

Company Value and Economic Currency Risk: An empirical study of UK-listed Importers and Exporters

Gary Mathieson

&

Peter Moles

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Corresponding Author:

Dr. Peter Moles
University of Edinburgh Management School
William Robertson Building
50 George Square
Edinburgh
EH10 5QR
Scotland

Tel: +44 (0) 131 - 650 3795/3823

Fax: +44 (0) 131 - 668 3053

email: P.Moles@ed.ac.uk

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ABSTRACT

This study examines the impact of economic currency exposure on UK share prices using both daily and monthly data. It makes use of survey information to identify two types of firm on the basis of exchange rate sensitivity of their sales volume and input prices, as being either exporters and importers. We then examine the relationship between the exchange rate and the share price of individual firms in our sample of importer and exporter firms. This is done for the period 1990 to June 1997 and the sub-periods October 1990 to August 1992, when the UK participated in the exchange rate mechanism, and August 1995 to June 1997, a period of sterling appreciation. The results showed a stronger currency effect on firm value during the ERM period than when sterling free-floated. The analysis is then extended to examining the effects of a range of individual currencies and indicate that individual firms have very different exposures to particular currencies. Overall our results indicate a weak relationship between our sample firms' share price and changes in the exchange rate.

Key Words: economic exposure, foreign exchange, currency risk, firm value

1. INTRODUCTION

The theory of economic exposure seeks to explain the sensitivity of corporate value to exchange rate movements. Firms engaged in international transactions are subject to transaction risk arising from payable and receivables in foreign currencies. In addition, multinational firms will have translation risks from having assets and liabilities denominated in foreign currencies. Economic exposure includes both transaction and translation effects but also incorporates the competitive situation of the firm (Shapiro, 1992). Even firms without accounting exposures to currencies are subject to economic exposure (Adler and Dumas, 1984). Flood and Lessard (1985) provide a framework for analysing a firm's competitive position and the extent of its economic exposure. Firms are categorised as having either high or low sensitivities to changes in exchange rates for costs or prices, or both. Firms which have a mismatch between their cost and price sensitivities, that is exporter and importer firms in their terminology, have the greatest degree of economic exposure. This approach to defining firms' sensitivity to exchange rate effects has been developed and extended by Pringle (1991), Pringle and Connolly (1993), and Miller (1998). These theoretical frameworks which predicate the degree of economic exposure on mismatches between inputs and outputs can be used to identify the potential impacts of exchange rate changes on individual firms (Levi, 1996).

In practice, the extent of a firm's economic exposure is estimated from the time series data relationship between firm value and changes in the exchange rate. However initial empirical research, such as Jorion (1990), Amihud (1994), and Bartov and Bodnar (1994) has shown only a weak relation between contemporaneous exchange rate changes and the share returns of US companies with apparent exposures to the international

environment. More recent studies, such as Miller and Reuer (1998) on US companies and He and Ng (1998) using Japanese firms have indicated a persistent, albeit weak, relationship between exchange rate movements and firm value. Donnelly and Sheehey (1996) using UK data also indicate a weak positive relationship between the share price of exporter firms and the exchange rate. Gendreau (1994), reviewing the theoretical and empirical evidence has difficulty in accepting that the insignificant empirical results mean that changes in exchange rates have no effect on share price returns. Bartov and Bodnar (1994) attribute the weak results either to the sample selection procedures of earlier studies and/or to pricing errors from investors in determining the effects of the linkage. Levi (1994) points out that instability in the degree of economic exposure, coupled to ambivalence as to the directional effects probably accounts for the lack of positive results.

This study addresses both these issues: our sample selection procedure makes use of survey data rather than crude foreign sales to total sales ratios to determine the extent and type of economic exposure. In particular, our selection procedure aims to identify those firms with a significant imbalance between foreign inputs and sales revenues. We also examine firms during periods of low and high economic exposure conditions. In addition, we test the validity of daily versus monthly data and the use of a currency index against individual currencies for estimating exchange rate sensitivities. Our main test is at the individual company level using the sterling index sensitivity to total equity returns of our sample of UK importing and exporting companies. This sample was constructed from a foreign exchange survey of all UK-listed non-financial firms. In accordance with the theory of economic exposure, we find that the returns of a significant fraction of both groups do move with the sterling index. This evidence of exposure at the individual company level contrasts with earlier studies.

To substantiate this finding we consider four additional tests. We test the samples in two sub-periods: the first during sterling's membership of the ERM and the second at a time of substantial sterling appreciation. Our results indicate a higher number of companies had significant exchange exposure during the ERM period as compared to a strong sterling period. In the third test, we attempt to find a lagged response in the change in returns to changes in the sterling index. Our results indicate no such relationship. In the final test, having found an earlier relation with the sterling index, we now use a number of currencies and estimate and compare at the individual company level the exchange rate sensitivities to total equity returns. We find that the returns of some of the companies are related to individual exchange rates.

The rest of this paper is set out as follows. The next section discusses previous research into firms' sensitivity to exchange rates. Section three explains the nature of our sampling procedure and the different analyses on our two samples for the full period and the sub-period. Section four details our conclusions.

2. Previous Research

Economic exposure is the extent to which unexpected movements in foreign exchange rates alter the present value of the company as measured by the total company share return (Adler and Dumas, 1984; Dumas, 1978; Hodder, 1982). The generic model used to estimate the exchange rate exposure of a particular company is a variant on the market model which explicitly includes an exchange rate term as an explanatory variable:

$$r_{jt} = \alpha_i + \beta_{im} r_{mt} + \beta_{ix} r_{xt} + \varepsilon_{it}$$

where r_{jt} is the return on the j th company's shares, r_{mt} is the rate of return on a market portfolio, r_{xt} is the rate of return on an exchange rate, and e_{it} is random error. The coefficient β_{im} is the normal beta from the market model and β_{ix} is the positive or negative relationship of the share price to exchange rate effects.

Different studies have used different variables for the exchange rate term. Amihud (1994), Bartov and Bodnar (1994), Bodnar and Gentry (1993), Choi and Prasad (1993), Donnelly and Sheehy (1996), He and Ng (1998) and Jorion (1990) have used a trade-weighted index of the external value of the currency as their measure. Booth and Rotenberg (1990) and Miller and Reuer (1998) use individual exchange rates after determining the principal currencies using a factor approach.

Jorion (1990) identified significant differences in the relationship between the value of 287 US exporting multinationals and the exchange rate for the period 1971-1989 using monthly data. This association was found to be positively correlated with the degree of foreign sales. For the full period, he found that only 15 firms (5.2 per cent) in his sample had significant exposure coefficients at the 5 per cent level. In addition, he calculated the exposure coefficients over three sub-periods and reported the disturbing finding that, of the 287 companies, only 109 had an exposure coefficient with the same sign for each of the three sub-periods. He also reported that nominal exchange rates can be used, as these are very highly correlated with the results obtained using real exchange rates.

Amihud (1994) used monthly data, a real trade weighted exchange rate and the market model on an equally-weighted portfolio of 32 leading US exporters. He found no significant relationship, implying that exchange rate changes have no effect on the values of exporting companies.

However he did find a significant negative relationship when the data was lagged for 1 and 3 months.

Bartov and Bodnar (1994) also failed to find a significant correlation between quarterly abnormal returns of a portfolio of companies with international activities and changes in the dollar. They did find that a lagged change in that the dollar was negatively associated with abnormal returns. They chose companies with consistently large foreign exchange rate adjustments (more than 5 per cent of pre-tax income in absolute terms) reported on their annual financial statements that were negatively correlated (at least 75 per cent of the time over the five years) with the corresponding changes in a US dollar trade-weighted index. The final sample contained 208 distinct companies, over a broad cross-section of industries. Their model consisted of a single regression of abnormal stock returns against a constant and a set of current and lagged changes in the foreign currency value of the US dollar trade-weighted index. Other studies reporting similar findings are those by Bodnar and Gentry (1993) and Khoo (1994).

The study by Choi and Prasad (1995) compares 409 US multinationals with at least 25 per cent foreign sales. Using both an individual company and portfolio approach they found that only 2 out of their 10 industry portfolios had significant coefficients, but that 15 per cent of individual companies had significant coefficients. Chamberlain *et al* (1996) also found that returns appear to be sensitive to exchange rate changes. The study by Booth and Rotenberg (1990) examined the effects of the US/Canadian dollar exchange rate on Canadian firms' share price returns rather than relying on a currency index.

Donnelly and Sheehy (1996) is the only published UK-based research. Continuing the approach adopted in previous research, they chose a sample of thirty-nine companies they identified as exporters. These

companies were then combined into an equally weighted portfolio on the grounds that use of the portfolio would diversify away company specific effects and improve the estimate of the common risk factor, the exchange rate. They then regressed the monthly abnormal returns of the portfolio on the returns of a sterling index.

Contrary to prior research, they found a contemporaneous relationship between the exchange rate and the value of the portfolio of export intensive companies. In addition there was some evidence of the anomalous lagged response of share prices to exchange rate movements and, as a result, they argued that currency effects take several months to be reflected in share prices. They also examined the effect of UK membership of the ERM. Their test for the pre-membership and ERM period relationships indicated a structural break in economic currency exposure between the two periods.

They attributed the difference between their results and previous US research to the fact that the market perceives large UK exporters as being more exposed to exchange rate risk than their US counterparts and that their sample consisted of companies exporting at least 40 per cent of their sales, which was higher than those of US studies. They also pointed out that US exporters may denominate their sales in terms of their domestic currency, thus potentially avoiding some exchange rate exposure.

The limited success of empirical research to identify economic exposure is due to several difficulties with the methodology adopted. First, regression analysis captures only residual (economic) exposure once hedging has taken place, inclusive of off-balance sheet financial transactions. Thus an effective hedging programme makes it difficult to capture a firm's economic exposure because it reduces the sensitivity of the company's value to exchange rate movements. Second, most studies

have examined the effects of exchange rate movements on a value of a portfolio of companies. The returns of some companies may be negatively related to exchange rate movements, while others may be positively related, resulting in a minimal effect on the total returns of the portfolio. Aggregation precludes linking the estimated exchange rate exposure to individual company characteristics (Luehrman, 1990). The study of Japanese multinationals by He and Ng (1998) indicated significant industry effects in their sample and they highlights the need for better classification criteria in this area. Third, investors may wait to learn the full impact of exchange rate changes, before they adjust company value, when actual information about the past performance of the company is made available leading to a lagged relation between exchange rate changes and company value.

A potential weakness of industry studies or multi-industry portfolios is that this may hide important differences in firm-specific factors that affect the degree of economic risk. Miller and Reuer (1998) point out that within an industry some firms may have significant exposures while other firms do not, but that the direction of the sign may be different even within an industry. They argue that economic exposure, since it includes competitive effects, will be linked to firm-specific strategies and industry factors. The assumption implicit in the aggregated or portfolio approach used by earlier studies is that no such diversity exists.

The overall impression from the empirical studies is that there is considerable variation in the impact of exchange rate movements on companies that, on theoretical grounds, might be considered sensitive to currency effects. The research, however, has revealed a degree of ambiguity in the direction of the sign. Those that have the highest foreign sales to total sales ratio tend to have the strongest relationship with

exchange rate changes. Finally, there may be a lagged response in the change in value of exporters to changes in the exchange rate.

3. EMPIRICAL ANALYSIS

Two groups of companies were chosen for the analysis. The first group consisted of 'importers' and the second group, 'exporters'. By using two groups of companies with opposing sensitivities, comparisons can be made between the two for the impact of changes in the foreign exchange rate on the share price. They can also be compared should one group show a relationship whilst the other does not.

The raw data from a postal questionnaire, administered by Bradley (1996), was used to select these groups. The questionnaire was sent to the finance directors of 579 listed British industrial and commercial companies in March 1996. A useable return of 298 replies was received, representing a response rate of 51 per cent. No evidence of non-response bias was found: a comparison showed that respondents and non-respondents had similar net assets and turnover. Two of the firms' structural characteristics measured in the survey were: (1) the percentage of the company's sales made in foreign markets and (2) the percentage of the company's inputs purchased in foreign markets. This addresses an issue raised by Miller and Reuer (1988) that it is not just the export volumes that are important but that economic risk arises from the mismatch between the currency of sales revenues and input costs. The survey data allowed us to identify those firms which have a significant currency mismatch between revenues and costs.

For the purpose of the analysis, 'importers' were defined as those companies whose percentage of inputs purchased in foreign markets were greater than, or equal to, 41 per cent. This resulted in selecting 85 of

the companies responding. Since it is a mismatch between the currency for inputs and outputs that creates economic risk, the group was filtered further by seeking only those companies whose percentage of sales made in foreign markets was less than or equal to 60 per cent. This resulted in selecting 38 companies with an expected negative sensitivity to sterling movements.

'Exporters' were defined as those companies whose percentage of inputs purchased in foreign markets were less than or equal to 40 per cent. This resulted in selecting 213 of the companies responding. This was filtered further by seeking only those companies whose percentage of sales made in foreign markets was greater than or equal to 41 per cent. This resulted in selecting 50 companies. Not all companies in the two groups had share return data for the full period. The companies that did not were eliminated leaving 31 importer firms and 32 exporters. Daily and monthly total share return data for these companies were extracted from the Extel 'Equity Research' share price database. The exchange rate index used is the Bank of England's trade-weighted exchange rate for sterling against the currencies of the UK's major trading partners. This index is based on the IMF's multilateral exchange rate model. It has the desirable characteristic that the weights are designed such that any combination of changes in other currencies against sterling, which would result in a 1 per cent change in the index, would have the same effect on the UK's visible trade balance as a 1 per cent change in sterling against all other currencies. An increase in the index infers a depreciation of the basket of foreign currencies and an appreciation of sterling. The index is a nominal exchange rate index, rather than a real rate. In practice there is little difference between the two because they are very highly correlated (Jorion, 1990; Amihud, 1994).

While the exchange rate may be a significant factor in determining company returns, the exchange rate is not the only factor, or even necessarily the most significant one. Therefore, following Jorion (1990) and others, we included the market index return in the estimating equation.

Because r_{xt} is expressed with an index or foreign currency (that is, an indirect quote), a positive change means that sterling has appreciated against the index or other currencies. A positive (negative) β_{xt} coefficient indicates that companies experience an increase (decrease) in total risk-adjusted return when the local currency appreciates against the foreign currency. Thus in our model an exporter should have a negative exchange rate coefficient and an importer a positive one. Ultimately, we will be interested in both the sign and the size of the β_{xt} coefficient.

A commencement date of July 1, 1990 was selected as the test start date to cover Britain's membership of the ERM through to the end of June 1997, a period of seven years. This allows us to cover the period when the Sterling Index appreciated significantly. The first sub-period covers Britain's membership of the ERM, from October 1990 to September 1992. We compare this with an equal-length 23 month period from 1 August 1995 to 30 June 1997, during which the sterling index rose more than 20 per cent. We obtained estimates for the exchange rate coefficient for both daily and monthly frequencies.

3.1 Full Period Analysis

Table 1 summarises the results of the regression estimation for the period 1 July 1990 to 30 June 1997, for daily and monthly frequencies. The table provides statistics that describe the distribution of the estimated exchange rate exposure measures, β_{xt} , including the mean and median estimates and the standard deviation of the estimates, various aspects of its range, and the number of companies whose exposure is found to be statistically significant. The first two columns present the results for the

daily and monthly estimates for ‘importers’, and the next two columns present the results for ‘exporters’. Recall that we might expect the exchange rate exposure coefficient, β_{xt} , to vary across companies. Indeed, our estimates include both positive and negative values for both types of company for both daily and monthly frequencies. For the importers, where a positive coefficient is predicted, the exposure measures range from -0.58 to 0.23 at the daily frequency, and -0.84 to 1.07 at the monthly frequency, with 68 per cent of the estimates positive. The ranges of estimates for the exporters, with a predicted negative sign, are -0.30 to 0.32 at the daily frequency, -0.68 to 2.44 at the monthly frequency, with 41 per cent of the coefficients with the predicted negative sign.

Table 1: Total period results for importers and exporters

The sample period extends from 1 July 1990 to 30 June 1997

<i>Statistics</i>	<i>Importing Estimates</i>		<i>Exporting Estimates</i>	
	<i>Daily</i>	<i>Monthly</i>	<i>Daily</i>	<i>Monthly</i>
Mean	-0.0004	-0.0218	0.0273	0.2311
Std. Deviation	0.1695	0.4508	0.1307	0.5833
Minimum	-0.5842	-0.8379	-0.3022	-0.6830
First Quartile	-0.1211	-0.2232	-0.0375	-0.0350
Median	0.0439	-0.0259	0.0280	0.1834
Third Quartile	0.1154	0.3200	0.0972	0.3855
Maximum	0.2284	1.0661	0.3245	2.4434
Positive Exposure	21 (68%)	14 (45%)	19 (59%)	23 (72%)
Negative Exposure	10 (32%)	17 (55%)	13 (41%)	9 (28%)
Companies in Sample	31	31	32	32
Significant Exposure ¹ (Total)	11/31 (35%)	2/31 (6%)	9/32 (28%)	4/32 (13%)
Significant Exposure (sign as expected)	6/11 (55%)	1/2 (50%)	4/9 (44%)	1/4 (25%)

¹ Significant at the 0.10 level (two tailed test). This refers to the number of companies whose exposure coefficients were found to differ statistically from zero at this confidence level.

The table also presents the number of companies in each sample for which we can reject, at the 10 per cent significance level (two tailed test), the null hypothesis that the coefficient on the exchange index is zero. For importers it is 11 for daily data, 2 for monthly; for the exporters it is 9 for daily data and 4 for monthly. As the number of such companies rises in all cases as we move from monthly to daily data, subsequently we only discuss the daily data results in detail.

Consider the estimates from the daily data first. At the 10 per cent level, we can reject the hypothesis that the coefficient is zero for 11 of the importers and for 9 of the exporters. This represents 35 per cent of the importing sample and 28 per cent of the exporting sample. At the monthly frequency, the number of companies for which we can reject the hypothesis that the coefficient equals zero falls. At the 10 per cent level, it falls to 2 importers and 4 exporters. This represents 6 per cent of the importing companies and 13 per cent of the exporting companies. Of the importers, with significant exchange exposure at the daily frequency, 55 per cent have a sign that indicates an increase in value from an appreciation of sterling. For the exporting companies 44 per cent have an adverse affect from an appreciation of sterling. These results are in accord with the theory discussed earlier but they do indicate that not all firms falling within a category have the value change as predicted.

These results also indicate that the portfolio approach used by many previous studies is likely to give an erroneous indicator of firms' sensitivity to economic exposure effects given that, even with a carefully constructed sample, there is a high degree of variation. Whilst the theory predicates that importers are advantaged and exporters disadvantaged by an appreciation of sterling, our coefficients indicate that share values do not always respond with the appropriate sensitivity. We attribute this variation to differences in the competitive environment for individual firms due to the specific nature of demand shifts, the response of

competitors to foreign exchange rate movements, and the dampening effects of operational and financial hedging.

3.2 Sub-Period Analysis

We now compare the exposure coefficients of the sample companies in the two sub-periods: the first representing sterling's membership of the ERM and the second representing the substantial significant appreciation in sterling of over 20 per cent in 1996/97.

Table 2: Currency sensitivity within ERM period for importers and exporters

The sample period extends from 1 October 1990 to 31 August 1992

<i>Statistics</i>	<i>Importing Estimates Daily</i>	<i>Exporting Estimates Daily</i>
Mean	0.2477	0.2346
Std. Deviation	0.4650	0.3763
Minimum	-0.7026	-0.5278
First Quartile	-0.0120	0.0618
Median	0.2561	0.1480
Third Quartile	0.5434	0.3384
Maximum	1.0312	1.4470
Positive Exposure	22 (71%)	26 (81%)
Negative Exposure	9 (29%)	6 (19%)
Companies in Sample	31	32
Significant Exposure ¹ (Total)	12/31 (39%)	9/32 (28%)
Significant Exposure (sign as expected)	11/12 (92%)	1/9 (11%)

¹ Significant at the 0.10 level (two tailed test). This refers to the number of companies whose exposure coefficients were found to differ statistically from zero at this confidence level.

Table 2 summarises the results of the regression estimation for the first sub-period October 1, 1990 to August 31, 1992. For the importers, the exposure measures range from -0.70 to 1.03 at the daily frequency, with 71 per cent of the estimates positive. The range of estimates for the exporters is from -0.53 to 1.45 at the daily frequency, with 19 per cent of the estimates negative. At the 10 per cent level (2-tailed test), we can reject the hypothesis that the coefficient is zero for 12 of the importers and for 9 of the exporters. This represents 39 per cent of the importing sample and 28 per cent of the exporting sample. Of the importers, with a significant exchange rate exposure, 11 see a share price increase from an appreciation in sterling. This sensitivity for importers is what we would expect. Only one exporter shows a statistically significant adverse affect from an appreciation of sterling. Thus, in the main, our exporter group is unaffected by exchange rate movements.

We now consider whether the present floating system outwith the ERM affects the value of a company more or less than that of the previous managed exchange rate period. Table 3 summarises the results of the regression estimation for the second sub-period August 1, 1995 to June 30, 1997. For the importing companies, the exposure coefficients range from -0.32 to 0.42 at the daily frequency, with 55 per cent of the estimates positive. The ranges of estimates for the exporting company are -0.48 to 0.68 at the daily frequency, with 41 per cent of the estimates negative. At the 10 per cent level, we can reject the hypothesis that the coefficient is zero for 6 of the importers and for 9 of the exporters. This represents 19 per cent of the importing sample and 28 per cent of the exporting sample. Of the importing companies with significant exchange exposure, 83 per cent exhibit the expected benefit from an appreciation of sterling. For the exporting companies 33 per cent have the expected adverse affect from an appreciation of sterling. We note also the means and standard deviations are lower outwith the ERM. This contrasts with the findings of

Bartov *et al* (1996). We are 98 per cent confident that the means are different for the importing companies and 92 per cent confident for the exporting companies.

Table 3: Currency sensitivity outwith ERM period for importers and exporters

The sample period extends from 1 August 1995 to 30 June 1997

<i>Statistics</i>	<i>Importing Estimates Daily</i>	<i>Exporting Estimates Daily</i>
Mean	0.0314	0.0754
Std. Deviation	0.1699	0.2450
Minimum	-0.3153	-0.4769
First Quartile	-0.0780	-0.0620
Median	0.0401	0.0741
Third Quartile	0.1512	0.1900
Maximum	0.4225	0.6787
Positive Exposure	17 (55%)	19 (59%)
Negative Exposure	14 (45%)	13 (41%)
Companies in Sample	31	32
Significant Exposure ¹ (Total)	6/31 (19%)	9/32 (28%)
Significant Exposure (sign as expected)	5/6 (83%)	3/9 (33%)

¹ Significant at the 0.10 level (two tailed test). This refers to the number of companies whose exposure coefficients were found to differ statistically from zero at this confidence level.

Unlike Donnelly and Sheehy (1996), who found no relationship during the ERM period, our results indicate a higher degree of exchange rate exposure during the ERM period than in the sterling appreciation period. One possible explanation is our use of daily data which, as discussed, is more powerful in revealing the effects of exchange rate movements on firm value. A second explanation is that we have not aggregated the results into portfolios and have thus been able to preserve important firm-specific sensitivities. There are also important differences between the importer and exporter group. Importers generally have the required sign on the exchange rate coefficient; exporters do not. Within the context

of the ERM our exporters appear to have some of the characteristics of importers with 26 having a positive coefficient. Outwith the ERM, 19 have a positive coefficient. This would indicate that for our sample of firms, the effect on firm value from a currency devaluation is not always as predicated by the theory.

We explain these results as follows: since our sample is drawn from the largest UK firms and these tend to be more diversified internationally, this group is less exposed to economic exposure effects by being more naturally hedged. Moffet and Karlsen (1994) point out that the use of production, financial and marketing policies to manage economic currency exposures will reduce firms' exposure. This is supported by the fact that our exporter group has less statistically significant exposure coefficients than the importer group. For the period as a whole, 35 per cent of importers have an exposure coefficient that is significant at the 10 per cent level (2-tail test) whilst only 28 per cent of exporters have an exposure coefficient that is significant at the 10 per cent level (2-tailed test). Another factor affecting these results is that it is possible that the exchange rate variable is acting as a proxy for the economic conditions that pertained during the ERM period.

We examined the correlation of the estimates for the two sub-periods. For the whole group, this was -0.0891, whilst for the exporter group, it was -0.2286 and for the importer group it was 0.0734, none of which are statistically different from zero. The number of exporter firms with the same sign in both periods was 18 (56 per cent), whilst 16 importers (52 per cent) had the same sign in both periods. This instability in the exchange rate coefficient accords with other studies. Jorion (1990) found only 109 of the 287 companies had a exposure sign of the same direction for each of the 3 sub-periods and Choi and Prasad (1995) also found considerable variability in their sub-period samples.

This instability does not appear to be attributable to our methodology. The coefficients for systematic risk between the two sample periods for the exporter group is 0.6023 and for the importer group is 0.7063 whilst that for the sample as a whole is 0.6445, which are all significant at the 1 per cent level. These results are similar to those of Jorion (1990) and Amihud (1994) and others using US data.

The instability in the exchange rate effect in our two groups can be attributed to a number of factors. One possible explanation is that contrary to the theory, exchange rate effects are unsystematic. Another is that firms' operational decisions, and in particular hedging, are significantly changing its economic exposure over time. It may also take time for the market to become informed of the net effect of exchange rate movements on firm value. We address this point next.

3.3 Lagged Relationships

We now test to see whether a lagged relation can be found. Although exchange rate changes are public information, the extent of a company's short term hedging against them is private (inside) information that is reported after the fact in the financial statements. This delay in disclosure may time shift the stock market's response to foreign exchange exposure. To test this we created a sub-sample of the ten largest and five smallest exposure coefficient companies from the importing and exporting groups, a total of thirty individual companies. To test for the lagged relationship, the natural log returns and natural log sterling index, for the individual companies were graphed using cross correlations with lags out to 300 days. No significant correlation was found.

3.4 Individual Currencies

Hitherto, having used only the sterling index, we took a macro-economic view and used numerous currencies, estimating and comparing at the individual company level, the exchange rate sensitivities to total equity returns. This could have included other variables such as domestic and foreign interest rates, commodity prices, and inflation, which may have contributed to the total variation explained by the regression (Miller, 1998). However we concentrate on exchange rates, and the analysis, unlike previous UK research, is done on an individual company to index or currency basis in order to determine the individual company relationships to exchange rate exposure.

Having shown that there is a relation between the sterling index and total share return, we now try and find whether it also applies to individual currencies and the extent of the differences. Table 4 summarises the importing groups' results for the full period: 1 July 1990 to 30 June 1997. The table provides statistics that describe the distribution of the estimated exchange rate exposure measures, β_{xt} , including the mean and median estimates and the standard deviation of the estimates, some aspects of its range, and the number of companies whose exposure is found to be statistically significant.

Table 4: Importers -total period sensitivities

The sample period extends from 1 July 1990 to 30 June 1997

<i>Statistics</i>	<i>DM</i>	<i>SW Fr</i>	<i>FFr</i>	<i>Pta</i>	<i>Lire</i>	<i>Fl</i>	<i>DKr</i>	<i>US\$</i>	<i>Yen</i>
Mean	.066	.087	-.079	.072	.001	-.236	.076	.026	-.008
Std. Deviation	.224	.135	.245	.142	.085	.296	.232	.107	.118
Minimum	-.315	-.223	-.918	-.181	-.170	-.768	-.397	-.176	-.357
Median	.084	.066	-.089	.045	.005	-.220	.076	.031	.006
Maximum	.694	.405	.268	.510	.150	.550	.742	.301	.207
Positive Exposure	18	24	13	21	17	4	20	21	16
Negative Exposure	13	7	18	10	14	27	11	10	15
Companies in Sample	31	31	31	31	31	31	31	31	31
Significant Exposure ¹ (Total)	2 6%	6 19%	4 13%	5 16%	5 16%	10 32%	6 19%	7 23%	7 23%

¹ Significant at the 0.10 level (two tailed test). This refers to the number of companies whose exposure coefficients were found to differ statistically from zero at this confidence level.

For the importing companies, the exposure measures ranged from -0.92 to 0.74. At the 10 per cent level, we can reject the hypothesis that the coefficient is zero for two firms against the German mark and ten firms against the Dutch Guilder. This represents between 6 and 32 per cent of the importing sample.

Table 5 summarises the exporting groups' results for the full period. For the exporters, the exposure measures range from -1.53 to 1.17. At the 10 per cent level, we can reject the hypothesis that the coefficient is zero for two firms against the Japanese Yen and eleven against the US dollar. This represents between 6 and 34 per cent of the exporting sample.

Table 5: Exporters -total period sensitivities

The sample period extends from 1 July 1990 to 30 June 1997

<i>Statistics</i>	<i>DM</i>	<i>SW</i> <i>Fr</i>	<i>FFr</i>	<i>Pta</i>	<i>Lire</i>	<i>Fl</i>	<i>DKr</i>	<i>US\$</i>	<i>Yen</i>
Mean	-.024	.081	.033	.042	-.036	-.137	.090	.024	.012
Std. Deviation	.330	.150	.313	.259	.119	.358	.177	.103	.060
Minimum	-.950	-.137	-.954	-.363	-.400	-1.531	-.192	-.151	-.140
Median	-.026	.041	.030	.014	-.031	-.137	.068	.017	-.001
Maximum	.820	.666	.602	1.169	.222	.557	.547	.268	.120
Positive Exposure	14	22	18	17	13	9	22	18	15
Negative Exposure	18	10	14	15	19	23	10	14	17
Companies in Sample	32	32	32	32	32	32	32	32	32
Significant Exposure ¹ (Total)	6 19%	5 16%	7 22%	7 22%	6 19%	8 25%	9 28%	11 34%	2 6%

¹ Significant at the 0.10 level (two tailed test). This refers to the number of companies whose exposure coefficients were found to differ statistically from zero at this confidence level.

Our results indicate that, for some companies, there is a significant relationship between firm value and specific exchange rate changes. The results suggest that for some firms at least, economic exposure is currency specific. This makes sense if the individual firm has a high degree of exposure to particular markets and hence currencies. The relatively high number of companies with significant exposures to the US dollar, the de facto currency for international trade and the German Mark and Dutch Guilder lend support to this view.

These results suggests that insofar as firms are affected by particular cross-rates, using these for assessment purposes provides a superior estimate than relying on an index.

4. CONCLUSIONS

In this paper, we examined the exchange rate sensitivities of importing companies and exporting companies using both daily and monthly data. Using daily data, we find that the total share returns of 11 out of thirty-one importing companies and 9 out of thirty-two exporting companies appear to be sensitive to exchange rate changes. Using monthly data, we find that the total share returns of approximately two out of the thirty-one importing companies and four out of the thirty-two exporting companies appear to be sensitive to exchange rate changes. The former findings contrasts with prior US studies that have uncovered little or weak evidence of such sensitivity, although the UK study by Donnelly and Sheehy (1996) did indicate a relationship for exporting firms when grouped into a portfolio. This pattern continued during two sub-period analyses. We attribute the relative strength of these results to the use of daily data, as suggested by Chamberlain *et al* (1996). This interpretation is confirmed by comparisons of monthly and daily estimates for the exchange rate variable.

We also find that of the importers with significant exchange exposure at the daily frequency, 55 per cent benefit from an appreciation of sterling. For the exporters, 44 per cent have an adverse affect from an appreciation of sterling. These results confirm the economic theory: an appreciation of an exchange rate is detrimental (beneficial) to exporting (importing) companies, while a decline of the exchange rate is beneficial (hurts) these companies. The exporter group's results are lower than expected, and we attribute this to a combination of natural hedging by companies operating in a multinational environment, effective competitive strategies and efficient financial and operational exposure management practices.

In contrast, we would expect the impact of foreign exchange exposure to be lower during membership of the ERM as about 55 per cent of Britain's exports go to ERM member countries (Donnelly and Sheehy, 1996). Surprisingly this was not the case. Twelve importing and nine exporting companies showed significant exposure during ERM membership compared to six importing and nine exporting companies outwith this period, with smaller mean exposure coefficients. However, these results need to be interpreted with a degree of caution, given that each sub-period is too small for broad generalisations. The differences in results can be explained if they reflect mainly direct economic exposures after effective financial and operational exposure management. Therefore they may underestimate the true extent of total (direct and indirect) exposure. Also the differences may be the result of the exchange rate acting as a proxy for economic conditions that pertained at the time of ERM membership.

In examining the individual currencies, significant relationships were again found. Our results show that importers and exporters are affected differently, even within each group. The problem in interpreting the results is that we require detailed segmental analysis of input costs and output prices. We also require a full understanding of the company's competitive position and that of its rivals. These are generally not provided by published and traditional reporting statements. However, further analysis of bilateral currency effects combined with information on firms' market segments points to one possible way to refine the analysis.

Looking ahead, more research on the financial characteristics that determine a company's exposure over time, and whether it is lagged to foreign exchange rates as a result of financial management practices would be worthwhile. Also an interview or survey based approach that

included additional operational, hedging and managerial information to help account for indirect exposure, may be needed to fully explain the relationship between exchange rate fluctuations and company value.

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