iii: Non-Traded Factors: Traded Products

There were five companies in this category. In many respects, it represents the most interesting category, since one would expect that companies in the category were most likely to be badly affected by deviations from purchasing power parity, given that they must compete globally using non-traded factors of production. All five companies would be expected to have been badly affected by the relative strength of Sterling in the early eighties since the bulk of their production was based in the UK. Details of their UK interests in 1981 are shown in Table 9.2.

Table 9.2: UK Sales and Exports: Traded Product Companies

Company	UK Sales ^a	UK Exports ^a	UK Production ^b
Alpha	43%	20%	63%
Beta	59%	6%	65%
Gamma	43%	29%	72%
Delta	56%	21%	77%
Epsilon	34%	22%	56%

Notes:

- a) Sales and exports are expressed as a percentage of total sales.
- b) UK Production represents the sum of UK sales and exports.

All five companies were manufacturing companies, and the bulk of their costs were incurred on UK goods and services. One would expect that these companies would be most susceptible to the strength of Sterling in the early eighties, due to the erosion of export competitiveness and the penetration of the UK market by foreign manufacturers. The experiences of the five companies are described in the following paragraphs.

I.iii.a: Alpha

Alpha was extremely badly affected by imports, particularly, from the US. During the late seventies and the early eighties, twenty five per cent of the capital employed was written off and the UK work force was cut by a third. It should however be pointed out that the industry appeared to be in decline in any case, and there had been a regular stream of redundancies since 1974. Therefore, a strong pound may have served mainly to speed up the process, rather than constitute the main causal factor.

By 1978, Alpha's export margins were being affected by the strength of Sterling. In July 1979, large advertisements began to appear in the financial press explaining how the strength of Sterling was adversely affecting the company. By August 1979, the company began to announce organisational changes which would affect marketing policies and granted subsidiaries freedom of sourcing. Intensive lobbying in both Westminster and Brussels also began at this stage. It was argued that the strength of Sterling combined with government intervention in the US industry gave US exporters an advantage. Balance of Payments statistics showed that in the first six months of 1979, UK exports had increased 6% in value terms, whereas imports in the same period had increased by 25%. By this stage, it emerged that the basic strategy of the company to deal with the downturn was a three pronged attack.

Firstly, the EEC was persuaded to investigate the alleged

dumping. The British Ministers also attempted to influence the EEC Council of Ministers. The EEC did not respond, however Britain was permitted to introduce limited quota arrangements on imports. At the time, it was suggested in the financial press that the EEC feared retaliatory US action on European Steel exports. Secondly, the company began to attempt to shift production overseas, in order to diversify itself. Alpha began to actively search for opportunities in the US. Thirdly, the company began to move out of market segments which were commodity segments and susceptible to import competition, and used marketing tactics to differentiate existing products. This rearrangement also included attempts to increase value added on products and a reorganisation of the company which allowed greater autonomy to operating units, including freedom of sourcing. Finally, the company emerged successfully with considerable increases in both profitability and share prices since 1982.

I.iii.b: Beta

Beta was in a similar position. It had been dominant in certain sectors of its industry in the UK. By 1979, the UK market began to be penetrated by imports, and the treasurer cited exchange rates as a 'predominant reason' for the erosion of market share. No attempts were made at campaigning for 'anti dumping' legislation, since most of the competition was European based. The reaction to import penetration was to reduce UK capacity and rationalise product lines. The marketing reaction was to

attempt to segment the market for some of the firm's products, and to increase product differentiation using packaging, promotions and advertising. In other market segments, the company invested in new plant in order to become the lowest cost producer in certain segments. By 1984, according to stockbrokers' reports, import penetration was still continuing, and the company had been the subject of periodic take-over rumours.

I.iii.c: Gamma

Gamma was also badly hit during the period of the strong Pound. The company had adopted a strategy of concentrating on areas which were more specialised and technologically based, and disposed of businesses which were competitive capital equipment markets. In the first six months of 1984 alone, pre-tax profits doubled and this was attributed (by both the management and the financial press) to the weakness of the dollar.

I.iii.d: Delta

Delta had a number of divisions. In the mid-seventies one of the divisions was a dominant global producer. By 1979, there were two forces at work, the strength of Sterling and the company's distribution policy. The company had a policy of using tied distributors to market its products, and refused to supply large retail chains. This in turn led to retail chains beginning to import the product from overseas and with the added

effect of the strength of Sterling, market share was eroded. Between 1979 and 1981, the market share of imports had increased from 10% to 46%. Moreover, despite obtaining major US export contracts, the UK plant was unable to produce the product profitably, and the company licensed Far Eastern producers to manufacture to order. Unfortunately, this led to some erosion of market share in the company's Far Eastern markets. The response of the company was to reduce the workforce drastically in the UK, rationalise the product range, and introduce automated manufacturing systems. According to press reports, there have been recurrent difficulties with the computerised production planning system. There has also been an increase in the proportion of components which are sourced overseas. By 1984, the division had failed to recover, and a US management consulting firm was appointed in 1985.

The largest division was involved in a commodity market. The market was characterised by excess capacity at the turn of the decade. The division was affected by a decrease in exports and import penetration (particularly from Germany) when Sterling was strong. There were attempts at rationalisation and the capacity of the industry was decreased. In 1984 agreement was reached with another UK manufacturer to share facilities, and the company had begun to source some raw materials overseas. By 1985, the division had recovered to some extent and exports had increased considerably. The managing director attributed this change in fortune to the rationalisation in previous years.

Other divisions were involved in producing capital equipment and had lost ground due to both the strength of Sterling and aggressive Japanese competition. There had been some increase in exports to the US during the period 1984/85, which the treasurer said was partially due to the strength of the Dollar at the time. However, in some areas, the company had been unable to penetrate the US market during this period due to strong lobbying by US congressmen.

I.iii.e: Epsilon

In many respects, Epsilon was similar to Alpha, since six per cent of sales arose from the same products as Alpha, and another division in Epsilon produced a raw material for those products. Epsilon was somewhat more fortunate than Alpha in that fifty five per cent of sales were non-traded products. The company had been pursuing a strategy of gradually increasing its international involvement. In 1979, the strength of the British Pound, began to affect both exports and profitability. Exports decreased for the first year since the sixties. Moreover, the company was facing increasing competition from both Europe and the US. In 1979 alone, the US share one UK market had increased from 7% to 32% and the US had also succeeded in obtaining a 40% share of the market in end-products. Apart from dollar based competition, the company was also extremely sensitive to fluctuations in the Deutsche Mark. One broker estimated (the chairman endorsed his estimate) that if the DM fell by 20%, 1983 profits for the whole company would be 20% higher.

Epsilon also made statements which were critical of government exchange rate and interest rate policy in the press and the annual report. However, there was no evidence of special representations to either the government or trade associations. The company also pursued a strategy of increasing its US presence, shifting production overseas and increasing value added. The process of increasing value added was also accompanied by a greater concentration on marketing, increased local autonomy and increased formal contact with both operating units, distributors and customers. The performance of the company has improved markedly in both accounting and share price terms since 1981.

I.iii.f: Summary

The potted histories of the five companies which were selling products in global markets from a UK manufacturing base were examined in this section. It was shown that strategies had been adopted by the companies in an attempt to prevent a recurrence of the difficulties encountered in the early eighties. However, it may be argued that these potted histories are ex post rationalisations of events. The author is quite aware of this potential problem and in order to minimise this risk, a variety of sources (interviews, annual reports, stockbroker reports and press cuttings) were used to construct the histories.

However, it is quite possible that nothing fundamental changed in

these business, and that the improved performance in recent years is attributable to the strength of the US dollar. The acid test of the success of these strategies will be the extent to which the performance of these companies is not adversely affected in future years, should the Pound's exchange rate be 'high' in purchasing power parity terms.

I.iv: Traded Product and Factor Markets

There were three companies in this category. The most notable feature about them is their relative lack of dependence on the UK market and UK production (see Table 9.3). Moreover, Mu and Omicron were significant importers of products into the UK, for sale in the UK market. Nu had diversified its production on a worldwide basis.

Table 9.3: UK Sales and Exports: Traded Products and Factors

Company	UK Sales ^a	UK Exports ^a	UK Production ^b
Mu	34%	1%	35%
Nu	23%	9%	32%
Omicron	25%	9%	34%

Notes:

- a) Sales and exports are expressed as a percentage of total sales in 1981.
- b) UK Production represents the sum of UK sales and exports.

The economic exposure of each of these companies is examined in the following paragraphs.

I.iv.a: Mu

Sixty seven percent of Mu's turnover arose from buying, processing and selling commodities in a global market. The remaining portion of turnover arose in the UK and another European country from an industry which had non-traded product markets, but traded factor markets. Essentially, the company had no economic exposure since there were world markets for both the products and the factors, and the only exposure was the small amount of local processing. The company was simple engaged in trading in global markets.

I.iv.b: Nu

Nu has an extremely global spread of operations, and despite both purchasing and selling in global markets, exchange rate changes are unlikely to have any effect on the local currency performances of the businesses, except for macroeconomic impacts. The group is however exposed to the translation impact of exchange rate changes, because of its geographical diversity.

I.iv.c: Omicron

Omicron had considerable manufacturing interests in the Commonwealth. The company maintained that the strength of Sterling had led to an increase in UK import competition and a decrease in export competitiveness. Attempts were made, through a trade association, to persuade the EEC to introduce anti-

dumping legislation. The effort was not successful and in fact, Omicron's UK market share was constant during the period due to its control of distribution in the UK. Moreover, because the company was a global producer, the only real effect of exchange rate changes was on the translation of overseas earnings.

I.v: Summary

In this section the economic exposure of the MNC was examined. It was shown that although many UK MNCs may not have an economic exposure of any dimension, some MNCs (particularly companies dealing in traded product markets and non-traded factor markets) do have. Moreover, individual subsidiaries or divisions may have economic exposures and this may be a considerable problem at lower levels of the hierarchy despite being irrelevant at a HQ level. A classic case in point is the MNC dealing in traded product and factor markets. At a HQ level, sufficient international diversification will ensure that the MNC is not exposed, however, the value added in individual countries will be exposed, and local management will be concerned with economic exposure.

II: Managing Economic Exposure

In this section, the management of economic exposure is discussed by synthesizing the material in section I and the previous three chapters. In the previous chapter, four types of economic exposure were identified:

- 1) Sticky Price Exposure
- 2) Traded Good Exposure
- 3) Parallel Import Exposure
- 4) Macroeconomic/Sectoral Exposure

Based upon the practices observed in the sample companies, the management of each type of exposure is summarised in the following sections.

II.A: Sticky Price Exposure

Sticky price exposure is the time lag between a change in costs arising from exchange rate changes and altering prices. If the firm is an exporter, then this would be extended to include the time lag between the sale of products and the receipt of cash in home currency. As shown in chapter seven, this type of exposure was explicitly managed by Pi, Gamma and Epsilon. Omega had begun to gather information to manage this form of exposure and Lambda was considering a strategy similar to Gamma's. Apart from these companies, the other companies had not come to grips with sticky price exposure and managed transaction exposure as a surrogate for sticky price exposure. It is impossible to know the extent to which this behaviour is sub-optimal, however the decision support model in chapter ten may be used for this purpose.

Based upon the experiences of Omega and Pi, there is both a

centralised and a decentralised approach to the management of economic exposure.

II.A.i: The Decentralised Approach

Omega used a decentralised approach to manage sticky price exposure. Information was gathered at the centre on the time lag so that the hedging behaviour of subsidiaries could be evaluated and, if necessary, modified. The proposed performance evaluation system based on current cost rather than historical cost factor prices ensured that subsidiaries would be motivated to institute price increases as quickly as possible. This was also illustrated in the Irish subsidiary when Omega² succeeded in persuading the NPC to revise prices monthly.

II.A.ii: The Centralised Approach

Pi combined a Europe-wide netting system and a treasury management objective of managing sticky price exposure. However, this approach may not be universally applicable, since there were significant netting opportunities (and hence transaction cost savings) and due to the nature of the industry, it was difficult to decrease the time lag using operational tactics.

II.A.iii: Conclusions

Transaction exposure management systems and the management of

sticky price exposure are inextricably linked. Companies should consider the relationship between the two systems and ensure that interdependencies between both systems are understood. For example, while the practice of invoicing overseas marketing subsidiaries in foreign currency may be an effective way of maximising netting opportunities and transaction cost savings, responsibility for sticky price exposure is effectively shifted from the overseas operating unit to the UK operating unit. If treasury management is focused on individual transactions, then this sticky price exposure may cease to be identifiable.

II.B: Traded Good Exposure

Essentially, the Shapiro [1975] model is based on traded good exposure in the overseas subsidiary. Traded factor exposure is discussed in section II.B.i and traded product exposure is examined in section II.B.ii.

II.B.i: Traded Factors

In order to manage this exposure, the tradability of factors must be increased. All of the techniques used to manage this form of exposure were operational rather than financial. The operational techniques which may be used are summarised in section II.B.i.a and the management accounting issues are considered in II.B.i.b.

II.B.i.a: Operational Techniques

There are two types of technique which may be used to manage this form of exposure, sourcing policy and investment policy.

Investment policies are relevant since increasing the international diversification of production will decrease exposure. Factors including land, labour and electricity are non-tradable. If international diversification is increased, then these factors will behave 'as if' they are tradable. The internal tendering techniques used by Pi and Tau constitute mechanisms which facilitate this process. Alpha and Epsilon began to shift production overseas at the beginning of this decade, and the success of the strategy is highlighted by the low traded good exposure of Mu, NU and Omicron.

If the MNC can alter its sourcing patterns in response to deviations from purchasing power parity, then the traded good exposure of the MNC can be decreased. Most of the firms were unable to alter sourcing since the purchasing decision was based upon considerations other than price (quality, delivery and stable supply). However, there was more scope to alter the sourcing of capital equipment. There are two preconditions for this policy. Firstly, the importance of contact between the financial and operational personnel was emphasized (e.g. Lambda1 and Iota2). Secondly, some form of information system on prices in alternative locations is necessary (Theta1, Theta2 and Iota1).

When considerations other than price are paramount, there would seem may be scope to bargain with suppliers. Quality, delivery and stable supply considerations will give rise to symbiotic seller-buyer relationships, if the firm is a large customer. Bargaining may then be based upon the possibility of going out of business unless prices are decreased (τ_3) or the threat of sourcing elsewhere (κ).

II.B.i.b: Management Accounting Issues

The operational techniques used to manage traded factor exposure give rise to two types of management accounting issue: performance appraisal and capital budgeting.

Quantitative analysis may be an input to the capital budgeting decision. If it is, then it is necessary to ensure that the externalities arising from international diversification are reflected within the decision. Performance appraisal systems may also be affected, since systems of internal tendering will mean that subsidiary performance will be related to deviations from purchasing power parity.

Performance appraisal may also be used to ensure that alternative sourcing opportunities are exploited. Standard global costs of factors may be used to evaluate purchasing performance. Iota² included this possibility in the evaluation of manufacturing performance, however the information was not integrated into the

management accounting system.

II.B.ii: Traded Products

Traded product exposure may be decreased by decreasing the tradability of products. The techniques which may be used to decrease tradability may be categorised as short and medium run.

II.B.ii.a: Short Run Tactics

In the short run (less than six months), promotional activity is the only tactic. Essentially, it consists of making a case to either customers or the government on the traded good exposure of the MNC. The case is based upon 'jobs in danger', 'foreign dumping' or 'unfair foreign government subsidies'. The objective of the activity is to either decrease the price elasticity of demand by appealing to nationalist sympathies, or persuade the government to take action.

Government action may consist of subsidies to the industry, the introduction of non-tariff barriers, the introduction of import quotas (Alpha), purchases of the industries output (Alpha1) or making a case to the EEC.

II.B.ii.b: Medium Run Tactics

In the medium run (six to twelve months), the firm may consider the introduction of 'barriers to entry' (Bain [1959]), colluding

with foreign competitors or cost cutting and rationalisation exercises.

The creation of barriers to entry increase the costs of foreign competitors entering the local market, and hence decrease the probability of a traded good exposure. Tau, Iota, Lambda, Psi and Rho ensured that they were dealing in non-traded product markets by using advertising, product quality and design, reputation, customer service, controlled distribution and leased equipment for use with their products. Similarly, the companies which had been adversely affected by the 'strength' of sterling at the beginning of the decade were attempting to use these tactics.

Collusion with foreign competitors (either rationalisation or market sharing arrangements) is another possible tactic. Omega₁, Epsilon₃ and Phi had used this technique. It is quite possible that other firms had tacitly done so. Information systems may also be modified to monitor traded good exposure by gathering information on competitor activity (Sigma and Epsilon).

Rationalisation and cost cutting was used by Alpha, Epsilon, Delta and Beta. As Shapiro [1986] quite correctly points out, this is not a response to economic exposure since companies should be operating at minimum cost anyhow. This latter fact may be explained by either management inertia or political resistance (government, labour unions and adverse publicity). However, the presence of foreign competition and the use of promotional

tactics may decrease political resistance. Ultimately, companies with a traded good exposure may be sold (Gamma).

II.C: Parallel Importing

In some respects, parallel importing represents an optimum, since its existence suggests that the MNC has been extremely successful in the creation of barriers to entry. Unfortunately, there is very little which may be done to ensure that it is prevented. If it arises purely because of exchange rate changes, then the only response may be the use of the political and promotional strategies suggested for decreasing the tradability of products.

Examples might include persuading governments to certify the quality and safety of the products and illegalise the sale of non certified products (Epsilon² and Tau¹). However, such action may be contrary to the Treaty of Rome.

Barriers to parallel importing could also be created. They might include the extension of the distributive network, the introduction of sanctions against distributors engaged in parallel importing, or the withdrawal of customer service and warranties. Again, such action is likely to be discouraged by EEC competition policy and consumer groups. It is also possible that minor infringements of EEC competition policy may lead to more widespread EEC or nation state investigations of a MNC's activities.

Therefore, the management of parallel import exposure is similar to the management of traded product exposure, since similar techniques may be used. However, the use of such techniques is more likely to incur the wrath of regulatory authorities. Indeed, in the interests of long term profitability, it may be prudent for MNCs to temper the activities of operating units in this respect.

II.D: Sectoral and Macroeconomic Effects

Sectoral/macroeconomic effects are more difficult to manage, since by definition, they are not firm specific and solutions may lie at an industry rather than a firm level. One possible solution may be the use of political mechanisms to ensure favourable fiscal treatment for individual sectors (Kappa and Phi). However, the international firm can to some extent overcome these effects by virtue of its international diversification, and the ability to alter either the sourcing or destination of products (Phi) to other countries.

The sectoral effects are also unlikely to pose a performance evaluation problem, since sectoral changes are likely to be less volatile than exchange rates and more predictable. Given this property, sectoral effects are easily reflected within conventional budgeting systems, since a forecast of sectoral demand may be made and the effects reflected in the budget. In the longer term, the prediction of sectoral effects will be important from the point of view of the investment decision.

However, forecasting the sensitivity of sectoral demand to exchange rate changes is likely to be a difficult task given the small number of observations available and the impact of many other state variables on sectoral demand.

III: Summary and Conclusions

In this chapter, the classification and management of economic exposure was examined. Four classes of economic exposure were highlighted; sticky price exposure, traded good exposure, parallel import exposure and the macroeconomic and sectoral consequences of exchange rate changes.

Two interesting issues emerge. Firstly, traded good exposure is not of enormous importance to many UK MNCs. This in turn suggests the need for a mode of analysis for the identification of MNCs which are most susceptible to traded good exposure in order to ensure that valuable management time is not devoted to the management of a non problem. Secondly, many of the managerial responses which may be used to manage economic exposure are operational rather than financial in nature. Moreover, in many cases, there is probably only an isolated role for the HQ treasurer in the management of economic exposure, since many of the tactics will be specific to operating units. Indeed, the role of the HQ treasurer may consist only of the analysis of the effects of exchange rate changes on the MNC as a whole and ensuring that performance evaluation and reward systems ensure that economic exposure is managed from a HQ rather than an

operating unit point of view. To this end, a model is proposed in chapter ten for measuring exposure and evaluating the impact of alternative tactics on the MNC's exposure.

CHAPTER 10

A DECISION SUPPORT SYSTEM

✓ In the previous chapters, some of the theoretical and practical issues connected with the management of foreign exchange risk were examined. In this chapter an attempt is made to build upon this knowledge by developing a decision support system which might be applied to the management of foreign exchange risk. The model was developed using a financial modelling computer package, FCS-EPS.

✓ The computer model was developed because analytical models are unlikely to produce any results about the combined effects of transaction, economic and translation exposure. By using a computer model, it is possible to integrate the three types of exposure in a multi-period setting. The model is also interesting, since it demonstrates the information inputs which are necessary for the management of foreign exchange risk. Finally, by using a comprehensive model, it is possible to examine the impact of different foreign exchange risk scenarios on corporate performance, and then use the model as a decision support system.

In the first section of this chapter the theory underlying the basic model is examined. A full listing of the basic model is provided in Appendix Seven. A series of tests and sample output from the basic model is presented in Appendix Eight. Some extensions and uses of the model are then summarised in the

second section of this chapter.

✓ I: The Basic Model

In this section, the basic decision support model is reviewed. In principle, it consists of a multicurrency planning model which permits the incorporation of a wide variety of assumptions and decision environments. In the first part of this section, the assumptions of the basic model are reviewed. The theoretical underpinnings of the model are reviewed in part two.

✓ I.A: Assumptions of the Basic Model

The assumptions underlying the basic model are summarised in the following paragraphs. They are simplifying assumptions and it is possible to relax all of them by making appropriate modifications to the basic logic of the model. Relaxations of the assumptions are discussed in the second section of the chapter. The assumptions relate to the environment which the firm operates in and the nature of the firm.

✓ I.A.1: Environmental Assumptions

The world is assumed to consist of a finite number of countries and each of the countries has its own currency. There is no inflation in the world and the term structure of interest rates is assumed to be flat. There are no transaction costs or bid-ask spreads, no taxes (or taxes are assumed unitary and symmetric

without carry forward or carry back provisions), and borrowing and lending rates are assumed equal.

I.A.ii: Assumptions about the Nature of the Firm

The company is assumed to be headquartered in a single country. The company's stock of assets is assumed constant with an infinite economic life, and debt is constant and perpetual. The analysis is restricted to 24 monthly periods, and all business is assumed to be transacted at the end of the month.

✓ It is also assumed that there is a linear relationship between total costs and output and that each subsidiary sells or manufactures a single product (or if it is multi product, that a suitable numeraire exists). The impact of exchange rate changes, other than invoicing effects, on prices, costs and volumes is also assumed to be linear. Transfers may take place between subsidiaries, provided that purchases are only made from a single subsidiary, and that a subsidiary is not simultaneously importing and exporting from another subsidiary. However, a subsidiary may export to an infinite number of other subsidiaries.

I.B: Theoretical Framework

In this section the logic of the basic model is described. Perhaps the most novel feature of the model is its flexibility. It may be applied to any subsidiary within the MNC regardless of

its location or function. A consolidation routine is then applied to the logic and the data may be combined to produce Area, Divisional and Group results. The logic of the model may be broken into three sections; the information common to all subsidiaries, the information necessary for individual subsidiaries and the computational logic. Each of these sections is dealt with in turn in the following paragraphs. The accounting system implicit in the model is then reviewed.

✓ I.B.i: Global Information

I.B.i.a: Exchange Rates

Exchange Rates are entered using the convention of the number of units of foreign currency per unit of home currency. The subscript 'p' is used to denote the currency of the parent and the subscript 's' is used to denote the currency of the subsidiary. The notation for exchange rates which are initially input into the model is:

$$E_{i/p,t} \quad i = 1 \dots n, s, p \\ t = 1 \dots T$$

This notation may be interpreted as the number of units of currency 'i' per unit of the parent's currency 'p' in time period 't'.

✓ I.B.i.b: Interest Rates

Interest rates may vary over time, however the expected term structure of interest rates is constant. The notation used is:

$$R_{i,t}$$

where 'R' is the monthly interest rate which may be earned on deposits denominated in currency 'i' in time period 't'. To simplify the model, it is assumed that lending and borrowing rates are equal.

✓ I.B.ii: Subsidiary Information

✓ I.B.ii.a: Forward Cover Rules

It is assumed in each time period 't' that the subsidiary has a set of hedging rules which are used to guide the purchase of forward currencies. These rules are denoted:

$$a_{i,t} \quad \text{and} \quad b_{i,t}$$

The rules are interpreted as the proportion 'a' of items which are denominated in currency 'i' and are receivable in period 't', and the proportion 'b' of items which are denominated in currency 'i' and are payable in period 't'.

✓ I.B.ii.b: Economic Exposure of the Subsidiary

In order to incorporate the impact of exchange rate changes on prices, volumes and costs, other than the effects of the currency of invoice, it is assumed there is a linear relationship between prices, volumes and costs and exchange rate changes. The problem then becomes one of stating the effects of an x% change in exchange rates on prices, costs or volumes. Having analysed the possible impact of exchange rate changes on these variables, the information is summarised in the following way.

In the case of revenues, exchange rate changes may affect either volumes, prices or both. The effect on volumes of an x% change in the exchange rate 'i' is summarised in the variable:

$$q_{i,t}$$

If 'q = 1' then an x% change in currency 'i' is expected to lead to an x% change in volumes. Conversely, 'q = 0' implies that a change in exchange rate 'i' is not expected to influence volumes. Since there is more than one currency, and only a single volume, it is necessary to weight the sensitivity variable 'q' for the relative impact of changes in different currencies. This is achieved using the variable:

$$e_{i,t}$$

$$\begin{array}{l}
 i=n \\
 \text{where:} \quad \sum_{i=1} e_{i,t} = 1 \\
 i=1
 \end{array}$$

An identical weighting system is used for prices using the same weights, however the sensitivity variable may take on values other than the values for volumes. The price sensitivity parameter is:

$$p_{i,t}$$

It is assumed that there is a linear relationship between costs and volumes, and all costs are classified as either fixed or variable. In the case of variable costs, the sensitivity parameter is:

$$r_{i,t}$$

And the weightings are:

$$\begin{array}{l}
 u_{i,t} \\
 i=n \\
 \text{where:} \quad \sum_{i=1} u_{i,t} = 1 \\
 i=1
 \end{array}$$

Fixed costs are treated in a similar way with a sensitivity parameter:

$$s_{i,t}$$

And a series of weightings:

$$f_{i,t}$$

$$i=n$$

where: $\sum_{i=1} f_{i,t} = 1$

✓ I.B.ii.c: Transaction Exposure of the Subsidiary

In order to operationalise the transaction exposure of the subsidiary, it is necessary to have information on the invoice currency of sales, variable costs and fixed costs. A variable is used to express the proportion of sales, variable costs and fixed costs invoiced in each currency.

For sales, the parameter is:

$$l_{i,t}$$

$$\begin{array}{l} \text{where:} \\ \sum_{i=1}^{i=n} l_{i,t} = 1 \end{array}$$

In the case of variable costs:

$$\begin{array}{l} \text{where:} \\ \sum_{i=1}^{i=n} k_{i,t} = 1 \end{array}$$

Finally, the proportion of fixed costs invoiced in currency 'i' is denoted as:

$$\begin{array}{l} \text{where:} \\ \sum_{i=1}^{i=n} j_{i,t} = 1 \end{array}$$

✓ I.B.ii.d: The Characteristics of the Subsidiary

Finally, some information is necessary on the characteristics of the subsidiary. Firstly, there is a set of prices which are applicable in each country. These prices are the expected

prices during the period and are denoted:

$$BP_{i,t}$$

In addition, there are budgeted variable and fixed costs denoted respectively;

$$BVC_{i,t}$$

$$BFC_{i,t}$$

Apart from income statement items, there are also items which appear on the balance sheet, namely.

$$FA_t \quad : \text{Fixed Assets}$$

$$LA_t \quad : \text{Liquid Assets}$$

$$BSU_t \quad : \text{Budgeted Stock (units)}$$

$$D_{i,t} \quad : \text{Debt in Currency 'i'}$$

Finally, it is necessary to take account of time lags. Firstly, there is the lag between ordering an item to be used in manufacture (or to be sold) and the sale of that item in finished form to a customer:

$$ol_t$$

Secondly, there is the lag between ordering an item and receiving the item, or receiving an invoice from the supplier:

p_{ult}

Thirdly, there is the lag between receiving an item from a supplier and actually paying for the item:

pal_t

Fourthly, there is the time lag between receiving and paying for fixed cost items.

fcl_t

Finally, there is the time lag between selling an item to a customer and receiving payment for the item:

dl_t

I.B.iii: The Model

I.B.iii.a: Calculation of Exchange Rate Changes

Exchange rate changes are expressed in the currency of the parent. The first step is to express the model in terms of the subsidiary currency.

$$E_{i/p,t}/E_{s/p,t} = E_{i/s,t}$$

Ultimately, the model is being used to examine the impact of unexpected exchange rate changes on the company, and a cumulative exchange rate change, since the beginning of the period, is defined as:

$$CE_{i/s,t} = 1 - [E_{i/s,t}/E_{i/s,0}]$$

I.B.iii.b: Incorporation of Exchange Rate Changes in estimates of Volumes, Prices and Costs

1. Volumes

The volume sold consists of the budgeted volume adjusted for the effects of exchange rate changes.

$$V_t = \sum_{i=1}^n (BV_t)(e_{i,t})(1+(q_{i,t}))(CE_{i/s,t})$$

2. Prices

There is a two stage process in the calculation of exchange rate adjusted prices. Firstly, it is necessary to calculate the effects of exchange rates on prices which are invoiced in foreign currency:

$$TP_{i,t} = BP_{i,t}(1+(l_{i,t})(CE_{i/s,t}))$$

Secondly, other effects of exchange rate changes on prices need to be incorporated.

$$P_{i,t} = (1+(p_{i,t})(CE_{i/s,t}))(TP_{i,t})$$

3. Sales

Sales are simply the product of prices and volumes.

$$S_t = \sum_{i=1}^{i=n} (P_{i,t})(V_{i,t})$$

4. Variable Costs

A two stage process similar to the process applied to prices is applied to variable costs. Firstly, allowance is made for the

effects of invoicing currency on unit variable costs.

$$\begin{aligned} & i=n \\ \text{TVC}_t = & \sum_{i=1}^n (\text{BVC}_t)(1+(k_{i,t})(\text{CE}_{i/s,t})) \\ & i=1 \end{aligned}$$

Secondly, the translated variable cost is adjusted for the effects of exchange rate changes.

$$\begin{aligned} & i=n \\ \text{VC}_t = & \sum_{i=1}^n (\text{TVC}_t)(u_{i,t})(1+(r_{i,t})(\text{CE}_{i/s,t})) \\ & i=1 \end{aligned}$$

5. Fixed Costs

Again, a two stage process is used.

$$\begin{aligned} & i=n \\ \text{TFC}_t = & \sum_{i=1}^n (\text{BFC}_t)(1+(j_{i,t})(\text{CE}_{i/s,t})) \\ & i=1 \end{aligned}$$

The translated fixed costs are then incorporated into the calculation of the exchange rate adjusted fixed costs.

$$\begin{aligned} & i=n \\ \text{FC}_t = & \sum_{i=1}^n (\text{TFC}_t)(f_{i,t})(1+(s_{i,t})(\text{CE}_{i/s,t})) \\ & i=1 \end{aligned}$$

6. Total Costs

Since a linear relationship between costs and volumes is assumed, total costs are simply the fixed costs plus the number of units sold times the volume sold.

$$TC_t = FC_t + ((V_t)(VC_t))$$

*7. Interest Expense

Since debt may be denominated in foreign currency, interest payments may also be denominated in foreign currency.

$$i=n$$

$$I_t = \sum_{i=1} (D_{i,t})(R_{i,t}) / (E_{i/s,t})$$

$$i=1$$

8. Interest on Liquid Asset Balances

Finally, interest on liquid asset balances is calculated. Because the interest on liquid asset balances is added to the liquid asset balance, it is necessary to obtain a simultaneous solution for liquid asset balances and interest on liquid asset balances. The composition of liquid asset balances is described later in this chapter. The interest on liquid asset

balances is calculated as:

$$ILA_t = LA_t(R_s, t)$$

I.B.iii.c: Foreign Exchange Gains and Losses

In order to allow for the possibility of forward hedging, forward rates are assumed to be determined by the interest rate parity theorem. The forward discount or premium is then calculated as:

$$F_{i,t} = (1+R_{i,t}) / (1+R_s, t)$$

Foreign exchange gains and losses may then be calculated for transactions relating to sales, variable costs and fixed costs.

1. Sales

The foreign exchange gain or loss made on sales invoiced in currency 'i' is defined as:

$$FXS_{i,t} = S_{t-d1}(l_{i,t-d1})(1 - (1 - a_{i,t-d1})(E_{i/s,t-d1}/E_{i/s,t})) + (a_{i,t-d1})(F_{i,t-d1})^{d1}$$

This formula is somewhat complex. It calculates the effects of exchange rate changes on items which were invoiced to customers in a previous period and for which cash was received in the current period. The exchange rate used is a weighted average of

the current exchange rate and the applicable forward rate at the time of invoicing. The weights are dependent on the proportion of sales which are hedged.

2. Variable Costs

The foreign exchange gain or loss on Variable cost transactions which were denominated in a foreign currency are calculated in a similar way. However, it is necessary to specify how the volume is arrived at. Exchange rate changes may affect volumes, however since the exchange rate changes are not known in advance, it is necessary to have a rule of thumb for ordering raw materials and other inputs. Order volumes are calculated in the following way.

$$OV_t = BV_{t+ol} + [V_t - BV_t]$$

The amount which is ordered depends on the anticipated budgeted volume in a future period, which is then adjusted for any difference between actual and budget volumes in the current period.

It is then assumed that an invoice is received for the goods some time after the order has been placed, and the volume of purchases is calculated in the following way.

$$PV_t = BV_{t+ol-pul} + [V_{t-pul} - BV_{t-pul}]$$

Using the purchase volume, the foreign exchange gain or loss is then arrived at in a similar way to the foreign exchange gain or loss on sales.

$$FXVC_{i,t} = PV_{t-pal}(VC_{i,t-pal})(k_{i,t-pal})(1 - ((1 - b_{i,t-pal})(E_{i/s,t-pal}/E_{i/s,t}) + (b_{i,t-pal})(F_{i,t-pal})^{pal})$$

3. Fixed Costs

The foreign exchange gain or loss on fixed cost items is similar to the gain or loss on sales in terms of its formulation.

$$FXFC_{i,t} = FC_{t-fcl}(j_{i,t-fcl})(1 - ((1 - b_{i,t-fcl})(E_{i/s,t-fcl}/E_{i/s,t}) + (b_{i,t-fcl})(F_{i,t-fcl})^{fcl})$$

I.B.iii.d: Income

Income is defined as revenues less total costs less interest less realised foreign exchange gains and losses, plus interest payable/receivable on liquid asset balances.

$$Y_t = S_t - TC_t + FX_t - I_t + ILA_t$$

where:

$$FX_t = FXS_t - FXVC_t - FXFC_t$$

I.B.iii.e: Balance Sheet Items

1. Calculation of Inventory

Firstly, it is necessary to calculate a closing physical stock figure. The opening budgeted stock figure is used as a basis for this calculation.

$$SU_t = SU_{t-1} + PV_t - V_t$$

Secondly, the current cost of the units in stock is used to produce a stock valuation. It is assumed that a direct costing system rather than an absorption based cost accounting system is used.

$$ST_t = (SU_t)(VC_t)$$

This process causes problems from an accounting point of view since closing stock in the previous period was valued using previous period variable costs, while the opening stock in the current period uses current period variable costs. In order to compensate for this, it is necessary to have a gain or loss on holding stock. This gain or loss will be:

$$FXST_t = SU_t(VC_t - VC_{t-1})$$

2. Calculation of Debt Outstanding

Since debt is denominated in foreign currency, it is necessary to translate it into the subsidiary currency.

$$D_t = \sum_{i=1}^{i=n} D_{i,t} / E_{i/s,t}$$

Again, while this produces a current value for debt, it is necessary to make an accounting entry for the gain or loss on debt. This is calculated using the current value of the debt in the currency of the subsidiary times the exchange rate change since the previous period.

$$FXD_{i,t} = (D_{i,t} / E_{i/s,t}) ((E_{i/s,t} / E_{i/s,t-1}) - 1)$$

3. Calculation of the Change in Net Liquid Assets

The first step of this calculation is to sum the cash flows in individual currencies. This process amounts to a netting routine.

$$CF_{i,t} = S_{t-d1}(I_{i,t-d1}) - (PV_{t-pal})(VC_{t-pal})(k_{t-pal}) - (FC_{t-fcl}) \\ (J_{t-fcl}) - R_{i,t}(D_{i,t} / E_{i/s,t})$$

The formula deducts the cash outflows in each currency from the cash inflows in each currency. The total cash flow in each

period is then evaluated.

$$CF_t = \sum_{i=1}^{i=n} FX_{i,t} + CF_{i,t}$$

In order to evaluate the change in liquid asset balances, the liquid asset balance is reevaluated.

$$LA_t = LA_{t-1} + CF_t + ILA_t$$

4. Calculation of Debtors and Creditors

The calculation of Debtors and Creditors is carried out using the exchange rates at which amounts were invoiced rather than the current exchange rates. In order to make the accounting system internally consistent, it could be argued that unrealised gains and losses on debtors and creditors should be taken into account. In this model, they are ignored, because it would lead to a considerable increase in the size of the programme with a corresponding decrease in the efficiency of the programme.

The calculation for debtors is simply:

$$DR_t = DR_{t-1} + S_t - S_{t-1}$$

A similar calculation is used for creditors.

$$CR_t = CR_{t-1} + (PV_t * VC_t) + FC_t - (PV_{t-pal} * VC_{t-pal}) - FC_{t-fcl}$$

5. Calculation of Reserves and Owner's Equity

The final item is the calculation of revenue reserves and owner's equity. Revenue reserves are the revenue reserves in the previous period plus the income in the current period.

$$RR_t = RR_{t-1} + Y_t$$

Other items which are held in reserves are the holding gains or losses on stocks and debt.

Owners equity is calculated using the other items on the balance sheet.

$$OE_t = FA_t + LA_t + ST_t + DR_t - CR_t - D_t - FXST_t - FXD_t - RR_t$$

I.B.iii.f: Calculation of Group Results

Using the subscript 's' to denote subsidiaries, and assuming that there are 'm' subsidiaries, profit for the group as a whole is calculated in the following manner.

$$Y_t = \sum_{s=1}^{s=m} Y_{s,t}/E_{s/p,t} \quad s = 1 \dots m$$

Assuming that there are no intracompany transactions, then Net Assets for the multinational as a whole may also be calculated in the same manner.

$$NA_t = \sum_{s=1}^{s=m} NA_{s,t}/E_{s/p,t}$$

I.B.iv: The Accounting System

Since a double entry accounting system is not used in this model, it is useful to examine the underlying accounting process in order to demonstrate the integrity of the accounting system. In Table 10.1, the complete list of transactions, with their corresponding debit and credit entries are listed. It may be seen that the calculation of debtors fails to take account of unrealised gains or losses on transactions invoiced in foreign currency, unless it is assumed that the payment lags are equal to

one period, in which case, there will be no unrealised gains and losses.

If a historic cost valuation basis were used, a stock flow assumption of some description would need to be made. This in turn would lead to a considerable increase in the size of the programme. Some allowance could be made for this factor by putting the gain or loss on holding stock in the variable costs account.

Table 10.1
Treatment of Transactions under Double Entry
Current Cost Basis

	Dr.	Cr.
Share Capital		
Revenue Reserves		
Gain/Loss: Stock		FXST
Gain/Loss: Debt		FXD _t
Debt	FXD _t	
Creditors	FC _t -fcl _t	FC _t
	P _t -pal	P _t
Liquid Assets	S _t -dl+FXS _t	I _t
	ILA _t	FC _t -fcl+FXFC _t
		P _t -pal+FXVC _t
Debtors	S _t	S _t -dl
Stock	FXST _t	VC _t
	P _t	
Fixed Assets		
Sales		S _t
Variable Costs	VC _t	
Fixed Costs	FC _t	
Interest on Debt	I _t	
Interest on Liquid Assets		ILA _t
FX Gain Loss Trade	FXFC _t	FXS _t
	FXVC _t	

* P_t = Purchases = V_t(VC_t)

L.B.v: Summary and Conclusions

In this section the informational requirements, structure, logic

and assumptions of the basic model were summarised. Using a Hewlett Packard 3000 minicomputer with a single user, a single pass for one subsidiary using twenty four time periods and ten currencies takes 13 minutes of CPU time. The model may be speeded up by restricting the number of currencies for each subsidiary and compiling the logic. Using two currencies and a compiled programme reduces the computation time to two minutes.

II: Extending and Using the Basic Model

In this section, some of the decision support uses of the basic model are reviewed, and the relaxation of the basic assumptions is discussed. In principle, all assumptions of the model may be relaxed without any difficulty, due to the nature of FCS-EPS programming. However, all modifications involve considerable decreases in the efficiency of the model, but for specific applications, where a modelling exercise may be done only irregularly, these decreases are unlikely to be a burden. Moreover, batch files may be set up which permit the programme to be processed as a low priority. Indeed, due to the nature of the programme, it is possible to write batch files which modify the internal logic of the model and permit the evaluation of the materiality of the relaxation of the assumptions. In the first part of this section some of the possible relaxations of the assumptions are discussed. The applications of the model are discussed in part two.

II:A: Relaxing the Assumptions of the Basic Model

II.A.i: Exchange Rate Processes

Using the 'Risk' function, the effects of different monetary scenarios on the performance of the MNC may be evaluated. Any user selected exchange rate probability density function may be chosen. Moreover, the function may be varied over time and hence assumed unstable. A similar process may be applied to any of the variables in the model in order to render them stochastic. However, the increase in machine overhead is considerable, since a single random trial takes up to five minutes, and 150 to 200 trials will be necessary in order to establish the resultant profit or cash flow distribution. In order to economise, and given that the function of the model is to examine the impact of exchange rate changes, this author found that it was most efficient to specify forward rates and interest rates as a function of the exchange rate.

II.A.ii: Relaxing the Environmental Assumptions

Inflation may be incorporated in the model by assuming that costs and prices are a function of inflation over time. Inflation may then be assumed as either exogenous or as partially exogenous and partially a function of the exchange rate. This latter assumption is particularly appealing, since it is consistent with a Nordic Theory of Inflation (see Edgren et al. [1969]) which in turn is consistent with the analysis of economic exposures using

traded and non traded goods.

The assumption of a term structure of interest rates is relevant, since it implies that the forward premium will incorporate liquidity premia differentials. In order to incorporate this effect, the calculation of the forward premium is modified to include an allowance for term premia which are a function of the settlement date of the forward contract.

The existence of transaction costs which give rise to either bid-ask spreads or unidentical lending and borrowing rates may be incorporated using the 'Interest' function. Essentially, the value applied depends on the sign of the amount to which it is applied. Using this function, transaction costs may be modelled explicitly. If transaction costs are lumpy, then it is necessary to use a table of spot rates, and the spot rate applied depends on the size of the transaction and the organisational level of the operating unit.

A variety of functions exist in the programme for the calculation of taxes which include both carry forward and carry back provisions. Moreover, asymmetric treatment of particular items (e.g. losses on liabilities) may be accommodated without any difficulty.

II.A.iii: Relaxing the Firm Specific Assumptions

The model may be modified to incorporate the effects of

investment and financing decisions. Moreover, a variety of functions are available to incorporate different debt refunding patterns. The increases in the computational complexity of the model would be insignificant.

The extension of the model beyond twenty four time periods simply results in a proportional increase in the computation time of the model. Similarly, the relationship of costs to volumes may be as complex as one wishes. However, precise specification of cost functions and the incorporation of discontinuities in the cost function may increase computation times considerably.

The assumption of a single product and simplified internal transfer structures may also be relaxed. The use of numeraires is likely to increase the efficiency of the model considerably, since otherwise a separate calculation is necessary for each product. This would be particularly inefficient in MNCs manufacturing a wide range of consumer products. Internal transfer structures are straightforward, provided that transfers are heirarchical and that it is not necessary to obtain simultaneous solutions for a number of subsidiaries.

Linear exchange rate effects on costs volumes and prices are easily modified and break points or time lags may be incorporated without any difficulty. More sophisticated specifications might include the time lag between a change in exchange rates and a change in operating variables, the possibility of overseas competition only in conditions where there are prolonged changes

in exchange rates of a certain magnitude, and the ability of management to engage in political and promotional activities which decrease the sensitivity of operating variables to adverse exchange rate changes.

II.A.iv: Contingent Financial Instruments

The incorporation of foreign currency options into the model has not been attempted. Conceptually, it is extremely simple, since the information in the model is sufficient either to incorporate an option pricing routine, or alternatively, treat option prices as an exogenous variable. Exercise of the option is straightforward, since it simply requires a specification of the conditions under which the option will be exercised.

√ II.B: Applications of the Model

The model may be used as a decision support system in a variety of contexts for the evaluation of the firm's foreign exchange risk management policies, and the firm's exposure to exchange rate changes. Some of the applications are examined in the following sections.

√ II.B.i: Quantifying Exposure

Exposure may be measured in a straightforward manner. Once the information requirements of the model have been met, the exposure of the firm may be examined under different stochastic exchange

rate scenarios, and the resultant profit and cash flow probability density functions may be examined. Exposure may also be examined under different assumptions about the nature of the firm and the likely effect of other exogenous variables.

✓ II.B.ii: Transaction Exposure Decisions

A number of transaction exposure decisions may be evaluated. Firstly, alternative centralisation policies may be examined and compared. Examples might include simulation of the effects of issuing guidelines to subsidiaries to either cover everything or cover nothing. Similarly, the effects of changes in the currency of invoice decision (particularly for internal transactions) may be examined. The presence of either an on-shore or an off-shore re-invoicing vehicle may also be evaluated by creating an operating unit which imports and exports in different currencies. Moreover, the issue of transaction cost savings arising from either the size of transactions or the possibility of netting transactions may be examined. With some modifications to the model, the effect of making currency options available to operating units could also be examined. Finally, the effects of alternative tax regimes may be incorporated within this analysis.

✓ II.B.iii: Economic Exposure Decisions

Economic exposures arising from the time lag between a change in raw material costs and a price rise may be incorporated using

time lags. Different transaction exposure policies may then be evaluated as proxies for this variant of economic exposure.

The use of forward contracts or options to cover economic exposures arising from the tradability of either factors or products may be successfully evaluated using the model. Only minor modifications of the model are necessary to evaluate the possible costs and benefits attached to such a strategy.

Operational techniques were highlighted in the previous chapter as a means of managing economic exposures. All of these tactics amount to an adjustment in the functional specification of the parameter which describes the sensitivity of costs, prices and volumes to exchange rate changes. Therefore, the benefits of altering the functional specification of the sensitivity parameter may be calculated and compared with the costs of using each tactic.

II.B.iv: The Investment Decision

Individual investment projects may be examined by specifying an operating unit of the MNC as an investment project. This in turn permits the evaluation of an investment on either a stand-alone basis or, alternatively, permit the incorporation of the investment project as part of the MNC as a whole. This in turn would permit the evaluation of any economic exposure externalities which arise from investment projects.

II.B.v: Performance Evaluation

Given both the actual exchange rate changes in a particular period and the budgeted figure for an accounting period, the effects of unexpected exchange rate changes on the operating unit's performance may be isolated and evaluated.

II.B.vi: Financial Reporting and Taxation Issues

Another possible application of the model lies in the analysis of financial reporting and taxation issues. Examples would include the examination of current versus historic cost accounting systems and the effects of different financing policies on both the accounting reports and the taxation liability of the MNC. Finally, alternative accounting and consolidation techniques and policies may be compared.

III: Summary and Conclusions

In this chapter, a flexible model for describing the exposure of an MNC has been described. In order to increase the computational efficiency of the model, a number of simplifying assumptions were made, but it was argued that it was possible to relax these assumptions. The model has been written for use in FCS-EPS and there is a complete listing of this model in Appendix Seven. Some tests of the model are presented in Appendix Eight.

A number of applications of the model as a decision support tool

are also described. The model is implementable, but to use it in practice, it may be necessary to create a user friendly interface for data entry, in order to permit data to be entered by untrained employees. It should also be borne in mind that the decision problem must be well specified, since a single simulation of the exposure of a MNC with 400 subsidiaries dealing in two currencies, using 200 trials will take about eleven days.

The model does however demonstrate that whilst exposure is a computationally complex issue, it is possible to operationalise exposure, and to evaluate the effects of different policies on that exposure. The model is also of use within an academic environment, since it facilitates the simulation of different environments and regulations on the exposures of prototype MNCs.

CHAPTER 11

SUMMARY, CONCLUSIONS AND IMPLICATIONS

In this chapter, the material in the previous ten chapters is summarised and the conclusions which may be drawn from the study are considered. The implications of the study for both the research and practice of foreign exchange risk management are then examined, and some suggestions for future research are made.

I: Summary

A first step in a study of foreign exchange risk management is to examine both the behaviour and the determination of exchange rate changes. It was shown in chapter two that if international parity conditions prevail, then foreign exchange risk does not exist. A set of sufficient conditions for the existence of international parity were examined and assessed from both a theoretical and empirical point of view. It was shown that there may be good reasons for rejecting the sufficient conditions on theoretical grounds and that empirical evidence (despite its limitations) would also imply the rejection of the sufficient conditions. It was also shown that the scenario which is most consistent with the empirical evidence is a situation of relatively efficient financial markets and relatively inefficient goods markets. The implications of such a scenario are that exchange rates may under or overshoot, and that deviations from purchasing power parity will exist. Given deviations from

purchasing power parity, foreign exchange risk will exist and a necessary condition for foreign exchange risk management is fulfilled.

*The discussion is also relevant to treasury management since a number of relevant issues emerge from the analysis. Firstly, it is quite possible that foreign exchange markets are informationally efficient and that commercially available forecasting services are unlikely to produce superior forecasts. However, recent evidence suggests that the use of filter rules may yield abnormal returns. However abnormality is ill-defined since the abnormal returns may represent risk premia which are, as yet, theoretically mis-specified. Hence, recent evidence may be consistent with market efficiency. It was also pointed out that intra-daily exchange rate changes behave as if they are generated by an unstable stochastic process. The implications of this research have not been examined, however, it may imply that existing models of foreign currency option pricing and international asset pricing are inappropriate. Finally, it was shown that international capital markets are likely to exhibit mild segmentation. This in turn implies that there may be opportunities for MNCs to benefit from the existence of segmentation.

Having examined the issue of exchange rate behaviour and determination, and established the existence of foreign exchange risk by virtue of observed deviations from purchasing power parity, the exposure of the MNC to foreign exchange risk was

examined (Chapter Three).

Exposure was defined as the effects of exchange rate changes on cash flows. Therefore, a flow rather than a stock concept of exposure was adopted. Exposure was defined as being either an economic or a transaction exposure.

A Transaction Exposure is a foreign currency cash flow which has a regression coefficient of one with the exchange rate. Moreover, the R-squared of the regression equation equals one.

An Economic Exposure is any foreign currency cash flow which does not meet the conditions of a transaction exposure, and any home currency cash flow which does not have a coefficient of zero with the exchange rate.

The foreign exchange exposure of the MNC was then examined using a model developed by Srinivasulu [1983] where foreign exchange risk depends on five covariance terms. The five covariance terms arise from the international diversification of operations, the structure of subsidiary operations, the portfolio of currencies, the exposure of the domestic firm and the existence of intersubsidiary linkages. Previous models of foreign exchange exposure were examined within this framework, and it was shown that exposure is likely to be firm specific and depend upon the tradability, price flexibility and substitutability of the firm's products and factors of production. It was also shown that it was necessary to incorporate the general equilibrium consequences of exchange rate changes as well as the partial equilibrium consequences.

Having discussed the nature of corporate exposure to foreign exchange risk, the ways in which exposure may be measured were

examined. It was shown that the conditions which are sufficient for the measurement of the effects of exchange rates on the firm are similar to the sufficient conditions which are necessary for the prevalence of international parity, and accounting statements were discounted as a suitable measurement device. It was also argued that net present value approaches to the measurement of economic exposure are inappropriate, and that a theoretically sound way of measuring exposure was the use of a regression equation. This in turn led to the definitions suggested above for the components of exposure to foreign exchange risk. A useful practical approach to measurement may be the use of qualitative measures of foreign exchange exposure, and some previous literature on this possibility was reviewed.

Given that firms are exposed to foreign exchange risk, two more issues were examined. The normative case for foreign exchange risk management and the techniques which may be used to manage foreign exchange risk (Chapter Four).

The normative case against the management of foreign exchange risk rests upon an internationalised version of the Modigliani and Miller irrelevancy propositions. It can be shown that if there are no barriers to homemade hedging, then shareholders should manage foreign exchange risk. In practice, there will be barriers to homemade hedging due to the existence of agency costs, capital market imperfections and information asymmetries. If these barriers to homemade hedging are significant, then the corporate hedging decision is no longer irrelevant, and a

normative case for the management of foreign exchange risk has been established.

The different categories of exposure to foreign exchange risk were then used as a basis for a review of the literature on the management of foreign exchange risk. It was shown that the management of transaction exposure was the area which had received the most attention in the foreign exchange risk management literature. Techniques were classified as being either internal (mediated within the MNC) or external (mediated in financial markets). As such, the management of transaction exposure is relatively straightforward unless, forward contracts are unavailable for settlement dates which are shorter than the maturity date of the transaction. However, it was pointed out that the evaluation of hedging decisions may be problematic if markets are imperfect and incomplete, and the expected utility of the decision maker is an inappropriate benchmark. The management of contingent exposures was then examined and some implications of the availability of foreign currency options were explored.

The management of economic exposure was examined and it was posited that the management of economic exposure was less clearcut, since there was the added complexity of an exposure which was stochastic and difficult to measure. While it is possible to manage economic exposure imperfectly using foreign currency debt and forward contracts, operational techniques may also be used to manage economic exposure. Such techniques

include international diversification, market selection and segmentation, pricing promotional and product strategy, product sourcing and input mix decisions, and plant location.

It was however argued that these normative suggestions may not be used in practice, since it requires the collection of substantial amounts of information about subsidiary operations and considerable interference with decentralisation. Moreover, due to bounded rationality and information impactedness, there may be excellent reasons for maintaining decentralisation. This in turn implies that the management of foreign exchange risk, which requires centralisation, will be in conflict with the need for decentralisation within the organisation as a whole. This in turn implies that the management of foreign exchange risk may be decentralised or responsibility for its management may be shared between the HQ and the operating units.

The foregoing discussion serves as a basis for some of the desirable features of a research strategy for the empirical investigation of foreign exchange risk management in UK MNCs. Previous empirical investigations in both the UK and the US are reviewed, and it is shown that the studies focused on the management of transaction exposure by HQ treasury. It is therefore necessary to examine how exposures other than transaction exposures are managed and also, to allow for the possibility that the management of exposure may be partially the responsibility of subsidiary personnel. Moreover, if a theory of internal organisation is invoked as a heuristic device, it is

more probable that the management of stochastic exposures is carried out at a subsidiary level, since the costs of communicating and aggregating stochastic exposures within the MNC will be greater than the costs of communicating and aggregating transaction exposures.

Given the lack of prior empirical research on the management of economic exposures, it would be premature to attempt to specify the techniques which may be used to manage economic exposure in advance. A research design was proposed which overcomes the issues of both knowing the right questions to ask and the uncertainty about the locus of foreign exchange risk management within the hierarchy. The design consisted of a field study in both the Irish subsidiaries and the HQ of a random sample of 20 UK MNCs, using interviews, archival data and a single case study. It is a particularly efficient research design since despite the intensive nature of the field study, there is a measure of external validity in the study because a random sample was used from a population of 60 UK MNCs. The concepts of theoretical sampling and triangulation, combined with the methodology of grounded theory were used as a basis for the analysis of the data.

The results of this field study were then presented in a manner which highlighted the individual roles of the subsidiary and the HQ, and also the economic exposure of the MNC.

Firstly, the HQ treasury role in the management of transaction

exposure was examined. The HQ treasuries were categorised by their degree of involvement in the management of transaction exposure and the results were similar to previous UK studies. It was found that in the majority of companies, the HQ treasury had little or no role in the management of the transaction exposures of the overseas subsidiary. It was also found that a significant number of companies did not centralise the transaction exposures of their UK subsidiaries. A rationale was advanced for this behaviour based upon transaction costs. It was argued that the main rationale for the centralisation of UK exposures was the possibility of transaction cost savings arising from netting opportunities. Moreover, overseas subsidiaries were not centralised due to the increased transaction costs of centralising overseas subsidiaries. It was also found that the internal bank mechanism was a popular method for the centralisation of transaction exposures, since it ensured that the autonomy of subsidiaries was left unscathed. If the main motivation for centralisation is transaction cost savings, which are in turn influenced by the efficiency of foreign exchange markets, then the degree of centralisation in the future may be greater (due to the decreased costs of communicating information within hierarchies) or decrease (due to a decrease in foreign exchange transaction costs).

Having examined the role of the HQ treasurer in the management of transaction exposures, the next set of results focuses on the role of the HQ treasurer in the management of other types of exposure. It was found that, for the most part, treasury

involvement in the management of economic exposure was minimal. Pricing decisions, invoicing decisions, the investment decision and HQ willingness to become involved in unrealised transactions were examined. In virtually all cases, it was not the perceived role of the treasurer to become involved in these issues. Only one company had hedged an economic exposure using forward contracts. Curiously, it was innovation in financial markets (the advent of foreign currency options) which had aroused central treasury interest in the protection of contingent exposures. Some companies using the internal bank structure were considering selling options to operating divisions.

Two cases of HQ treasury becoming involved in economic exposure were examined. In both cases the attempts were relatively unsuccessful despite the fact that in one case considerable resources had been devoted to the problem. The reasons the attempts failed arose to some extent from organisational barriers, accounting and taxation issues.

The management of transaction exposure at a foreign subsidiary level was then examined. It was found that the results were consistent with the reported degree of centralisation at the HQ level. Unfortunately, the analysis at a subsidiary level was somewhat limited by the presence of Irish Exchange Controls, since they implied that companies were forced to use transactional definitions of exposure. The practices of the firms were summarised and it was also pointed out that UK divisional staff may become involved in local hedging decisions.

The economic exposures of both the Irish subsidiaries and the MNC as a whole were then examined. This in turn led to the definition of four types of economic exposure.

- 1) Sticky Price Exposure
- 2) Traded Good Exposure
- 3) Parallel Import Exposure
- 4) Macroeconomic/Sectoral Consequences of Exchange Rate Changes

Based on the observation of the tactics which were actually used by both the MNC and the subsidiary, some suggestions were made as to how economic exposure might be managed. It was argued that the management of transaction exposure may act as a surrogate for the exposure which arises from sticky price exposure. In order to discount the possibility of exposures arising from either the tradability of products or the existence of parallel imports, some tactics were suggested which would render traded products less tradable. It was also shown that there may be benefits from making non-tradable factors more tradable. Finally, it was suggested that if these tactics were used within a decentralised environment, then incentive schemes and performance evaluation should reflect the existence of economic exposure.

In order to operationalise the foregoing recommendations and the theoretical review, a decision support system which uses a computer based financial planning model was developed in Chapter

Ten. The model permits the measurement of the total exposure of the MNC and the exposure of individual operating units, using a technique similar to the regression equation technique. It may then be used to simulate the effects of different policies and exposure management tactics on the exposure of either the subsidiary or the MNC, and permit the evaluation of alternatives.

II: Implications

Foreign exchange risk management is complicated and, in many respects, a problem which is capable only of clarification rather than resolution. However, the model developed in Chapter Ten does go some way toward simplifying the task of foreign exchange risk management since it permits meaningful measures of the exposure of either cash flows, profits or measures of net worth to be made in a straightforward manner. Moreover, it is possible to use the model to simulate the effects of different management policies and strategies on the exposure of the MNC. Finally, for the first time a catalogue of the strategies and tactics which may be used has been produced, so that practitioners may have a greater appreciation of the range of tactics which may be applied.

III: Suggestions for Future Research

The main difficulty in international financial management is the lack of a satisfactory normative or theoretical framework. In the meantime, managers must still contend with the existence of

foreign exchange risk. Research in the future is likely to concentrate on the managerial implications of foreign exchange risk, and the suggestions for future research are based upon this premise.

Firstly, further research on the behaviour of intra-daily exchange rate changes is necessary. An understanding of these statistical processes is important for the development of theoretical models and has practical implications if foreign exchange markets are inefficient.

Secondly, the advent of foreign currency options may have interesting implications for the management of foreign exchange risk. There is considerable scope for the development of both normative techniques for the application and evaluation of foreign currency options, and surveys of the actual use of foreign currency options and its implications for the internal bank function.

Thirdly, the presence of the internal bank function raises many interesting issues and there are considerable opportunities to test why the internal bank has emerged and its likely fate.

Fourthly, the locus of foreign exchange risk management is a challenging issue, and the role of the HQ treasurer within the process. There is considerable scope for studies of the locus of risk management and its implications, for example, the role of the treasurer in the education of operating personnel.

Fifth, an attempt has been made in this study to classify economic exposure and to suggest tactics for the management of economic exposure. Further research is necessary to establish if this classification is exhaustive, and the usefulness of the techniques suggested.

Sixth, a model was developed of foreign exchange risk. Further research is needed to investigate the applicability of the model in practice, and its shortcomings.

APPENDIX 1

THE POPULATION

There are sixty seven UK MNCs in the Stopford [1982] directory of MNCs. Seven companies were considered inappropriate for inclusion in this study, and they are discussed in the following paragraph. A list of the sixty companies included in this study is provided overleaf.

Bass and Whitbread were excluded because they both had insignificant overseas involvement. Nationalised industries were also excluded since they were essentially government controlled (British Leyland, British Steel and Rolls Royce). The Wellcome Foundation was excluded because it was a charitable trust in 1983 and Ultramar was excluded since it was managed from outside the UK. Finally, Consolidated Gold Fields was excluded due to the unique characteristics of its activities (mining finance).

The companies included in the population were:

AE plc	ICL plc
Allied Lyons plc	IMI plc
Arthur Guinness and Sons plc	Imperial Chemical Industries plc
Associated British Foods ltd.	Imperial Group plc
Babcock International plc	John Brown and Company Ltd.
B.A.T. Industries plc	Johnson Matthey and Company Ltd.
Beecham Group plc	Lucas Industries Ltd.
BICC plc	Metal Box plc
Blue Circle Industries plc	Northern Engineering Industries
BOC Group plc	Northern Foods plc
The Bowater Corporation plc	Pilkington Brothers plc
British Aerospace plc	The Plessey Company plc
The British Petroleum Company	Ranks Hovis McDougall plc
Brooke Bond Group plc	Reckitt & Coleman plc
BTR plc	Reed International plc
The Burmah Oil plc	Rio Tinto Zinc Corporation Ltd.
Cadbury Schweppes plc	RMC Group plc
Coats Patons plc	Rothmans International Ltd.
Courtaulds plc	Rowntree Mackintosh plc
Dalgety plc	Royal Dutch/Shell Group
Delta Group plc	S. Pearson & Son plc
DRG plc	Tate & Lyle plc
Dunlop Holdings Ltd.	Thomas Borthwick & Sons plc
FMC plc	Thorn EMI plc
The General Electric Company	TI Group plc
Glaxo Holdings plc	Turner & Newall plc
Grand Metropolitan plc	Unigate plc
Guest Keen Nettlefold	Unilever plc and Unilever NV
Hanson Trust plc	United Biscuits (Holdings) Ltd.
Hawker Siddeley Group plc	Vickers plc

APPENDIX II

EXTERNAL VALIDITY: OTHER MNCs

Chapter 5 gives details of the sampling frame. This appendix explains the rationale for generalising from a random sample of twenty to a population of sixty.

It is assumed ultimately that all responses may be classified as either positive or negative. The sampling process then becomes analagous to randomly selecting twenty balls from a bag containing sixty balls without replacement. Since it is assumed that there are at most two types of balls, the sampling process may be described using a hypergeometric distribution.

The aim of the generalisation process is to infer the proportion of 'negative' balls in the population from the proportion of 'negative' balls in the sample. Inferring the exact proportion is difficult, given the low sample size, however, this author considers it useful to attempt to infer the following sevenfold population classification.

- i) All the balls are likely to be positive.
- ii) Nearly all the balls are likely to be positive.
- iii) About 75% of the balls are likely to be positive.
- iv) About 50% of the balls are likely to be positive.
- v) About 25% of the balls are likely to be positive.
- vi) Very few of the balls are likely to be positive.
- vii) None of the balls are likely to be positive.

In classical statistical hypothesis testing, two errors are controlled for. Firstly, the probability of rejecting the null hypothesis when it is in fact true; for example the probability of rejecting the hypothesis that the population proportion is about fifty per cent when it is in fact true. Secondly, there is the probability of accepting the null hypothesis when it is in fact false. Tables A2.1 and A2.2 provide estimates of these probabilities for selected populations and observed frequencies. Table A2.1 gives the probabilities of certain sample observations of 'negative' balls given the number of 'negative' balls in the population. Table A2.2 gives the probability of each possible observation for four population states. Both tables allow some interpretation of the external validity of the study.

Table A2.1 is based on the assumption that the real world population is totally unknown but that only seven types of sample observation are possible. It may be seen that in some instances the sample observations will not be unique at a ten per cent level.

If it is assumed that the real world population may only occur in seven possible states, then Table A2.2 illustrates that each observed frequency will allow discrimination between these states with an error of about ten per cent.

Table A2.1
Probability (%) of sample outcomes given the
population frequency.

Actual number in population	Observed frequency in sample of twenty.			
	0	2	5	10
0	100.00			
1	66.70			
2	44.00	10.73		
3	28.86	22.20		
4	18.74	30.38		
5	12.05	34.36	00.28	
6	7.06	34.68	1.23	
7	4.82	32.36	3.13	
8	3.00	28.49	5.99	
9	1.84	23.95	9.58	
10	1.12	19.37	13.52	
11	00.60	15.16	17.36	
12		11.51	20.65	
13		8.50	23.07	
14		6.12	24.43	
15		4.30	24.70	00.20
16		2.95	23.95	00.47
17		1.97	22.36	00.89
18		1.29	20.16	1.53
19		00.80	17.59	2.47
20			14.87	3.74
21			12.20	5.34
22			9.72	7.30
23			7.52	9.50
24			5.64	11.88
25			4.12	14.31
26			2.91	16.61
27			2.00	18.62
28			1.33	20.19
29			00.85	21.18
30			00.52	21.52

Table A2.2
Probability (%) of an observation in the sample,
given the population proportion.

population proportion (%):population=60

	0	10	25	50
number of observations				
sample=20				
0	100.00	7.66	00.07	
1		26.30	00.87	
2		34.70	4.30	
3		22.50	11.97	
4		7.55	21.10	00.09
5		1.24	24.70	00.52
6		00.07	19.90	2.05
7			11.20	5.82
8			4.41	12.10
9			1.21	18.60
10			00.22	21.50

APPENDIX 3

EXCHANGE RATE BEHAVIOUR: THE PUNT

This appendix examines deviations from Purchasing Power Parity (PPP) for some major currencies vis a vis the Punt since 1975. The implications for firms are also discussed.

I: The Data

The IMF "International Financial Statistics" were used as a source of monthly exchange rate and consumer price index (CPI) data. The Irish CPI series is only available quarterly, and the author extrapolated monthly data under the assumption of a constant rate of price change within quarters.

It was also assumed that PPP prevailed on January 1, 1975 for Sterling and the Deutschmark, and that the parity rate for the Dollar as of that date was 2.2 \$/£. This assumption is entirely arbitrary, and the choice in this case was predicated by computational convenience, and the fitted PPP line as a 'line of best fit'. Their arbitrariness may be overcome by comparing the slope of the actual exchange rate and the slope of the PPP exchange rate in any time period.

II: The Sterling-Punt Exchange Rate (Figure A3.1)

Prior to Ireland joining the EMS, the PPP rate seems to cycle around the parity exchange rate. In some respects, this is

hardly surprising, given the geographical proximity of the countries, the openness of the Irish economy, and the similarities in tastes between both markets.

After March 1979, this cycle ceases, and there are deviations from PPP ranging from +27.2% (May 1981) to -8% (February 1983). These deviations are graphed in Figure A3.2. In addition, the volatility of the nominal exchange rate is considerable, and it might be expected that transaction exposures concerned firms, given that fifty per cent of foreign trade is invoiced in Sterling.

From the point of view of firms, exporting from the U.K. to Ireland may be less profitable, and exporting to the U.K. from Ireland may be more profitable. It might also be conjectured that domestic firms which depend on government capital spending, may be adversely affected by the March 1983 devaluation, due to increased debt financing costs. Finally, Figure A3.3 illustrates the differences in quarterly inflation rates between Ireland and the U.K.. It is clear that inflation rates were broadly similar until 1979 and diverged thereafter. This in turn, may make accounting statements more ambiguous.

III: The Deutschmark-Punt Exchange Rate (Figure A3.4)

The volatility of this exchange rate has decreased markedly since 1979. Many of the significant changes occurred during March and September, when EMS realignments took place, and otherwise, the

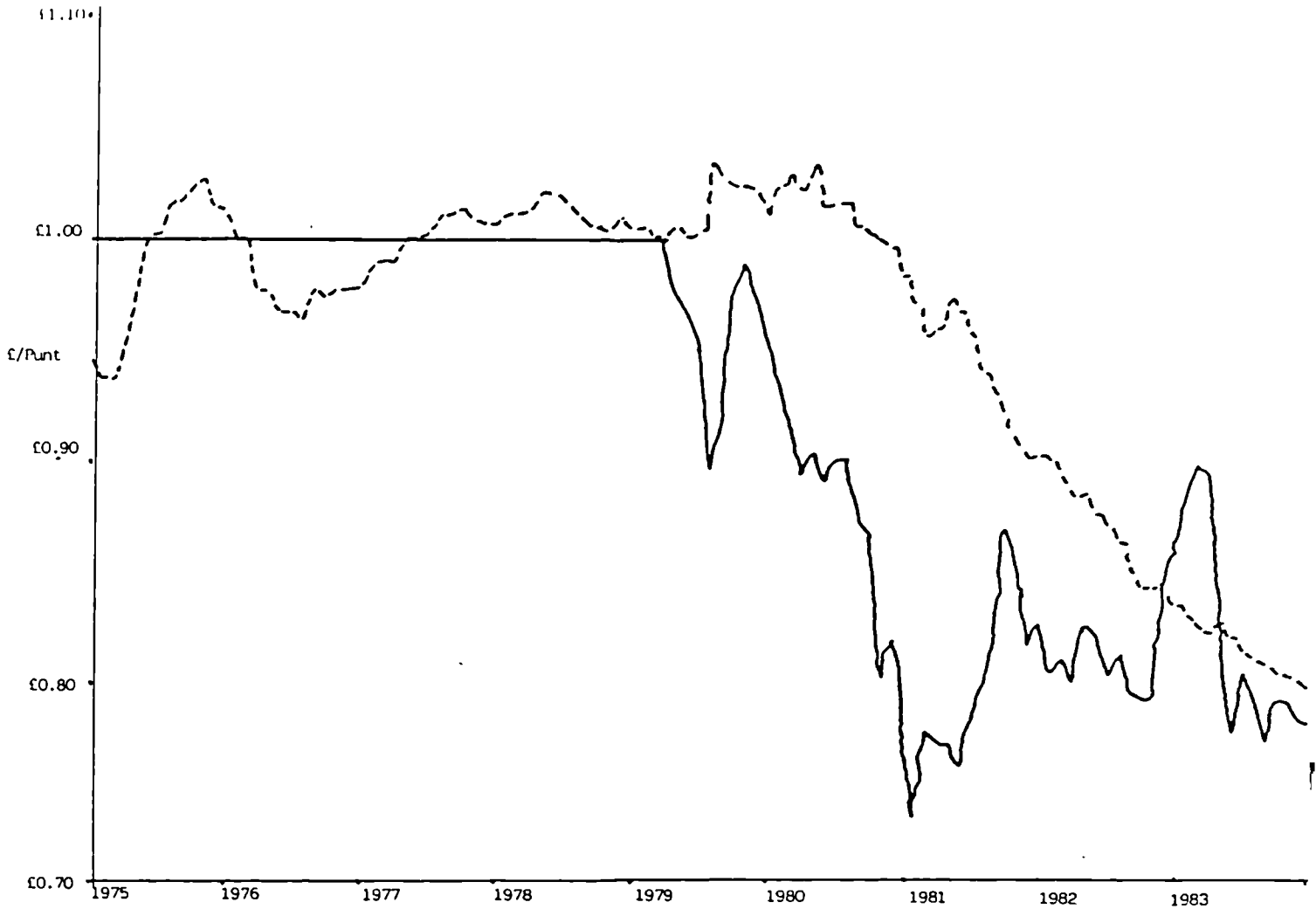
nominal exchange rate was relatively stable. The most dramatic change occurred in March 1983, when dealings in the Punt were suspended. This was also the point of the 8% negative PPP deviation vis a vis sterling, and at the time, there were fears that unless the Punt were devalued, Irish exports to the U.K. would become uncompetitive.

In real terms, there has been a substantial deviation from PPP, since 1979. This has been due to the enormous differential between Irish and German inflation rates, unless the German CPI is a totally inappropriate reflection of German inflation. From the point of view of the domestic firm, there were substantial opportunities to switch sourcing from Britain to Germany, and to export to the U.K. rather than Germany, in the short run.

IV: The Dollar-Punt Exchange Rate (Figure A3.5)

The volatility of the Dollar exchange rate, does not seem to have altered significantly since 1979. However, PPP deviations did exist, and this might in turn suggest U.S. sourcing possibilities (1978-1981) and U.S. export possibilities since 1983.

Figure A3.1: The Sterling-Punt Exchange Rate



KEY:

—— = PPP Exchange Rate

—— = Actual Exchange Rate

Figure A3.2: Sterling-Punt PPP Deviations

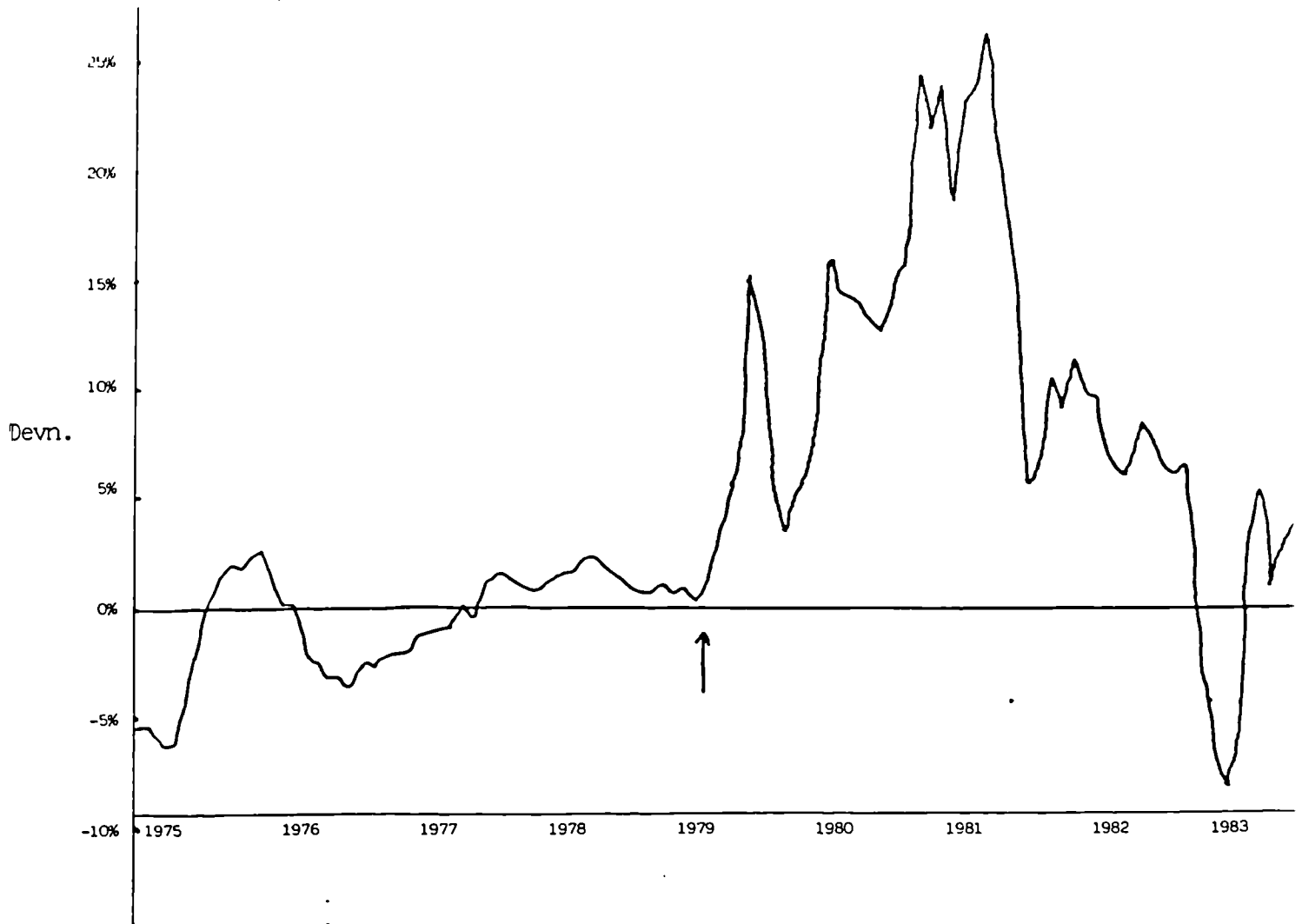


Figure A3.3: UK vs. Irish Inflation Rates

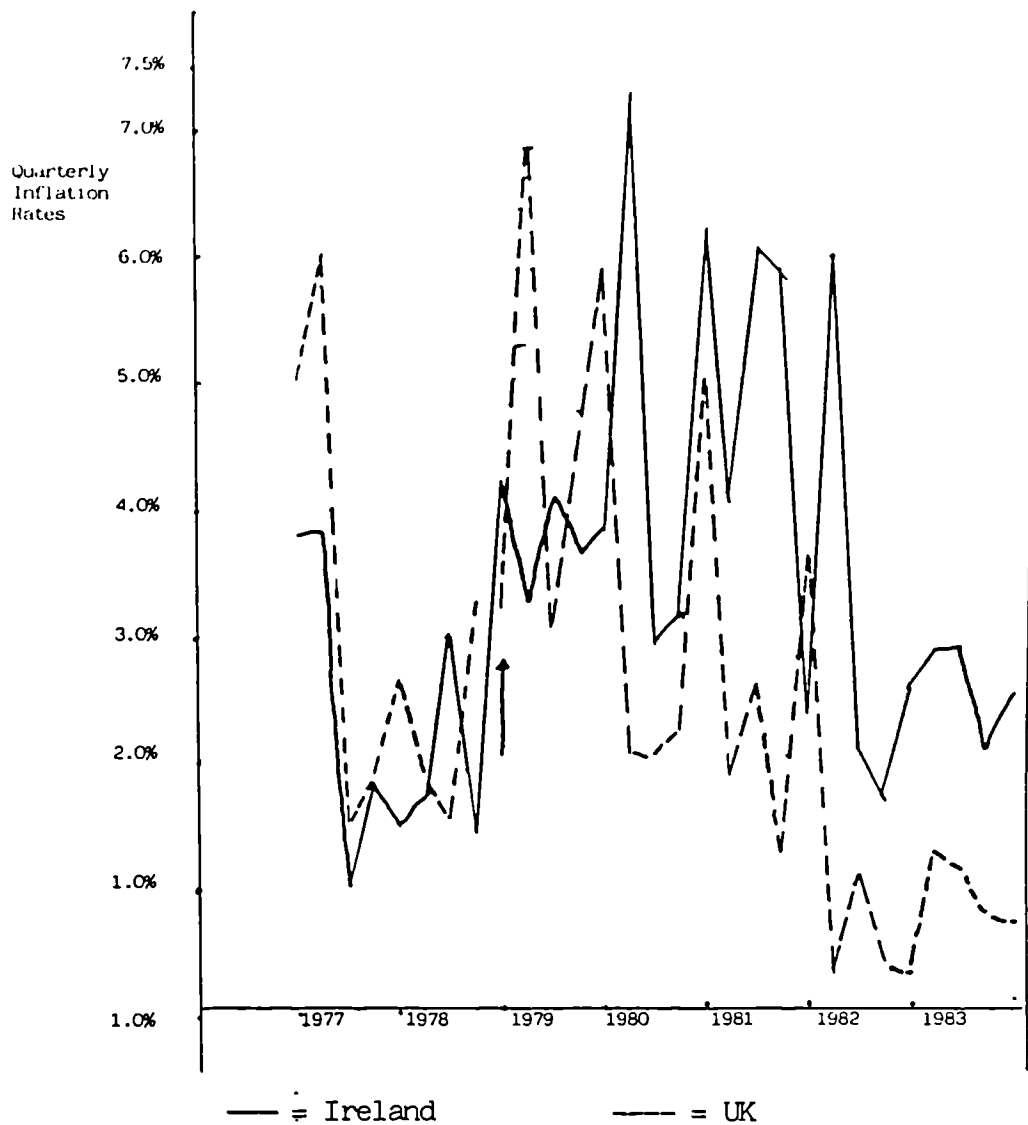


Figure A3.4: Deutschemark-Punt Exchange Rate

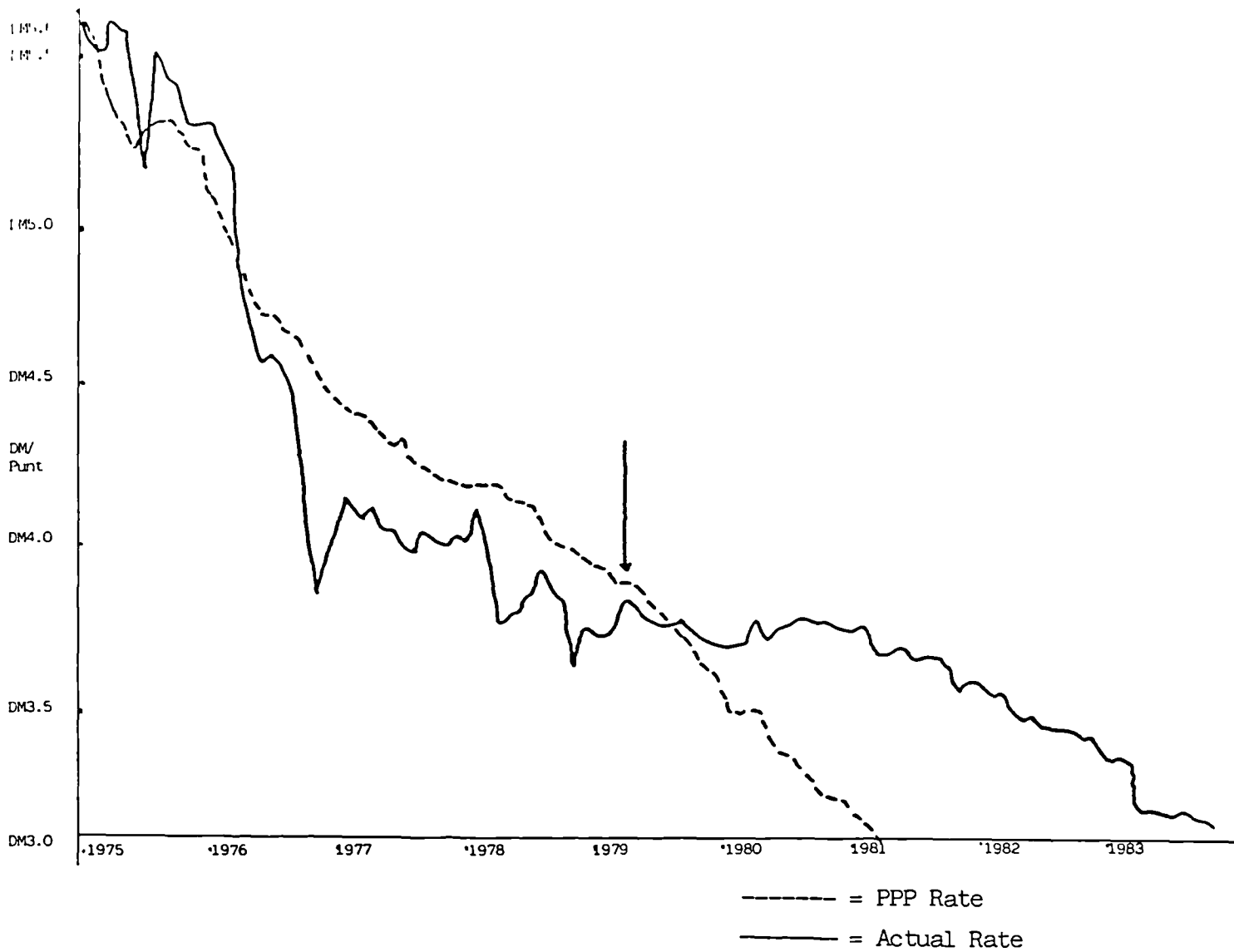


Figure A3.5: Dollar-Punt Exchange Rate



—— = PPP Rate
—— = Actual Rate

3. Dependence on parent

Are final goods sourced abroad?

Choice in source, or just U.K.?

If manufacturing, why?

Source raw material abroad?

Significant?

Depend on parent?

Source choice?

Source work in progress abroad?

Significant?

Depend on parent?

Source choice?

Other interdependencies?

- R+D
- Personnel
- Know how
- Planning
- Treasury management
- Economic info. etc.

Organisational structure & relation to U.K./Europe

- geog
- prods.
- matrix
- other

organisational structure (formal) in Ireland

- geog
- prods.
- matrix
- other

4. Nature of Irish org.

- Product
- Region

{discuss responsibility division btw. Irish profit centres, Irish HQ and U.K. HQ}

Degree of discretion: Financial/control

credit terms&cash discounts
sell and lease assets
arrange external SR borr.
" " LR "
transaction/translation exp.
administer subsidiary budget
determine methods of budgetary control.
determine internal audit procedure.
capital invest/disinvest
specify cap. budget annually

Long range planning

{related to capital budget}

respon. for strategy

Forecast and interpret econ.

Make major organisational changes

Legal

tax

use HQ legal staff

secretarial

Personnel & industrial relations

remuneration policy

managers

labour

appoint local managers

training local managers

Operations Research

Marketing

segment decisions in Irl.

export

product line

new product intro.

pricing

promo. budget

promo. strategy

distrib. channels

Production

manfg./indal. engineering

Plan and schedule o/p

level of o/p

level of prodn.(export;local)

equip replacement/installn.

local manfg. vs. import

quality control

Purchasing

choose suppliers

specify product/price

Engineering (other than industrial)

R+D

allowed to have local R&D

level of R&D

research

{Classify as:

- 1) Fully centralised control.
- ii) Subject to specific directives.
- iii) Subject to general guidelines.
- iv) Largely autonomous.
- v) Participative (truly consensual)

Operating responsibility vs. policy from HQ

Try and find role for Irish head office (if applicable) i.e. a mail box vs. a regional HQ:

(Try and find out the extent to which these relationships have evolved since 1979 and why?)

5. Economic exposure.

What have been the effects of 1979 break with sterling on your firm? (use to get general idea of his awareness, and perception of the problem).

{Check in partic. for the PPP deviations in appendix 4 as an influence}

Also, given the effects, what have you done about it? {attempt to find out tactics which are now regretted}

Probe: -competitors

-pricing policy

-destination of sales (market segmentation and selection)

-sourcing-raw materials

-intermediate goods

-finished goods

-plant and machinery

-arms length/within the firm

-investment/disinvestment

-real income effects and govt.spending

-other pre active-new prods (product strategy)

-promotional strategy

-working capital policy, credit policy

6. Information Flows

Examination of HQ-Subsid-local operators info. flows: Stress changes in the content, detail and frequency of:

visits and memos

internal audit

accounting reports and budgeting

short range planning

other info?

If short range plan, do they incorporate economic info? If so, how? ex ante vs. ex post

Stress changes since 1979

a) local subsid. > Irish HQ:

Budget

Market info

Transaction exposure

etc.

b) Irish HQ > local subsid.

Econ. info. for incorp. in budget etc.

c) Irish HQ > U.K.

Budget

Visits

Internal audit

Transaction exposure

7. Transaction exposure

source of forecasts

definition of exposure

nature of exposure reports (frequency, detail)

dissemination of forecasts and exposure reports

integrated in working capital, and potential/use of pre

active transaction exposure management.

Responsible for defensive strategies, and if so,

strategies used, frequency of use and choice between

alternative strategies.

8. Invest & disinvest (if applicable)

In partic., incorporation of exchange rate considerations,
influence of competitiveness and development of contingency
plans.

APPENDIX 5

DETAILS OF IRISH FIRMS AND INTERVIEWEES

Details of the turnover (Table A5.1) and the number of employees (Table A5.2) for the Irish subsidiaries are presented below. In two cases, the interviewee was the managing director. In all other cases, it was the finance director or the chief accountant.

Table A5.1.

Turnover (Punts).	No. of Firms.
Greater than 100 mln.	5
Between 50 and 100 mln.	3
Between 10 and 50 mln.	6
Less than 10 mln.	<u>8</u>
Total	22

Table A5.2.

No. of Employees.	No. of Firms.
Greater than 1000	4
Between 500 and 1000	2
Between 100 and 500	11
Less than 100	<u>5</u>
Total	22

All of the firms with more than 100 employees had a manufacturing facility, while the five firms with less than 100 employees were marketing subsidiaries.

APPENDIX 6

THE PUNT AND THE MEDIA

In this appendix, a summary of newspaper articles which were relevant to either changes in the Punt exchange rate or attempts to influence government exchange rate policy are summarised from 1980 to 1984. This appendix is most useful if it is read in conjunction with Appendix Three.

Irish Times 040180

Frantic dealing in gold yesterday - at close last night at 96.3p a fall of .25p but went up 1% against the dollar. The DM went up against the punt. Its due to the flight from the \$ into gold.

Irish Times 080180

IFA call to devalue - increase the competitiveness of exports: inflation = 11% in 2/79: 16% in 11/79- first call for devaluation. Also the Punt down to 95.8 due to the run from the \$ into gold.

Irish Times 100180

ITGWU oppose devaluation. They maintain that a 5% drop led to the increased inflation in November. A further 5% devaluation would increase inflation even more.

Irish Times 150180

The Punt fell below 95p yesterday for the first time since Sept. 94.75. Its a drop of .45, but small gains against the DM. It was due to an increase in London interbank rates and an easing of Dublin interbank rates. Dublin 3 month is at 17.5 and London at 17% On one month money, the rates are 17.75 on Dublin and 17.25 in London. But above the Central Bank intervention limit compared with last year.

Irish Times 160180

Lost 1p against £ yesterday but stable in EMS

Irish Times170180

Gained .35p

Irish Times170180

Strong performance: closed 93.5p i.e. down against £. But did well against other currencies.

Irish Times220180

£ Lost ground: .55p to 93.6: steady against other currencies.

Irish Times230180

Tax marches halt Dublin currency dealing.

Irish Times250180

Central Bank announce a new policy to decrease intervention. To start off they kept things in a narrow band; by last Sept. the

band was .8% either side: now it has been increased to 1.65% on either side. At the moment the EMS permits 3.799 to 3.63 DM and the Central Bank permits 3.776 to 3.664. If the Central Bank hits either of these limits, it will intervene.

David Kern spoke in Dublin yesterday to financial executives and said that comparing inflation rates would imply Punt pound parity but that due to N.Sea oil, would expect .925 or .93 by the end of 1980.

Irish Press 250180

Central Bank Winter bulletin says that Demand is greater than Supply and that demand needs to be decreased rather than devaluation. 1000 mln. borrowing in 1979 and a Balance of Payments deficit of 800 mln. (11% of national output). Warn that the external deficit can only be kept if we have reserves or are creditworthy- otherwise 'very severe adjustments' will be forced on us. An increase in borrowing would involve such an increase in external debt as to raise questions regarding our capacity to sustain it'. They estimate that every 100mln. decrease in exchequer borrowing would decrease the Balance of Payments by 80mln. over 12 months.

Irish Times 240180

Punt recovering. Increase .22p to 93.95p. Lost ground in the EMS.

Irish Times 250180

Paul Tansey comment on the Central Bank bulletin.

Need to decrease the current deficit and not the capital budget.
18% guideline to 2/80 had been exhausted at 11/79. they won't
issue a guideline until they see the budget and decide on credit
for the private sector. They rule out devaluation because it
will increase domestic prices and wage demands. Say must
combine pay, monetary and fiscal policy. Reserves are down
200mln.

Irish Times010280

Decrease to 93.7 and decreased within the EMS.

Irish Times290180

Bad day in the EMS

Irish Times 020280

Punt still in decline against the EMS and £.

Irish Times050280

£ up against all currencies. down .73p to 93p. Held steady in
the EMS:

Irish Times060280

Sharp recovery - dipped to 92.6 overnight and then up to 92.75

Irish Times070280

Punt up against all currencies other than £. Close at 92.4.

Irish Times080280

Retreat to 92.28 and also decrease in the EMS.

Irish Times140280

Gained against the \$ along with £ and EMS. Closed at 92.3

Irish Times160280

Up .5 at 93.05.

Irish Independent130380

Lost 40 pts. to £ yesterday: close at 91.2. 10 pts. to \$.

Irish Times190380

IR£ < 90p, i.e. at 89.86. and down to 1.976\$. 1.5p down since Friday (today is Weds. and Mon. was a bank holiday). Only 1.2p above all time low against £ and greater than 10% since halycon days of late last year when slightly above parity. Perhaps the decrease is due to devaluation fears.

Irish Times200380

Back up to 90.18 but down on \$ and EMS, cept DM.

Irish Times250380

Punt recovers to 90.4. Turn around in the Snake. There is evidence of leading and lagging.

Irish Times260380

Back down to <90p but at close it was 90p: may have been Central

Bank intervention. The £ climbed strongly against all currencies, and the Punt went with it to some extent. Gone from 2nd. worst in EMS (20/3/80) to third best- its due to the expectation that the punt will benefit from an increased £ due to the ability of Irish exports to compete in the UK.

Irish Times020480

\$ on the up 1.935 to 1.911. The rate has fallen from 2.10 in early march implies greater than 10% qand this will have a significant impact on Irish trade patterns. Oil prices will be up, but so will tourism. £ = 89.24. Ireland is at the top of its band and it is thought that the Central Bank intervened to deflate it.

Irish Times030480

£089.12 but up to 1.92\$: losses in Snake and around the middle now.

Irish Times080480

Phillips and Drew forecast a depreciation in the second half of the year. Expect the Balance of Payments to be 700 mln. They say that the budget is high risk, since there is increased VAT etc. so this will be incorporated in the CPI and therefore affect wage negotiations and demands. Inflation in the first quarter =15.5% and expect 19.5% in the 2nd. quarter due to the budgetary price increases.

Irish Times160480

Paul Tansey reviewing Colm McCarthy in the LBR.

Prior to the EMS, Irish inflation tracked British inflation in the 70's and Irish interest rates were determined in the London markets. This meant that monetary policy was impossible. The implication is that since survived big changes over 50 years, it is possible to have a single currency. The real resource transfers =3% of GNP in 1979 and in present value terms, the Central Bank could increase seignorage profits by 5mln. at 10% discount rate. But there are new foreign currency transaction costs which could add 5.5 mln. to the Irish costs of trading with the UK.

Irish Times280580

Slipped to 88.58p: just above the lowest ever of 88.5p on 30/7/79 its due to our association with Europe and UK energy. The \$ is at its lowest level for 5 years and we are 3rd. strogest in the EMS.

Irish Times130680

From today, the Central Bank bands will be +/- 2.25%. The idea was to allow the orderly development of the Irish foreign exchange market. It led to a severe drain on the foreign reserves but this year they stabilised at 920 mln. for the last 5 months. Still 3rd. in EMS.

Irish Times290780

Talks with 14 banks will lead to the creation of a forward market

but the Central Bank will reserve the right to intervene.

Irish Times280880

For the fourth day running that a new low has been reached against the £. The rate now is 87.4 and it has lost 2.5p since 1/8/80. The £ is going wild at 2.396\$. But the TWI at 9/79 was 78.25 and at 5/80 was 74.4. Current estimates imply that a But our reserves are high because we're at the top of the snake and there is SSB and private sector borrowing abroad.

Irish Press280880

Punt is not at its worst ever. The previous break in the last century when the Punt was at 84p sterling. Up until 1797 there were 13 Punts for 12 pounds throughout the 18th. century. Then there was the currency crisis of 1797 and there was a free float until 1821. In September 1803, one £ cost 1.19 punts. It was due to inflationary pressures at the time.

Irish Press260880

We're still at the top of the EMS. 88.2 p due to sterling doing well.

Irish Times100980

The £ is down from 2.42 to 2.40 due to expectations of a cut in the MLR because of money supply figures. The current expectation is 2.35 and this could bring the Punt up to 90p. The possibility of an decrease in interest rates in the UK led to an increase in long dated gilts in Ireland. The associated

banks are disturbed because the ICC and the ACC are being allowed to borrow in Europe with the government taking on the exchange risk and are currently lobbying both the Central Bank and the Taoiseach.

Irish Times120980

The external reserves have increased 220mln. due to State borrowing. Disclosed in the September supplement to the Summer Quarterly bulletin. Its due to foreign borrowing in DM and other EMS currencies. The trade balance is deteriorating. 1250 mln. reserves in 3/1979, went down to 899mln. in 4/80 and now back up to 1199.7mln. which may lead to a 1.5 to 2% cut in the Associated Banks' interest rates. But, the Balance of Payments deficit is still 700 mln. The key policy variables in Ireland are the private sector credit expansion and the external reserves, and not the Money Supply.

Irish Independent041080

Ray Douglas associate director of AIIB says that a 2% cut in the MLR by the end of the month could bring the Punt up to 91-2p. An Irish oil find would bring us back to parity. N.B. Gilts are not subject to exchange controls.

Irish Independent181080

Peter Barry has urged the government to shore up the sinking Punt and said that if they didn't do so, inflation would be increased. The Donegal by election is under way.

Irish Times181080

The Central Bank intervened yesterday and the Punt was at a new low against £. During the day it fell to 84.15 but by the close it stood at 84.37. Currently, 2.0410\$. The Central Bank argues that the interest rate cut and the strong \$ led to confusion among people buying and selling foreign exchange, especially, companies doing business abroad.

Irish Times221080

Gains against all currencies except £. Gone up in the EMS, but down to 82.55 against £. It is due to exporters selling \$ and £ and importers putting off purchases according to the Central Bank. But, the Punt closed at 82.97 and reached 83.05 in after hours trading. The slide may be halted, but one operator says that it will drift in the next few weeks due to the repatriation of foreign borrowing. Also interest rates are very low due to the fund injections from SSB borrowing abroad. Interest rates will increase in 2-3 months. The IFA are campaigning for devaluation, because inflation here is higher than Germany etc. and therefore the value of the Green pound is askew.

Irish Times231080

Down to 82.65; had fallen to 82.25. Lost ground against all 6 EMS currencies. £ is strong due to high interest rates but the prime rate in the US is now 14% and the \$ is on the way up.

Irish Times041180

Less than 80p for the first time.- 79.75p. This rate led to

importers moving into the market in substantial numbers and bidding up the price to 80.3 in late deals. <80p as a psychological spur. This in turn led to gains in the EMS. The US\$ is on the way up and this has led to fears of an increase in Irish petrol prices. The Euro£ rose to 17.5% as traders reckon that the cut in the MLR is unlikely until after Christmas. The Irish TWI is at a new low of 69.75 (base, 1971=100).

Irish Times071180

Shoppers: cards etc are up 20% on last year and very expensive. According to the merchandising director of Switzers, Hugo Mitchell, buyers are being instructed to go outside the £ area, but £ purchases would be up 25% particularly, clothes, cosmetics, etc. Irish manufacturers have been approached with an offer that both the manufacturer and the retailer should cut margins.

Irish Times071180

David Andrews, sales director in Weirs said that prices would be lower. They persuaded English manufacturers to give discounts because of the exchange rate (and the UK recession)- One company gave a 20% reduction, and a 20% discount. Also buying gold and Jewellery outside the £ market and in the EMS.

Oil money etc. is going into the \$ and the £ which brought it down to its lowest ever level of 79.05 and 78.8 in after hours trading. Due to Reagan's victory, £ lost ground against \$ and Punt stood at 1.9285.

Irish Times101180

Turning point in sight. Maybe the market thinks that Thatcher is relenting: the CII is praying for lower rates to help exports: but maybe it is a good thing now, because in a few months, it will lead to inflationary pressure on imports. Dearth of research on the economic effects of a change in the exchange rate in Ireland, but commentators reckon that there is no long run competitive effect- it will be gone within 9-12 months which implies a decrease in competitiveness by the end of 1981. But it may have made the difference between survival and closure now. There is a negative real interest rate in Ireland now of -5 to 6%. In Germany there is a real rate of 5/6%. PPPT is on its head since the inflationary countries have strong currencies and vice versa e.g. US and UK vs. Germany and Switzerland. We can do nothing except be opportunistic.

Irish Press141180

-Report on the Statistical and Social Enquiry Society meeting. Worse off with Sterling- Farmers' margins being squeezed according to O'Connor from the Central Bank due to the use of £ inputs. Brendan Dowling (J+E Davy) complains about the Central Bank not revealing intervention and therefore cannot forecast the effects of market factors. If we stayed with the £, could be 10% up against the DM etc.

Sunday Tribune.231180

Discussion of £.

Positive effects are:

Increased exports to the UK

Decreased UK imports and so Irish goods are more competitive.

Increased Tourism.

Negative effects:

Increased raw material and Capital goods costs.

Increased import prices lead to increases in the CPI and hence increases wage demands.

Increased wages and costs decrease competitiveness.

Probably beneficial in the short run but when it filters into wages, it is of no value.

Irish Times100181

New low of 78.68 but improved in the EMS. There is a strong commercial demand for foreign currency, and the Central Bank is intervening.

Irish Times170181

Creeping weakness. All time low of 77.18p- also lost in the EMS. The \$ is weak because of the Teheran Hostages. \$12bln ransom?

Irish Times200181: Financial Times210181

The European Commission is concerned at the Punt not being accepted in some European banks because it is so thinly traded.

Irish Times270181

New low of 75.6p and 1.82\$- increased oil and petrol prices. The

hostage saga has been satisfactorily concluded.

Irish Times290181

New low 74.1p: Still wondering if an MLR cut is likely.

Irish Times280181

Tansey: eve of budget and its less than 75p. D.J. Moore (AIB) speaking to the CII conference says that the future looks bleak for the Punt unless drastic corrective measures are taken. Balance of Payments deficits in the last two years of 1500mln.- Foreign reserves would be wiped out were it not for massive foreign borrowing. The bulk of trade is in \$ and £. Also report on Howe in Paris last night saying that Britain wants to join the EMS but that this couldn't be achieved without a more stable currency and this could not be done at the moment.

Irish Times280181

AIB	Sell	Buy
Dublin	75.45	77.2
Belfast	1.31	1.35

Irish Times300181

Reports from Strabane and Derry that the shops there are being hit by the £. This is due to too little business from the Republic and people in Strabane purchasing in the South. (there is a 15% VAT on clothes in the North.)

Irish Times310181

Pettigo (Donegal) and Tullyhammon (Tyrone) were both the same town once, but now they're not and there is a boom in Pettigo.

Sunday Tribune220281

Report that UK property buyers are moving into the Republic. Also purchasing Bars etc.

Irish Press230281

Complaints of lack of exchange facilities for tourists etc. because of bank opening hours.

Irish Press310381

Punt performing badly in the EMS and hitting the lower band.

Irish Independent170681

UK brokers complain that Irish people can't buy Guinness shares: 30% of the shares are held in Ireland. Also they had to get a special dispensation from the Central Bank to allow Irish employees hold the shares.

Irish Times180781

O'Donoghue says that Ireland's future belongs with the EMS.

Sunday Tribune210681

Petrol up 10p because of the sliding Punt. The Irish Refining co. BP 16%, Texaco 20%, Shell 20% and Esso 40%. BP has moved because it is 5\$ per tonne more costly here. Also Latsis

allegedly setting up a refinery in Ballylongford at a cost of \$500 bln.

Irish Times 150881

Punt falls on speculation of a revaluation of the DM. Dealers said that there was a lot of speculation yesterday with companies and Banks taking up positions.

Sunday Tribune 160881

O'Grady Walsh (Deputy Gen. manager of the Central Bank) says that the devaluation rumours are untrue. He wouldn't comment on the rumoured intervention of 15mln.

Irish Times030981

Punt at its highest level this year. 81.25p and 1.5\$: stayed constant in the EMS.

Sunday Tribune060981

Chartists (Portfolio Management) say that devaluation against the DM is inevitable but there has been momentum gained to climb against the £.

Irish Times090981

Highest since October last at 83.39. It will help ease inflationary pressures because a lot of imports are in £. £ is weak because of the glut in World oil markets. The US rush to sell £ is attributed to the chartists- a lot of "sell" signals.

Sunday Tribune 270981

Article by Philip Bourke- UCD lecturer.

An increased exchange rate leads to:

Decreased import costs.

Exports are injured unless they are price inelastic.

Exchange controls limit the possibilities on transactions and capital movements.

Irish Times061081

There has been intense speculation in the last few weeks of an EMS currency realignment. The punt has jumped from the bottom to the middle of the snake. The banks and companies are dying to offload foreign currencies and get Punts. But down to 1.598\$ Interest rates eased 0.5%. The official close was 86.31 and the main effect is the lifting of realignment fears every Friday since last Spring. The TWI is down 0.75%.

Irish Times061081

The farmers are bitter about the change in the Punt. They maintain that it should have been devalued by between 6 and 10%.

Irish Press211081

Punt moved forward again to 86.84. It was due to British trade figures being poorer than expected, because the British Civil Service strike since February had led to no trade figures being published. In the EMS, the Punt lies at third last, and the TWI stands at 70.4.

Irish Times211081

Reports that the Central Bank has been intervening in the Inter Bank market.

Irish Times071081

Sadat's assassination; move into gold and \$

Irish Times221081

Down to 1.55\$ due to the increase in US interest rates. We're still third last in the EMS

Irish Press221081

The increase in US interest rates and the increased inflation in the US has led to the Punt decreasing against the dollar.

Irish Times241081

Stockbrokers complaining that you can buy property horses and yachts abroad but not shares.

Cork Examiner241181

Paul Dalsager (EEC Agriculture Minister) says that Ireland should devalue in line with local inflation.

Irish Independent311081

Punt up again to 85.05

Irish Times171181

Punt down again at 82.66 due to high UK interest rates but

showing strength against the EMS currencies

Irish Press201181

Lost ground against everything other than the \$. The TWI stands at 69.05. Overnight money in the Inter Bank market was up to 27% because of Gilts.

Irish Press201181

IFA claim that the Punt is 18.5% overvalued and claim that it is costing the agriculture sector 250mln. annually- can't compete with the EEC.

Irish Times111281

Irish reserves up 400mln. to 1473mln. in October and November (started October at 1000mln.) because of foreign borrowing and the ending of realignment fears. Closed 4th. from the top in the EMS- a new found strength. There are no figures available on foreign borrowing. Also CAP payments to the exchequer helped reserves. Importers were speeding up payments to Suppliers in September because of the realignment - this led to a decrease in the Money Supply in October and since then Gilts have rallied. Also the SSBs are taking up foreign credit.

Irish Times121281

Punt at the top of the EMS- boosted by expectations of a weak £ and \$. It reached 83.75p, but there is a possibility of an increase in UK interest rates. The Central Bank intervened in order to stop it going above the limits. The markets are

expressing doubts about the origins of the 400mln. reserves and the foreign borrowing figures won't be available until January.

Irish Times301281

D.Cronin, Senior manager of AIB - Reckons punt rate of .85 to .89 for the year.

Irish Times210182

John Bourke from BofI reckons that the Punt will devalue by 5-10% against the 3. 80% of trade is in \$ and £, and therefore we were helped by this. Other speaker- Both Doomsday- paying ourselves too much.

Irish Independent230182

Bottom of the EMS bands but unchanged on the £ at 81.45. Heavy selling in Dublin.

Irish Press020182

Very small drop in the TWI over the Year. The steep fall in 1980 of the Punt may have added 5% to the CPI. But note that the TWI is a 1971 base year and therefore may not reflect the oil effect of the \$

Cork Examiner170282

10% devaluation of the green pound sought.

Cork Examiner280182

John Burke (B of I) says that a 10% devaluation is likely as we

forecasted last week: Ben Power (Chairman of the institute of secretaries) also agrees with this forecast. Alan Dukes (Min. for Agric.) refuses to do so.

Irish Times290182

News of the fall of the government led to a downward pressure on foreign exchange markets yesterday and there was some Central Bank intervention amounting to 10mln. Closed at 1.35\$ and commercial operators were waiting for the election results in three weeks - they are anti Fianna Fail.

Irish Times150282

Phillips and Drew forecast that the Punt may come under pressure because of foreign indebtedness and political uncertainty. The expected current account deficit is 1300mln.

Irish Press240282

There is speculation that there was 50-100mln. support for the punt last Monday following the realignment at the week-end. The TWI=67.75. Interest rates hardened.

Irish Times240282

WSJ (yesterday): says that the Punt is next for devaluation. Traders speculate that the Irish government did not have the authority to devalue because the the elections last week were inconclusive.

Sunday Tribune280282

Devaluation is no use because:

Most trade is with the £ and the \$ (70%) and therefore only a small proportion of trade is affected.

It would increase debt service costs.

It would increase imported inflation.

Farmers NESC commissioned study to boost farm incomes.

Irish Times040382

Bankers forecast devaluation.

David Went (32, chief exec of UIB) says that need to do so within EMS because of higher inflation and also the farmers.

David Kern (chief economist at the NatWest) sees the DM strengthening in 82/83. It was a UIB seminar for financial executives.

Irish Times050382

Joe Durkan of the ESRI says that a devaluation would be desirable, in the quarterly economic commentary. Forecast a decrease in GNP, employment etc. He reckons that a pay framework and a devaluation are necessary. Also, he questions the increase in foreign debt, since it increases the revenues from creditor countries with exports.

Balance of Payments in 1981 was 1310 and expected to be 1200 in 1982. Exports are the only bright spot.

Sunday Tribune080382

Comment on Went. The £ and \$ have maintained our

competitiveness. Suggested that if they devalue, firms are more likely to borrow abroad.

Irish Times090382

Interest rates could be eased by a devaluation. Durkan's idea that it would give us a competitive edge.

Cork Examiner110382

Yet another appeal to devalue.

Irish Times190382

Top of EMS after Patrick's Day, but lost 1p on £ to 81.15. Basically due to the Franc. Haughey has been denying categorically a devaluation recently.

Improved trade performance in February.

Irish Times190382

£ tumbles against the \$: there are rumours of a Franc devaluation.

Sunday Press26 0382

EEC urges devaluation for farmers: It was Dalsager last night.

Irish Times290382

Goodbody and Wilkinson say that Haughey's denial of devaluation is unrealistic.

Irish Times0504 82

IFA pushing for a devaluation.

Irish Press0704 82

IFA stepping up the devaluation campaign.

Irish Press1504 82

Irish Banking Review says that devaluation is imminent - argued in terms of different inflation rates- say that a devaluation and a pay policy are necessary - otherwise, there will be serious implications for the economy.

Cork Examiner2204 82

(Farming Examiner)Devaluation still on say the experts.

Punt to be devalued? Maintain that they have exclusive information that it will be devalued by 5%.

Irish Times2804 82

Joe McCartin urges a 10% devaluation.

Irish Press2904 82

Sank from 82.5 to 82.3- no movement in the EMS:

Irish Press2804 82

Brokers expect an EMS realignment - Phillips and Drew (monthly market review) say that the DM will revalue.

Sunday Tribune2504 82

Condon (CTT) reckons that a devaluation will be of little help. Beverage and Tobacco exports increased 50% due to Cream Liqueurs: Chemicals increased 54%: there is talk of attempts to establish a trading company.

Irish Times260482

Phillips and Drew report suggests devaluation.

Irish Times080582

Realignment of the EMS won't change the Punt according to the Lloyds Bank 'International Financial Outlook'.

Irish Times290582

IFA will have a meeting on inflation and the exchange rate on the 10th. of June in Kill , Co. Kildare.

Irish Press0106 82

Problems in exchanging Punts.

Irish Times1206 82

Speculation on realignment is becoming stronger- the French governemnt seems a likely candidate. It is unlikely that the Punt will change.

Irish Times1506 82

Franc was devalued at the week end. The punt wasn't. The Farmers are bitter.

Irish Times160682

Recovered from an all time low against the \$ yesterday. The £ was up because the Falklands is over. Went from 80p to 79.95. Ireland is still high in the EMS.

Irish Times190682

New low against the \$: 1.398.

Irish Times090982

MacSharry scotches devaluation rumours. He considered the Economist (3/9/82) a devious act.

Irish Times270982

Another report from Pettigo: the place is still booming.

Irish Independent151082

O'Malley suggests a dual exchange rate for imports which differentiates between luxuries and productive goods.

Irish Times181082

Colm McCarthy at the CII conference suggests that there is a case for a less ambitious exchange rate policy, and that the current one is decreasing competitiveness.

Irish Times291082

The Punt is doing well in the EMS- Puzzling- but the Central Bank Quarterly Bulletin just out suggests:
Turnaround in the Balance of Payments in the Summer. It was

85mln. in that quarter and so the supply of foreign currency exceeded the demand. There was an inflow of government borrowing in mid August of 440mln. There was a change in the tendency to lead and lag. It has been reversed from being against the pound.

Irish Times111182

IFA wants the parties to pledge a devaluation of about 10%

Irish Times161182

The Punt is seen as overvalued in the EMS according to Panmure Gordon (London S-broker).

Current foreign debt = \$2000 per capita.

Foreign borrowing in 1981 was 13% of GDP. (3% in 1978).

Irish Times061282

No devaluation since 1979. A lot of it is due to the Mark being out of fashion, but now the \$ and £ being reassessed - if it does, there will be pressure on the Punt to devalue. Last Friday, the Punt began to fall in the EMS and heavy selling pressure was reported. £=83.6- cheap rate and \$=1.375

Irish Press291282

The Irish Exporters association would like a devaluation. They also claim that the recent increase in PRSI has hit exporters.

Irish Times291282

Patrick McEvoy, (M.D., Irish Intercontinental Bank) attributes

the tightness in the Dublin market to the low £ and \$ and due to importers speeding up payments and export receipts being delayed. Also the realignment rumours are leading to refinancing in Irish pounds. There is a correlation between a weak £ and short run Irish interest rates.

Irish Times080183

The bulk of finance to date has been in Europe and now they are moving to the US and Japan: got a AA rating in Japan, the same as Denmark. Issued a Samurai Bond, but the difference between a AA and a AAA rating is only .1%. This is a shame since Irish borrowing decreased by 20% in real terms last year and should fall further this year. In recent months some Irish deals not taken up. But, the Japs were in Ireland last October, an unfavourable time.

Foreign borrowing=10% of GNP in 1982=1148mln. (12.8% in 1981)

The Balance of Payments deficit is expected to be 800mln.

Expect 6.5% foreign borrowing this year i.e. 800 mln. and of this 330mln. has already been raised.

Irish Press040183

In 1979, there was a .6% fall in the value of the £, in 1980 there was a 4% fall in value and in 1981 a 8.5% fall. Last year was the best year yet, with a .08% increase and it was 86.63p at the weekend. But now the focus is on the Punt within the EMS but most of our trade is in \$ or £.

Irish Times070183

Up to 87.88p yesterday. £ was down because OPEC can't agree on oil prices: this will decrease our exports, but make imports cheaper. It will also lead to more people going shopping in the North.

Irish Times110183

The Punt is up to 89.13p and the £ fell to 1.6\$. The punt weakened against all the EMS currencies except the DM.

Irish Times030183

Cashman resigned yesterday from the board of the Central Bank. Bruton is against devaluation because it will increase inflation. Conellan would prefer to contain inflation, than see devaluation. Condon is anti devaluation because he says that it had the opposite effect when we entered the EMS: there was less export growth in GB and UK exports to Ireland increased at a faster rate.

Meanwhile, in a statement attacking a number of British Food exporters who were trying to put up their prices on top of profits gained from the punt's rise against sterling, Quinnsworth the supermarket chain said that Irish consumers were not getting the benefits of the rise at a time when they needed it most.

Irish Independent150183

The IR£ is precariously close to the EMS bands limit; just inside the 1.125 band. The Central Bank is intervening and says that demand for the Punt has decreased. Also forward cover has been

reduced from 30 to 15 days ahead. There is selling in DM because of election fears. There are also election fears with the UK £.

Irish Times170183

AIB like government policy in their latest economic review and say that the key is the £-\$ rate which is a function of oil prices and US interest rates.

Irish Press190183

There are realignment fears after the punt slump. The Central Bank is lending substantial support. 88.19p. Expectations of a devaluation by the end of February.

Irish Times210183

Fears of a devaluation have been allayed by the increase in reserves of 167 mln. It is possible that the Central Bank is intervening and pursuing a tactic of keeping the punt lowest in the EMS (the Belgians do this regularly): also the Cabinet, the CII and CTT are opposed to a devaluation. The only possibility may be a CDU victory in Germany. The last realignment was on 14/6/82. There was a 80mln. Balance of Payments deficit in the last quarter.

Government foreign borrowing has decreased but SSB borrowing has increased.

Irish Times240183

Farmers should be pleased that input prices have decreased but

that output prices have remained the same, but they want a devaluation.

A devaluation will lead to a once and for all change in relative prices if and only if Ireland were a relatively closed economy. But Ireland is extremely open, (35% of expenditure is on imports) and this makes us susceptible to foreign inflation.

The Irish experience in the last four years suggests that it is only a short run solution. CTT stresses design, marketing, efficiency and ability to meet delivery dates as well as price.

The only solution is a prices and incomes policy. The NPC should check that import savings are passed on and there should be minor indirect taxes. However the ICTU are anti incomes policy.

Irish Times270183

E. Regan (chief exec of the Irish Meat exporters association) says that the fall in £ is affecting Irelands 35mln. sheepmeat trade - UK lamb is displacing Irish lamb in France.

Irish Press280183

There was a 250mln. outflow last year (it's unexplained, and amounted to 400 mln. at one stage) according to s-brokers Maguire McCann Morrison - they maintain that it is due to short run speculation against the punt devaluing and attempts by business to cover the exchange risk. They point out that:

The Irish German Inflation differential since 1979 has been 48% but the punt has only devalued 14% against the DM in that period.

Foreign borrowing =51% of GNP

There is leading and lagging speculation of 250mln. and forward cover.

Irish Times280183

Maguire and co. predict decreasing interest rates if the punt devalues.

Irish Independent280183

Maguire and co. see the use of leading and lagging as an explanation of the restriction of forward cover from 30 to 15 days.

Irish Press190283

Devalue to compete says Prof. Walsh. (Marketing Society yesterday)

Irish Times220283

Yesterday it was at 90.19. Up further next week?- given the uncertainty on oil prices.

Irish Times230283

90.74p. Oil price uncertainty. Lying 6th. in the EMS. Pressure on Gold because if oil prices go down it will lead to Arab gold sales.

Irish Times010383

Central Bank forecasts a 500mln. Balance of Payments deficit for

the year and good news on oil and interest rates and gold is down. The punt was stronger in the EMS.

Irish Times050383

£ weak and the punt at a new high of 91.5p due to the general election and the OPEC meeting.

Irish Times020383

The rush out of gold is easing. It was a 100\$ down last week. Sterling is at a new low against the \$. 90.16p

Irish Times110383

EMS realignment rumour. Dealers agree that there will be a realignment but the question is when.

Also the french elections mean it might happen by mid April.

Business men are concerned about the high £ rate but the Punt is sustainable at the moment.

Irish Independent110383

Brendan Walsh says that the government must consider devaluation.

Irish Times 120383

The Central Bank is supporting the Punt in the EMS but the Punt is at 92p. Irish businesses are making moves into the stronger EMS currencies. Also the Central Bank are not doing anymore Euro£ authorisations by phone, and only by post.

Irish Times150383

Davy Kelleher McCarthy recommend a 10% devaluation - the report was commissioned by some (un named) business and agricultural interests.

10% devaluation would increase employment by 16000 in 2 years and increase industrial exports by 3.5% in 2 years. But, they stressed that there was very little empirical research in this area in Ireland.

CII made a statement on the DKM report - they are concerned that 40% of trade is with the UK and outside the US. Really need control and the elimination of self imposed inflationary pressures.

Irish Times180383

Brendan Lynch- economist with CRH- argues that the government should go for the 6% rather than the 2.25% band and that this would allow more flexibility against £.

Irish Times190383

The IFA makes a devaluation appeal. Bord Baine (Brian Joyce, MD) mentions the effects of the Punt on sales in GB and this has led to a decrease in Creamery prices. But also mentions that there is a lot of overseas competition.

Irish Times210383

Garret announces a 4-5% devaluation against the £ yesterday. All foreign exchange is suspended today in Ireland because the French government is in turmoil. All the other EMS exchanges

are closed too. Likely effects.

The increase in oil prices due to devaluation may affect Dukes' hopes of raising 15mln. in increased excise duties due to the OPEC cut.

It will increase debt service costs. 80% of debt is in \$ or DM. and the debt will increase by about 400mln. and the debt service costs by about 40 mln.

Manufacturing companies, agriculture and tourism should benefit.

60% of imports are for further production and the cost of these imports will increase by about 5%.

Inflation will be increased to about 12% whereas previously it was in single figures (9%?).

This in turn will make a moderate pay round all the more difficult.

It will increase the budget deficit and lead to a tightening of the central bank guidelines.

There should be a big gain in the German and UK export markets. [19-3-85: this presupposes that exports are to unrelated firms.]

DKM estimate an increase in employment.

DKM estimate that it should increase farm incomes by 3.25%

Interest rates will decrease because of a decrease in speculative pressure.

Irish Times220383

Fell yesterday to 88.9 and \$1.3095. Farmers say that it is too small. The TWI is down 4.1% (3.8% against the EMS). The DM

went up 5.5% therefore the Punt has gone down 9% against the DM. But, now the punt is trading at the top of its band and it is therefore only 4.6% down against the DM. The devaluation will add 2% to the CPI over the next 6 months.

Irish Times230383

Dukes (in the Dail yesterday hinted at a tax rise to cover the devaluation because it will increase the interest portion of debt service by 17mln. in the current year. Irish holders are converting DMs to Punts and this has led to the DM-Punt rate being above the band. Because of this repatriation, dealers maintain that it may be a month before the exchange rate finds its correct level.

Haughey claims that the devaluation was forced by the international financial community and it displays the lack of confidence by them in Fine Gael. He said that it was unlikely to be of any benefit to anybody other than the farmers, and there were plenty of other ways of helping the farmers. (speaking on 'Day by Day' yesterday).

Irish Times220383

CII say that 60% of imports are materials and therefore moderation will be necessary. It will also increase the price of consumption goods from abroad, and therefore Irish goods will be more competitive. Need a fiscal, monetary and incomes policy.

CTT see the devaluation as a breathing space and the benefit would vary from company to company depending on the export

markets in which firms were operating, the proportion of production costs spent on raw materials, the source of raw materials and the foreign borrowing of companies. Also there are other factors in competitiveness such as quality and delivery dates.

IDA say that it removed the uncertainty.

McCarthy: it wasn't big enough, but at least they devalued.

AIIB (Breda McCarthy)- it was needed to restore competitiveness. There was a calm reaction in the stock market. There was a drop in GB of Irish shares because they involve Punt earnings, but a very low volume was traded. The move was too small for either Jacobs, or Irish Ropes.

Friday 25th, Punt at 89.49.

Irish Times280883

A more coordinated monetary policy is necessary in the EMS.

Irish Times300383

The IR£ is still high.

Irish Times310383

Nicholas Robinson (Vice President of Chase Manhattan) predicts that the Punt is likely to devalue further.

Irish Times270583

Punt at a two year low against £. Its due to the expectation of a Thatcher Victory. Punt = 78.8p. The Punt is resilient in the EMS. 9.4% decrease in the Punt since 210383 using the TWI.

Exporters will benefit but importers will lose out.

Irish Times120483

Mr. G. Byrne (chairman of Dublin Tourism) wants a special exchange rate for tourists- MacNulty (the manager) supports this idea.

Irish Times190483

Punt at 82.25p

Irish Independent240583

Sharp losses for the Punt to 81.58

Irish Independent100883

40% devaluation against the dollar since 1979, and this has increased both the costs of debt service, and import bills.

Irish Times230284

Punt at 79.1

Irish Times060384

ECU travellers cheques are likely- it is the most stable currency in Europe- used in commercial banking and EEC transactions- it is now the third most widely used currency for bond issues after the DM and \$.

Irish Times060384

Because of the EMS realignment, the punt is now at 80.8p

Irish Independent110484

Punt has devalued by 12% in the last year and has given a big boost to competitiveness. It is possible that one option for the national planning board is devaluation.

Irish Independent090584

Down to 1.05\$ at one stage.

Irish Independent090584

Decrease in the dollar will increase the cost of oil supplies.

Irish Independent100584

Recovered to 1.105

Irish Independent040784

Rate now at 1.085

Irish Times130784

New low of 1.076

Irish Times140784

Closed at 1.0825

Irish Times190784

New low of 1.0705

APPENDIX 7

LISTING OF THE BASIC MODEL

In this appendix, a complete listing of the basic model is provided. The numbers on the left hand side of the listing are the row numbers. Ten currencies are assumed. Global information is input in lines 1 to 77. Subsidiary information is input in lines 77 to 280. The remainder of the programme performs the calculations.

- 1 'Pounds'
- 2 'Dollars/Pound'
- 3 'Francs/Pound'
- 4 'DM/Pound'
- 5 'Rand/pound'
- 6 'Punt/Pound'
- 7 'Aus\$/Pound'
- 8 'Peso/Pound'
- 9 'Sing\$/Pound'
- 10 'Peseta/Pound'
- 11 'UK Int Rate'
- 12 '\$ Int Rate'
- 13 'Fr. Int Rate'
- 14 'DM Int Rate'
- 15 'Rand Int Rate'
- 16 'Punt Int Rate'
- 17 'Aus Int Rate'
- 18 'Peso Int Rate'

19 'Sing Int Rate'
20 'Peseta Int Rate'
22 'Transfer Volume'
77;
78 'Transfer Status'
80 'Cover Sales UK'
81 'Cover Sales US'
82 'Cover Sales Fr'
83 'Cover Sales Ge'
84 'Cover Sales SA'
85 'Cover Sales Ir'
86 'Cover Sales Au'
87 'Cover Sales Me'
88 'Cover Sales Si'
89 'Cover Sales Sp'
90 'Cover Costs UK'
91 'Cover Costs US'
92 'Cover Costs Fr'
93 'Cover Costs Ger'
94 'Cover Costs SA'
95 'Cover Costs Irl'
96 'Cover Costs Aus'
97 'Cover Costs Mex'
98 'Cover Costs Sing'
99 'Cover Costs Sp'
100 'Currency Number'
101 'Intrate Number'
102 'Export UK'

103 'Export US'
104 'Export FR'
105 'Export Ger'
106 'Export SA'
107 'Export Irl'
108 'Export Aus'
109 'export Mex'
110 'Export Sing'
111 'Export Sp'
120 'Unitvc UK'
121 'Unitvc US'
122 'Unitvc Fr'
123 'Unitvc Ger'
124 'Unitvc SA'
125 'Unitvc Irl'
126 'Unitvc Aus'
127 'Unitvc Mex'
128 'Unitvc Sing'
129 'Unitvc Sp'
130 'Fc UK'
131 'Fc US'
132 'fc Fr'
133 'Fc Ger'
134 'Fc SA'
135 'Fc Ir'
136 'Fc Au'
137 'Fc Me'
138 'Fc Si'

139 'Fc Sp'
148 'Budvol'
149 'unitvc'
150 'fc'
151 'orderlead'
152 'purchlag'
153 'pay lag'
154 'debtorlag'
155 'FC Lag'
160 'Price'
170 'Expcurr UK'
171 'Expcurr US'
172 'Expcurr Fr'
173 'Expcurr Ger'
174 'Expcurr SA'
175 'Expcurr Irl'
176 'Expcurr Aus'
177 'Expcurr Mex'
178 'Expcurr Sing'
179 'Expcurr Sp'
180 'Impcurr UK'
181 'Impcurr US'
182 'Impcurr Fr'
183 'Impcurr Ger'
184 'Impcurr SA'
185 'Impcurr Irl'
186 'Impcurr Aus'
187 'Impcurr Mex'

188 'Impcurr Sing'
189 'Impcurr Sp'
190 'Fc curr UK'
191 'Fc curr US'
192 'Fc curr Fr'
193 'Fc curr Ge'
194 'Fc curr SA'
195 'Fc curr Irl'
196 'Fc curr Aus'
197 'Fc curr Mex'
198 'Fc curr Sing'
199 'Fc curr Sp'
200 'Senpri UK'
201 'Senpri US'
202 'Senpri Fr'
203 'Senpri Ger'
204 'Senpri SA'
205 'Senpri Irl'
206 'Senpri Aus'
207 'Senpri Mex'
208 'Senpri Sing'
209 'Senpri Sp'
210 'Senvc UK'
211 'Senvc US'
212 'Senvc Fr'
213 'Senvc Ger'
214 'Senvc SA'
215 'Senvc Irl'

216 'Senvc Aus'
217 'Senvc Mex'
218 'Senvc Sing'
219 'Senvc Sp'
220 'Senfc UK'
221 'Senfc US'
222 'Senfc Fr'
223 'Senfc Ger'
224 'Senfc SA'
225 'Senfc Irl'
226 'Senfc Aus'
227 'Senfc Mex'
228 'Senfc Sing'
229 'Senfc Sp'
230 'senvol UK'
231 'Senvol US'
232 'Senvol Fr'
233 'Senvol Ger'
234 'Senvol SA'
235 'Senvol Irl'
236 'Sevol Aus'
237 'Senvol Mex'
238 'Senvol Sing'
239 'Senvol Sp'
240 'Wc UK'
241 'Wc US'
242 'Wc Fr'
243 'Wc Ger'

244 'We SA'
245 'We Irl'
246 'We Aus'
247 'We Mex'
248 'We Sing'
249 'We Sp'
250 'Debt UK'
251 'Debt US'
252 'Debt Fr'
253 'Debt Ger'
254 'Debt SA'
255 'Debt Irl'
256 'Debt Aus'
257 'Debt Mex'
258 'Debt Sing'
259 'Debt Sp'
260 'FA UK'
261 'FA US'
262 'FA Fr'
263 'FA Ger'
264 'FA SA'
265 'FA Irl'
266 'FA Aus'
267 'FA Mex'
268 'FA Sing'
269 'Fa Sp'
270 'Stock (units)'
271 'Debtor'

```

272 'Creditor'
278;
279 'currency' = "Currency Number"
280 groupdiv ('Pounds','Peseta/Pound','currency',281)
291 'Pound Change' = 281/281lag1.
292 'Dollar Change' = 282/282 lag 1.
293 'Franc Change' = 283/283 lag 1.
294 'Dm Change' = 284/284 lag 1.
295 'Rand Change' = 285/285 lag 1.
296 'Punt Change' = 286/286 lag 1.
297 'Aus$ Change' = 287/287 lag 1.
298 'Peso Change' = 288/288 lag 1.
299 'Sing$ Change' = 289/289 lag 1.
300 'Peseta Change' = 290/290 lag 1.
301 groupsub('Pound Change','Peseta Change',1.,'Pound Change')
302 'Cum Pound Change' = ((281col1./281)-1.) for 2. to 25.
303 'Cum Dollar Change' =((282col1./282)-1.) for 2. to 25.
304 'Cum Franc Change' = ((283col1./283)-1.) for 2. to 25.
305 'Cum DMark Change' = ((284col1./284)-1.) for 2. to 25.
306 'Cum Rand Change' = ((285col1./285)-1.) for 2. to 25.
307 'Cum Punt Change ' = ((286col1./286)-1.) for 2. to 25.
308 'Cum Aus$ Change' = ((287col1./287)-1.) for 2. to 25.
309 'Cum Peso Change ' = ((288col1./288)-1.) for 2. to 25.
310 'Cum Sing$ Change' = ((289col1./289)-1.) for 2. to 25.
311 'Cum Peseta Change'= ((290col1./290)-1.) for 2. to 25.
312 groupmult('Cum Pound Change','Cum Peseta Change','senvol
      UK',333,'Pounds')
313 groupadd(333,342,1.,333)

```

```

314 groupmult(333,342,'Budvol',333)
315 groupmult(333,342,'Export UK',333,'Pounds')
316 groupmult('Impeurr UK','Impeurr Sp','Cum Pound
Change',323,'Pounds')
317 'Translated VC' = 'unitvc'*('Pounds'+(323sum332))
318 groupmult('Fc curr UK','Fc curr Sp','Cum Pound Change',323,
'Pounds')
319 'Translated FC' = 'fc'*('Pounds'+(323sum332))
320 groupmult('Expeurr UK','Expeurr Sp','Cum Pound Change',323,
'Pounds')
322;if('Transfer Status'eq2.)'Volume'='Transfer Volume'
344 'Volume' = 'Volume' + (333 sum 342)
345 'Order Vol.' = ('Budvol'lead'orderlead')+('Volume'-'Budvol')
346 'Purchase Vol.'=('Budvol'lead('orderlead'-'purchlag'))+
('Volume'lag'purchlag '-'Budvol'lag'purchlag')
347 if('Transfer Status'eq2.) clear ('Transfer Volume')
348 if('Transfer Status'eq1.) 'Transfer Volume'='Transfer
Volume'+ 'Order Vol.'
349 'TPrice' = 'Price'*('Pounds'+(323sum332))
350 groupmult('Cum Pound Change','Cum Peseta Change','Senpri
UK',353,'Pounds')
351 groupadd(353,362,1.,353)
352 groupmult(353,362,'ExportUK',353,'Pounds');
groupmult(353,362,'Volume',353)
363 groupmult(353,362,'TPrice',353)
364 'Sales' = 353 sum 362
365 groupmult ('Cum Pound Change','Cum Peseta Change','Senvc
UK',368,'Pounds')

```

```

366 groupadd(368,377,1.,368)
367 groupmult(368,377,'Unitvc UK',368,'Pounds')
378 groupmult(368,377,'Translated VC',368)
379 'Unit Var. Cost' = 368 sum 377
380 groupmult('Cum Pound Change','Cum Peseta Change','Senfc UK',
      383,'Pounds')
381 groupadd(383,392,1.,383)
382 groupmult(383,392,'Fc UK',383,'Pounds')
393 groupmult(383,392,'Translated FC',383)
394 'Total Fixed Costs' = 383 sum 392
395 'Total Costs'='Total Fixed Costs'+('Unit Var. Cost'*'Volume')
396 groupmult('Debt UK','Debt Sp','UK Int Rate',403,'Pounds')
397 groupdiv(403,412,281,413,'Pounds')
398 'interest' = 413 sum 422
399 clear(403,412)
401 'Interest Rate' = 'Pounds'+ "Intrate Number"
402 groupadd('UK Int Rate','Peseta Int Rate',1.,403);
      groupdiv(403,412,'Interest Rate',403,'Pounds')
424 'CF UK' = ('Sales' lag'debtorlag'*'Expcurr UK')-('Purchase
      Vol.'lag'pay lag' *'Unit Var. Cost'*'Impcurr UK')-('Total
      Fixed Costs'lag'FC Lag'*'Fc curr UK')-41 3
425 'CF US' = ('Sales' lag'debtorlag'*'Expcurr US')-('Purchase
      Vol.'lag'pay lag' *'Unit Var. Cost'*'Impcurr US')-('Total
      Fixed Costs'lag'FC Lag'*'Fc curr US')-41 4
426 'CF FR' = ('Sales' lag'debtorlag'*'Expcurr Fr')-('Purchase
      Vol.'lag'pay lag' *'Unit Var. Cost'*'Impcurr Fr')-('Total
      Fixed Costs'lag'FC Lag'*'Fc curr Fr')-41 5
427 'CF GE' = ('Sales' lag'debtorlag'*'Expcurr Ger')-('Purchase

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Vol.'lag'pay lag '*Unit Var. Cost'*Impcurr Ger')-(Total
 Fixed Costs'lag'FC Lag'*Fc curr Ge')- 416

428 'CF SA' = ('Sales' lag'debtorlag'*Expcurr SA')-(Purchase
 Vol.'lag'pay lag' '*Unit Var. Cost'*Impcurr SA')-(Total
 Fixed Costs'lag'FC Lag'*Fc curr SA')-41 ***

429 'CF Ir' = ('Sales' lag'debtorlag'*Expcurr Irl')-(Purchase
 Vol.'lag'pay lag' '*Unit Var. Cost'*Impcurr Irl')-(Total
 Fixed Costs'lag'FC Lag'*Fc curr Irl') -418

430 'CF Au' = ('Sales' lag'debtorlag'*Expcurr Aus')-(Purchase
 Vol.'lag'pay lag' '*Unit Var. Cost'*Impcurr Aus')-(Total
 Fixed Costs'lag'FC Lag'*Fc curr Aus') -419

431 'CF Me' = ('Sales' lag'debtorlag'*Expcurr Mex')-(Purchase
 Vol.'lag'pay lag' '*Unit Var. Cost'*Impcurr Mex')-(Total
 Fixed Costs'lag'FC Lag'*Fc curr Mex') -420

432 'CF Si' = ('Sales' lag'debtorlag'*Expcurr Sing')-(Purchase
 Vol.'lag'pay la g'*Unit Var. Cost'*Impcurr Sing')-(Total
 Fixed Costs'lag'FC Lag'*Fc curr Sin g')-421

433 'CF Sp' = ('Sales' lag'debtorlag'*Expcurr Sp')-(Purchase
 Vol.'lag'pay lag' '*Unit Var. Cost'*Impcurr Sp')-(Total
 Fixed Costs'lag'FC Lag'*Fc curr Sp')-42 2

434 'fxsaUK'='Sales'lag'debtorlag'*Expcurr UK'lag'debtorlag'
 (1.-((1.-'Cover Sa les UK')((281lag'debtorlag'/281)))+
 ('Cover Sales UK'*403lag'debtorlag'power-'de btorlag'))

435 'fxsaUS'='Sales'lag'debtorlag'*Expcurr US'lag'debtorlag'
 (1.-((1.-'Cover Sa les US')((282lag'debtorlag'/282)))+
 ('Cover Sales US'*404lag'debtorlag'power-'de btorlag'))

436 'fxsaFR'='Sales'lag'debtorlag'*Expcurr Fr'lag'debtorlag'
 (1.-((1.-'Cover Sales Fr')((283lag'debtorlag'/283)))+

('Cover Sales Fr'#405lag'debtorlag'power-'de btorlag'))
 437 'fxsaGE'='Sales'lag'debtorlag'*'Expcurr Ger'lag'debtorlag'
 (1.-((1.-'Cover Sales Ge')((284lag'debtorlag'/284)))+
 ('Cover Sales Ge'#406lag'debtorlag'power-'d ebtorlag'))
 438 'fssaSA'='Sales'lag'debtorlag'*'Expcurr SA'lag'debtorlag'
 (1.-((1.-'Cover Sales SA')((285lag'debtorlag'/285)))+
 ('Cover Sales SA'#407lag'debtorlag'power-'de btorlag'))
 439 'fxsaIR'='Sales'lag'debtorlag'*'Expcurr Irl'lag'debtorlag'
 (1.-((1.-'Cover Sales Ir')((286lag'debtorlag'/286)))+
 ('Cover Sales Ir'#408lag'debtorlag'power-'debtorlag'))
 440 'fxsaAU'='Sales'lag'debtorlag'*'Expcurr Aus'lag'debtorlag'
 (1.-((1.-'Cover Sales Au')((287lag'debtorlag'/287)))+
 ('Cover Sales Au'#409lag'debtorlag'power-'debtorlag'))
 441 'fxsaME'='Sales'lag'debtorlag'*'Expcurr Mex'lag'debtorlag'
 (1.-((1.-'Cover Sales Me')((288lag'debtorlag'/288)))+
 ('Cover Sales Me'#410lag'debtorlag'power-'debtorlag'))
 442 'fxsaSI'='Sales'lag'debtorlag'*'Expcurr Sing'lag'debtorlag'
 (1.-((1.-'Cover Sales Si')((289lag'debtorlag'/289)))+
 ('Cover Sales Si'#411lag'debtorlag'power-'debtorlag'))
 443 'fxsaSP'='Sales'lag'debtorlag'*'Expcurr Sp'lag'debtorlag'
 (1.-((1.-'Cover Sales Sp')((290lag'debtorlag'/290)))+
 ('Cover Sales Sp'#412lag'debtorlag'power-'debtorlag'))
 444 'fxvcUK'='Purchase Vol.'lag'pay lag'*'Unit Var. Cost'
 '*'Impcurr UK'lag'pay la g'*(1.-((1.-'Cover Costs UK')*
 ((281lag'pay lag'/281)))+('Cover Costs UK'
 '#403lag' pay lag'power-'pay lag'))
 445 'fxvcUS'='Purchase Vol.'lag'pay lag'*'Unit Var. Cost'
 '*'Impcurr US'lag'pay la g'*(1.-((1.-'Cover Costs US')*

$((282 \text{lag}' \text{pay lag}' / 282)) + (' \text{Cover Costs US}' * 404 \text{lag}'$
 $\text{pay lag}' \text{power} - ' \text{pay lag}')$

446 'fxvcFR' = 'Purchase Vol.'lag'pay lag' * 'Unit Var. Cost'
 * 'Impcurr Fr'lag'pay lag' * $(1 - ((1 - ' \text{Cover Costs Fr}')) *$
 $((283 \text{lag}' \text{pay lag}' / 283)) + (' \text{Cover Costs Fr}' * 405 \text{lag}'$
 $\text{pay lag}' \text{power} - ' \text{pay lag}')$

447 'fxvcGE' = 'Purchase Vol.'lag'pay lag' * 'Unit Var. Cost'
 * 'Impcurr Ger'lag'pay lag' * $(1 - ((1 - ' \text{Cover Costs Ger}')) *$
 $((284 \text{lag}' \text{pay lag}' / 284)) + (' \text{Cover Costs Ger}' * 406 \text{lag}'$
 $\text{pay lag}' \text{power} - ' \text{pay lag}')$

448 'fxvcSA' = 'Purchase Vol.'lag'pay lag' * 'Unit Var. Cost'
 * 'Impcurr SA'lag'pay lag' * $(1 - ((1 - ' \text{Cover Costs SA}')) *$
 $((285 \text{lag}' \text{pay lag}' / 285)) + (' \text{Cover Costs SA}' * 407 \text{lag}'$
 $\text{pay lag}' \text{power} - ' \text{pay lag}')$

449 'fxvcIR' = 'Purchase Vol.'lag'pay lag' * 'Unit Var. Cost'
 * 'Impcurr Irl'lag'pay lag' * $(1 - ((1 - ' \text{Cover Costs Irl}')) *$
 $((286 \text{lag}' \text{pay lag}' / 286)) + (' \text{Cover Costs Irl}' * 408 \text{lag}'$
 $\text{pay lag}' \text{power} - ' \text{pay lag}')$

450 'fxvcAU' = 'Purchase Vol.'lag'pay lag' * 'Unit Var. Cost'
 * 'Impcurr Aus'lag'pay lag' * $(1 - ((1 - ' \text{Cover Costs Aus}')) *$
 $((287 \text{lag}' \text{pay lag}' / 287)) + (' \text{Cover Costs Aus}' * 409 \text{lag}'$
 $\text{pay lag}' \text{power} - ' \text{pay lag}')$

451 'fxvcME' = 'Purchase Vol.'lag'pay lag' * 'Unit Var. Cost'
 * 'Impcurr Mex'lag'pay lag' * $(1 - ((1 - ' \text{Cover Costs Mex}')) *$
 $((288 \text{lag}' \text{pay lag}' / 288)) + (' \text{Cover Costs Mex}' * 410 \text{lag}'$
 $\text{pay lag}' \text{power} - ' \text{pay lag}')$

452 'fxvcSI' = 'Purchase Vol.'lag'pay lag' * 'Unit Var. Cost'
 * 'Impcurr Sing'lag'pay lag' * $(1 - ((1 - ' \text{Cover Costs Sing}')) *$

((289lag'pay lag'/289)))+('Cover Costs Sing'*4 11lag'
 pay lag'power-'pay lag'))

453 'fxvcSP'='Purchase Vol.'lag'pay lag'*'Unit Var. Cost'
 '*Impcurr Sp'lag'pay la g'*(1.-((1.-'Cover Costs Sp')*
 ((290lag'pay lag'/290)))+('Cover Costs Sp'*412lag'
 pay lag'power-'pay lag'))

454 'fxfcUK'='Total Fixed Costs'lag'FC Lag'*'Fc curr UK
 'lag'FC Lag'*(1.-((1.-'Co ver Costs UK')*((281lag'FC Lag'
 /281)))+('Cover Costs UK'*403lag'FC Lag'power-'FC Lag'))

455 'fxfcUS'='Total Fixed Costs'lag'FC Lag'*'Fc curr US
 'lag'FC Lag'*(1.-((1.-'Co ver Costs US')*((282lag'FC Lag'
 /282)))+('Cover Costs US'*404lag'FC Lag'power-'FC Lag'))

456 'fxfcFR'='Total Fixed Costs'lag'FC Lag'*'Fc curr Fr
 'lag'FC Lag'*(1.-((1.-'Co ver Costs Fr')*((283lag'FC Lag'
 /283)))+('Cover Costs Fr'*405lag'FC Lag'power-'FC Lag'))

457 'fxfcGE'='Total Fixed Costs'lag'FC Lag'*'Fc curr Ge
 'lag'FC Lag'*(1.-((1.-'Co ver Costs Ger')*((284lag'FC Lag'
 /284)))+('Cover Costs Ger'*406lag'FC Lag'power-' FC Lag'))

458 'fxfcSA'='Total Fixed Costs'lag'FC Lag'*'Fc curr SA
 'lag'FC Lag'*(1.-((1.-'Co ver Costs SA')*((285lag'FC Lag'
 /285)))+('Cover Costs SA'*407lag'FC Lag'power-'FC Lag'))

459 'fxfcIR'='Total Fixed Costs'lag'FC Lag'*'Fc curr Irl
 'lag'FC Lag'*(1.-((1.-'Cover Costs Irl')*((286lag'FC Lag'
 /286)))+('Cover Costs Irl'*408lag'FC Lag'power- 'FC Lag'))

460 'fxfcAU'='Total Fixed Costs'lag'FC Lag'*'Fc curr Aus
 'lag'FC Lag'*(1.-((1.-'Cover Costs Aus')*((287lag'FC Lag'
 /287)))+('Cover Costs Aus'*409lag'FC Lag'power -'FC Lag'))

461 'fxfcME'='Total Fixed Costs'lag'FC Lag'*'Fc curr Mex

'lag'FC Lag'*(1.-((1.- 'Cover Costs Mex')*((288lag'FC Lag'
 /288))))+('Cover Costs Mex'*410lag'FC Lag'power -'FC Lag'))
 462 'fxfcSI' = 'Total Fixed Costs'lag'FC Lag' * 'Fc curr Sing
 'lag'FC Lag'*(1.-((1.- 'Cover Costs Sing')*((289lag'FC Lag'
 /289))))+('Cover Costs Sing'*411lag'FC Lag'power-'FC Lag'))
 463 'fxfcSP' = 'Total Fixed Costs'lag'FC Lag' * 'Fc curr Sp'
 lag'FC Lag'*(1.-((1.- 'Cover Costs Sp')*((290lag'FC Lag'
 /290))))+('Cover Costs Sp'*412lag'FC Lag'power-'FC Lag'))
 464 groupsub ('fxsaUK', 'fxsaSP', 'fxvcUK', 510, 'Pounds')
 465 groupsub ('fxfcUK', 'fxfcSP', 510, 466, 'Pounds')
 477 'FX G/L trading' = 466sum475
 478 groupdiv('Debt UK', 'Debt Sp', 281, 523, 'Pounds')
 479 groupmult(523, 532, 'Pound Change', 480, 'Pounds')
 501 'FX G/L Debt' = for 2. to 25. 480 sum 489
 503 groupmult('Price', 169, 'Export UK', 504, 'Pounds')
 515 'Cash Flow' = 'FX G/L trading'+('CF UK'sum'CF Sp')
 516 'cum Cash Flow'='Cash Flow'thru25.
 517 'cum Purch Vol'='Purchase Vol.'thru25.
 518 'cum Sales Vol'='Volume'thru25.
 519 'purch-sales vol' = 'cum Purch Vol'-'cum Sales Vol'
 520 'opening WC'='Wc UK'sum'Wc Sp'
 521 'closing WC'='opening WC'+ 'closing WC'lag1.+ 'Cash Flow'
 +'Interest on WC'
 522 'Interest on WC' = "Intrate Number"*'closing WC'
 605 'Unit VC (B)' = 'unitvc'
 606 'Unit VC (A)' = 'Unit Var. Cost'
 607 'Volume(B)'='Budvol'
 608 'Volume(A)'='Volume'

609 'Stock Units' = 'Stock (units)'+ 'Stock Units'lag1.
 + 'Purchase Vol.'- 'Volume'
 611 'Sales(B)' = (504sum513)* 'Volume(B)'
 612 'Variable Cost(B)' = 'Budvol'* 'unitvc'
 613 'Fixed Cost(B)' = 'fc'
 614 'Profit(B)' = 'Sales(B)'- 'Variable Cost(B)'- 'Fixed Cost(B)'
 615 'Sales(A)' = 'Sales'
 616 'Variable Costs(A)' = 'Unit Var. Cost'* 'Volume'
 617 'Fixed Cost(A)' = 'Total Fixed Costs'
 618 'Profit (A)' = 'Sales(A)'- 'Variable Costs(A)'- 'Fixed Cost(A)'
 619 'Fx G/L - trad trade' = 'FX G/L trading'
 620 'Profit less FX' = 'Profit (A)'+ 'FX G/L trading'
 621 'Debt Interest' = 'interest'
 622 'Interest on WC' = 'Interest on WC'
 624 'Net Profit' = 'Profit less FX'- 'Debt Interest'
 + 'Interest on WC'
 625 'Fixed Assets' = 'FA UK'sum'Fa Sp'
 626 'Stock' = 'Stock Units'* 'Unit VC (A)'
 627 'Debtors' = 'Debtor'+ 'Debtors'lag1.+ 'Sales'
 - 'Sales'lag'debtorlag'
 628 'Liquid Assets' = 'closing WC'
 629 'Total Assets' = 'Fixed Assets'sum'Liquid Assets'
 630 'Creditors' = 'Creditor'+ 'Creditors'lag1.+604+'Total Fixed
 Costs'-604lag'pay 1 ag'- 'Total Fixed Costs'lag'FC Lag'
 631 'Debt' = 523sum532
 632 'Liabilities' = 'Creditors'+ 'Debt'
 633 'Revenue Reserve' = 'Net Profit'+ 'Revenue Reserve'lag1.
 634 'G/L - Debt' = 'FX G/L Debt'

635 'G/L - Stock'='Stock Units'lag1.

*('Unit VC (A)('-Unit VC (A)'lag1.)

636 'Equity'='Total Assets'-('Debt'sum'G/L - Stock')

APPENDIX 8

TESTS OF THE DECISION SUPPORT MODEL

In this appendix some tests and results from the decision support model are summarised and reported. The aim of these tests is to demonstrate the integrity of the model.

Test 1: The Base Case

This test examines the integrity of the model, when exchange rates are constant. Data is as follows:

Currencies constant: 1,u,x1: 2,u,x2

Interest rates constant : 11,u,x.01: 12,u,x.011

No transfers or forward cover.

Currency Number: 100,u,x2

Interest Number: 101,u,x12

Export 50% : 102,u,x.5

Unit Var. Cost : 120,u,x.5: 121,u,x.5

Fixed Cost : 130,u,x.2: 131,u,x.8

Budget Volume : 148,u,x100

Unit Var Cost : 149,u,x40

Fixed Cost : 150,u,x2000

All leads and lags set to zero.

Prices : 160,u,x70: 161,u,x70

Export Currency: 170,u,x.5: 171,u,x.5

Import Currency: 180,u,x.5: 181,u,x.5

F.Cost Currency: 190,u,x.2: 191,u,x.8

All sensitivity variables are assumed to be zero.

Working Capital and opening stocks are assumed to be zero.

Debt : 251,u,x5000

Fixed Assets : 261,u,x8000

Aim of Test

To demonstrate that monthly cash flows and profits are constant when sales and costs are constant, there are no time lags, and exchange rate changes are zero.

Result of Test

It may be seen in Table A8.1 that if exchange rates do not change, none of the figures are effected.

Test 2: Effect of Variable Exchange Rates

Data were as follows.

Currencies variable: 1,u,x1: 2,u,(series of values see Table A8.2)

Int rates constant : 11,u,x.01: 12,u,x.011

No transfers or forward cover.

Currency Number: 100,u,x2

Interest Number: 101,u,x12

Export 50% : 102,u,x.5

Unit Var. Cost : 120,u,x.5: 121,u,x.5

Fixed Cost : 130,u,x.2: 131,u,x.8

Budget Volume : 148,u,x100

Unit Var Cost : 149,u,x40

Fixed Cost : 150,u,x2000

All leads and lags set to zero.

Prices : 160,u,x70: 161,u,x70

Export Currency: 170,u,x.5: 171,u,x.5

Import Currency: 180,u,x.5: 181,u,x.5

F. Cost Currency: 190,u,x.2: 191,u,x.8

All sensitivity variables are assumed to be zero.

Working Capital and opening stocks are assumed to be zero.

Debt : 251,u,x5000

Fixed Assets : 261,u,x8000

Aim of Test

To demonstrate that the calculation of the translated costs and sales is correct. For example in April.

Budget Sales = \$7000 and Sterling Invoices = 50%

Therefore,

Actual Sales = \$3500 + (50 units * \$70/2*1.4)
= \$5950

Result of Test

It may be seen in Table A8.2 that when exchange rates fluctuate, both costs and revenues are affected by exchange rate changes. There are no foreign exchange gains and losses. Finally, costs

revenues and sales correctly reflect the exchange rate change.

Test 3: Effects of Time Lags

In this test, the effects of a time lag of one month on foreign exchange gains and losses are examined. Data is similar to the previous test, except that a debtor lag exists.

Currencies variable: 1,u,x1: 2,u,(series of values see Table 2)

Int rates constant : 11,u,x.01: 12,u,x.011

No transfers or forward cover.

Currency Number: 100,u,x2

Interest Number: 101,u,x12

Export 50% : 102,u,x.5

Unit Var. Cost : 120,u,x.5: 121,u,x.5

Fixed Cost : 130,u,x.2: 131,u,x.8

Budget Volume : 148,u,x100

Unit Var Cost : 149,u,x40

Fixed Cost : 150,u,x2000

All leads and lags set to zero, except debtorlag: 154,u,x1

Prices : 160,u,x70: 161,u,x70

Export Currency: 170,u,x.5: 171,u,x.5

Import Currency: 180,u,x.5: 181,u,x.5

F.Cost Currency: 190,u,x.2: 191,u,x.8

All sensitivity variables are assumed to be zero.

Working Capital and opening stocks are assumed to be zero.

Debt : 251,u,x5000

Fixed Assets : 261,u,x8000

Aim of Test

To show that foreign exchange gains and losses are correctly calculated, and that the debtors are correctly reflected in the balance sheet. In April, the foreign exchange gain or loss will equal:

Sales invoiced to UK in March = £1,750, or \$3,150.

In April, £1,750 * \$1.4 = \$2450 is received, representing a loss of \$700. Moreover, there will be debtors equal to the current month's sales.

Result of Test

The loss reported in Table A8.3 is \$739. The inaccuracy arises from the way in which the exchange loss is approximated, in order to increase computational speed.

TABLE A8.1
A UK MNC PLC
A Subsidiary Inc.
Results Expressed in \$

Operating Summary: 1986

	Jan	Feb	Mar	Apr	May
Dollars/Pound	2.00	2.00	2.00	2.00	2.00
Unit VC (B)	40	40	40	40	40
Unit VC (A)	40	40	40	40	40
Volume(B)	100	100	100	100	100
Volume(A)	100	100	100	100	100
Stock Units	0	0	0	0	0
Sales(B)	7000	7000	7000	7000	7000
Variable Cost(B)	4000	4000	4000	4000	4000
Fixed Cost(B)	2000	2000	2000	2000	2000
Profit(B)	1000	1000	1000	1000	1000
Sales(A)	7000	7000	7000	7000	7000
Variable Costs(A)	4000	4000	4000	4000	4000
Fixed Cost(A)	2000	2000	2000	2000	2000
Profit (A)	1000	1000	1000	1000	1000
Fx G/L - trade items	0	0	0	0	0
Profit less FX	1000	1000	1000	1000	1000
Debt Interest	55	55	55	55	55
Interest on WC	87	99	111	122	134
Net Profit	1032	1044	1056	1067	1079
Fixed Assets	8000	8000	8000	8000	8000
Stock	0	0	0	0	0
Debtors	0	0	0	0	0
Liquid Assets	7948	8992	10048	11115	12194
Total Assets	15948	16992	18048	19115	20194
Creditors	0	0	0	0	0
Debt	5000	5000	5000	5000	5000
Liabilities	5000	5000	5000	5000	5000
Revenue Reserve	7948	8992	10048	11115	12194
G/L - Debt	0	0	0	0	0
G/L - Stock	0	0	0	0	0
Equity	-2000	-2000	-2000	-2000	-2000

TABLE A8.2
A UK MNC PLC
A Subsidiary Inc.
Results Expressed in \$

Operating Summary: 1986

	Jan	Feb	Mar	Apr	May
Dollars/Pound	1.80	1.70	1.80	1.40	1.30
Unit VC (B)	40	40	40	40	40
Unit VC (A)	38	37	38	34	33
Volume(B)	100	100	100	100	100
Volume(A)	100	100	100	100	100
Stock Units	0	0	0	0	0
Sales(B)	7000	7000	7000	7000	7000
Variable Cost(B)	4000	4000	4000	4000	4000
Fixed Cost(B)	2000	2000	2000	2000	2000
Profit(B)	1000	1000	1000	1000	1000
Sales(A)	6650	6475	6650	5950	5775
Variable Costs(A)	3800	3700	3800	3400	3300
Fixed Cost(A)	1960	1940	1960	1880	1860
Profit (A)	890	835	890	670	615
Fx G/L - trading	0	0	0	0	0
Profit less FX	890	835	890	670	615
Debt Interest	55	55	55	55	55
Interest on WC	94	104	115	123	130
Net Profit	929	884	950	738	690
Fixed Assets	8000	8000	8000	8000	8000
Stock	0	0	0	0	0
Debtors	0	0	0	0	0
Liquid Assets	8589	9473	10423	11161	11851
Total Assets	16589	17473	18423	19161	19851
Creditors	0	0	0	0	0
Debt	5000	5000	5000	5000	5000
Liabilities	5000	5000	5000	5000	5000
Revenue Reserve	8589	9473	10423	11161	11851
G/L - Debt	0	0	0	0	0
G/L - Stock	0	0	0	0	0
Equity	-2000	-2000	-2000	-2000	-2000

TABLE A8.3
A UK MNC PLC
A Subsidiary Inc.
Results Expressed in \$

Operating Summary

	Jan	Feb	Mar	Apr	May
Dollars/Pound	1.80	1.70	1.80	1.40	1.30
Unit VC (B)	40	40	40	40	40
Unit VC (A)	38	37	38	34	33
Volume(B)	100	100	100	100	100
Volume(A)	100	100	100	100	100
Stock Units	0	0	0	0	0
Sales(B)	7000	7000	7000	7000	7000
Variable Cost(B)	4000	4000	4000	4000	4000
Fixed Cost(B)	2000	2000	2000	2000	2000
Profit(B)	1000	1000	1000	1000	1000
Sales(A)	6650	6475	6650	5950	5775
Variable Costs(A)	3800	3700	3800	3400	3300
Fixed Cost(A)	1960	1940	1960	1880	1860
Profit (A)	890	835	890	670	615
Fx G/L - trad tra	-350	-185	190	-739	-212
Profit less FX	540	650	1080	-69	403
Debt Interest	55	55	55	55	55
Interest on WC	11	19	29	36	42
Net Profit	496	615	1054	-88	389
Fixed Assets	8000	8000	8000	8000	8000
Stock	0	0	0	0	0
Debtors	6650	6475	6650	5950	5775
Liquid Assets	967	1756	2636	3248	3812
Total Assets	15617	16231	17286	17198	17587
Creditors	0	0	0	0	0
Debt	5000	5000	5000	5000	5000
Liabilities	5000	5000	5000	5000	5000
Revenue Reserve	7617	8231	9286	9198	9587
G/L - Debt	0	0	0	0	0
G/L - Stock	0	0	0	0	0
Equity	-2000	-2000	-2000	-2000	-2000

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