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ABSTRACT

Using the Branson model as an example, this paper seeks to clarify the role of interest rate and exchange rate changes in asset market models. Focusing on short-term adjustments, it is shown that portfolio shifts mainly affect relative interest rates in different countries. Only to the extent that portfolio shifts lead to changes in the money demand or money supply, are exchange rates affected as well. The announcement of German monetary union in 1990 is used as an example to illustrate the relative significance of interest rate changes as shock absorbers.

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1. INTRODUCTION

The BIS investigation of foreign exchange markets provides evidence as to the astonishing volume of activity in these markets (BIS 1996).[1] It also supports the view that foreign exchange market activity is not primarily due to international trade and capital flows. Rather, the shifting of stocks of local or foreign assets seems to be the driving force. One approach that is meant to capture the interaction of such portfolio shifts and exchange rate changes is the asset market approach (see, for instance, Branson 1977 and Kouri 1976). This approach that was developed in the 1970s became 'the widely accepted theory of exchange rate determination' (Filc 1987, 53) in the 1980s. Its development is closely linked to the transition to flexible exchange rates at the beginning of the 1970s. The considerable volatility of exchange rates since the end of the system of Bretton Woods apparently could not be explained by fundamentals like differences in inflation. Therefore, economists were looking for new explanations of the observed exchange rate behavior. The result of these efforts was the development of the asset market approach, that is based on the monetary approach and portfolio theory (Branson 1985, 135). This approach seems to be better suited to explain large and often unpredictable exchange rate movements. In contrast to older approaches, the exchange rate is interpreted as the relativ price of monies and not as the relative price of goods (Branson 1977, 69, Kouri 1976, 280-281, Mussa

[1] Daily turnover (spot, outright forward and swap transactions) was estimated at around US$ bn. 1.260 in 1995.

1978, 47). The term 'monies' has to be interpreted broadly, including all financial assets (Lindbeck 1976, 136 and Zieschang 1990, 47).

While older exchange rate theories emphasized the role of flows, the asset market approach focuses on stocks. Thus, exchange rate theory followed monetary theory, where a shift from flow- (loanable funds theory) to stock-concepts (liquidity preference theory) had taken place earlier[2]. Although advocates of the asset market approach are admitting that, in principle, both approaches (stock and flow) can be used, stock approaches are favored because adjustment in financial markets is 'instantaneously' (Branson 1977, 70) and because the volume of shiftable assets is much bigger than the volume of goods and capital flows (Kouri 1976, 281, Lindbeck 1976, 134 and Branson 1977, 70-1).[3]

So far, empirical testing has not been very supportive (Levich 1985, 1014-5, Pippenger 1997, Taylor 1995, 30-1). As has been pointed out, this may be due to data problems or difficulties in specifying stable asset demand functions (Levich 1985, ibid.). A particularly striking example of the predictive failure of the asset market approach, described in section 2, is the announcement of German monetary union. At the time of the announcement German monetary union was interpreted as bad news for the DM, possibly leading to high budget deficits and increasing inflation. Still, the US$/DM exchange rate hardly moved. After briefly describing the Branson model (the most popular asset market

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[2] See Hicks (1967), Keynes (1964) and Tobin (1958) and (1969).

[3] According to Mussa (1984, 21) the distinction between stock and flow approaches is less significant. He emphasizes the idea, that the spot exchange rate is determined by expected future exchange rates.

model) in chapter 3, a new interpretation of the asset market approach is given in chapter 4. The main result of this re-interpretation is that interest rate or bond price changes are much more important to bring about financial market equilibrium than is commonly understood. Portfolio shifts may trigger large interest rate changes and also high turnover in financial markets. But they are not likely to create large excess demands for foreign exchange. Indeed, it can be argued, that exchange rate changes are only of secondary importance for portfolio adjustment. They are mainly due to induced changes of the money supply or the money demand.

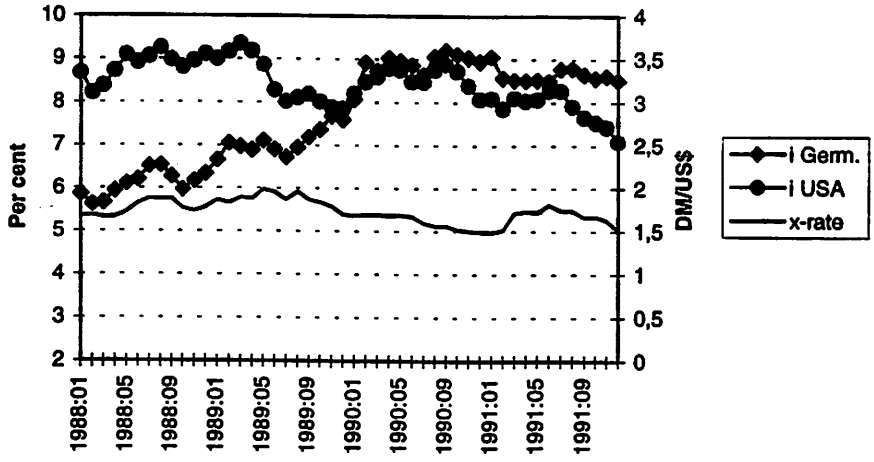
2. PORTFOLIO SHIFTS WITHOUT EXCHANGE RATE CHANGES? THE CASE OF GERMAN MONETARY UNION

In order to understand the interaction of portfolio choice and exchange rates, it is useful to look at episodes where investors clearly changed their attitudes towards certain kinds of assets. One such episode is German unification. The strength of the DM in recent years and the break down of the EMS sometimes obscures the first reaction of international financial markets after it became clear that unification became a real possibility: investors downgraded German bonds. The prospect of large transfers to East Germany and the possibly inflationary consequences of a monetary union undermined the standing of German bonds in international markets. Especially the February announcement of negotiations about German monetary union triggered a wave of selling.

To be sure, German interest rates had been rising already before the autumn of 1989 (see chart 1). While a positive inflation outlook and a favorable development of the

trade balance made dollar bonds look more attractive in the first half of 1989, inflation seemed to gather momentum in Germany and the Bundesbank pushed up interest rates. The interest rate differential between the U.S. and Germany that had been above 250 basis points throughout 1988 quickly narrowed in 1989 (see chart 1) falling to 100 basis points in September 1989. The narrowing of the interest rate differential was mainly brought about by falling US interest rates. In spite of a strong rise in official interest rates German long-term interest rates remained surprisingly stable, rising only around 70 basis points between January and October 1989. In the same period, the Bundesbank raised the discount and the lombard rate by 250 basis points. The first three quarters of 1989 were also characterized by a strong dollar. In May 1989 the dollar even briefly rose to a rate of 2 DM per US$. This period of a narrowing interest rate differential and a strong dollar lasted until early October.

Chart 1: Interest rates and the exchange rate: the US$ and the DM

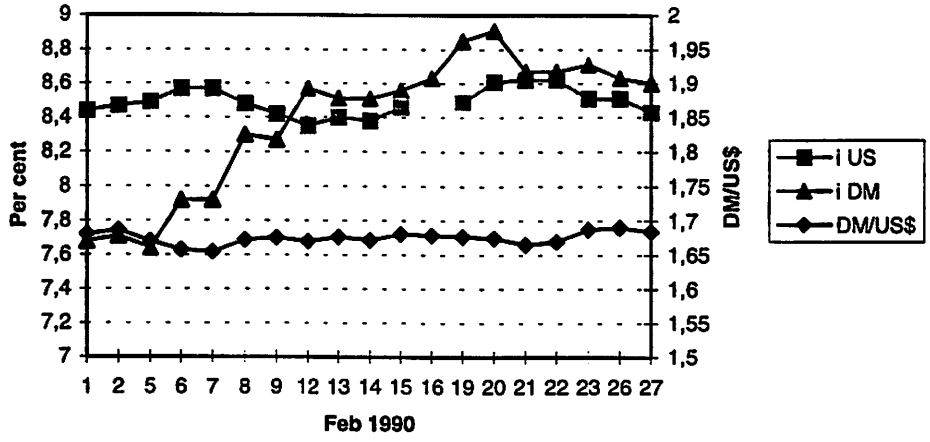


Source: IMF, International Financial Statistics

This was the situation right before the fall of the wall on November 9, 1989. Of course, this situation can hardly be characterized as a stable equilibrium calling for no further adjustments. Therefore, it is not easy to interpret the following developments. Still, all observers in this period agreed that the political developments strongly influenced the expectations of market participants.[4] At the end of 1989 market participants had already been worried by the prospect of economic unification that was likely to drive up interest rates in Germany (and elsewhere). But confidence in DM assets was even more eroded once it became clear that German monetary union would become reality earlier than expected. This raised fear of further inflationary pressures and, possibly, general instability in Germany. What followed was a strong hike in interest rates - this time quite evidently not due to monetary policy measures (see also appendix 2). On February 6, 1990 the yield on ten year Bunds jumped 30 basis points on rumors of monetary union (see chart 2). And when the West German government officially announced its commitment to monetary union on February 7, long-term interest rates rose even further reaching 8.30 per cent on February 8. The following week saw the announcement of the two German governments that they were negotiating a monetary union, sending interest rates even higher. The yield of ten year Bunds that had been well below 8 per cent at the beginning of the month was approaching 9 per cent. Thus, within two weeks interest rates rose by more than 100 basis points. For the first time since 1976 German long-term interest rates lay above U.S. long-term rates.

[4] See for instance BIS (1990), Deutsche Bundesbank (1991) and Sachverständigenrat (1990).

Chart 2: Interest Rates and Exchange Rates in February 1990



Interest rates: Benchmark government bond yields
Source: Financial Times

This strong reaction of interest rates was not accompanied by a similar exchange rate reaction. The dollar had weakened against the DM at the end of 1989 but was more or less stable in the first months of 1990 and continued its downward path in the middle of the year reaching a price of 1.50 DM in late 1990. Thus, there was no sharp depreciation of the DM as predicted by the portfolio models. Rather, the US dollar continued its downward slide vis-à-vis the DM (see chart 2). This episode provides an example for a major shock that strongly affected the desired composition of investor's holdings of dollar and DM-bonds. It suggests that adjustment can be brought about more or less exclusively by interest rate changes. As will be shown in the subsequent chapters, such a finding can be reconciled with the asset market approach.

3. BASIC FEATURES OF THE ASSET MARKET APPROACH

The early asset market models were structured quite simply (Murphy/Van Duyne 1980).[5] The Branson model includes two countries, the home country and the foreign country. The home country is assumed to be 'small' and the foreign country is assumed to be 'big'. There are only four different assets: local money, local bonds, foreign money and foreign bonds. While local investors are holding local assets and foreign bonds, foreign investors are only holding foreign assets.[6] The demand of local investors for different types of assets depends on the local and the foreign interest rate and the level of wealth. The foreign interest rate is given. The local interest rate is not tied to the foreign interest rate by interest rate parity because local and foreign assets are assumed to be 'gross substitutes'. In the 1977 model expected exchange rate changes are assumed to be zero.[7] Since this is a short-term model, incomes, prices and the flows of goods, services and capital are supposed to be constant. Endogenous variables are the exchange rate and the

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[5] Subsequent versions became more sophisticated, however, without changing the basic structure of the model. See, for instance, Branson/Henderson (1985).

[6] If 'home currency preference' is assumed, this assumption is not crucial, see Tobin (1982a), 119.

[7] The introduction of rational expectations does not produce significantly different results. They only reduce the required size of exchange rate adjustment. See Bender (1982), 760 and Baltensperger/Böhm (1982), 129. Retaining the original assumption of static expectations can also be justified by the near random walk behavior of exchange rates.

local interest rate. The model contains three stock equilibrium conditions and a wealth constraint:

(1)	$M = m(r,r^*)W$	money market
(2)	$B = b(r,r^*)W$	bonds market
(3)	$eF = f(r,r^*)W$	market for foreign assets
(4)	$W = M + B + eF$	wealth constraint

where M, B and F are the supplies of money, local bonds and foreign bonds respectively, r and r are local and foreign interest rates, e is the exchange rate, W is total wealth and m, b, and f are the demand functions for money, local bonds and foreign bonds.*

Money demand is negatively dependent on both interest rates. The demand for local (foreign) bonds is positively (negatively) dependent on local and negatively (positively) dependent on foreign interest rates. The demand for all assets is a positive function of total wealth[8].

The early models were usually used to analyze the exchange rate effects of standard macro shocks such as monetary or fiscal policy. Since the asset market approach is meant to capture the influence of financial market activity on the short-run dynamics of exchange rates, a parameter should be added that represents exchange rate expectations or 'asset preferences' (Branson 1985). Therefore, in the following, a parameter 'λ' will be introduced that represents asset preferences or exchange rate expectations.[9] This parameter

[8] In Branson (1985) money demand is independent of wealth. This assumption is not crucial.

[9]Treating exchange rate expectations in a similar fashion as asset preferences implies that the expected rate of change is exogenous - depending on the general outlook for a certain currency. This assumption can be interpreted as a general form of static

λ captures the influences of 'news' on the desired portfolio composition of international investors. Thus, the equilibrium conditions have to be slightly modified:

(5)	$M = m(r,r^*,\lambda)W$	money market
(6)	$B = b(r,r^*,\lambda)W$	bonds market
(7)	$eF = f(r,r^*,\lambda)W$	market for foreign assets

Exchange rate changes are only derived from disturbances of the asset market equilibrium. Various disturbances may change the desired structure of investor's portfolios. As a consequence, the structure of asset demand differs from the structure of the given market portfolio and economic agents try to rebalance their portfolios. This causes exchange rate changes that contribute to the attainment of a new equilibrium. Therefore, according to the asset market approach, volatility of exchange rates has to be interpreted as the result of frequent changes in economic policy and unstable expectations.

Exchange rate changes are not explicitly traced back to supply and demand in the market for foreign exchange. They are always derived from the equilibrium condition for foreign assets[10]:

(8) $$de = \beta[f(r,r^*,\lambda)W - eF]$$

$f(r,r^*,\lambda)W$ represents the demand for foreign bonds and eF the supply. If there is an excess demand for foreign bonds (due to changes of r^* or λ), equilibrium can be brought about by

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expectations where the expected rate of change is not constrained to zero. On the distinction between expected future level of the exchange rate and expected rate of change see Baltensperger (1992), 516.

[10] See Branson et al. (1977), 305. 'β'is an adjustment coefficient.

exchange rate changes (influencing eF)[11]. Advocates of the asset market approach emphasize the significance of adjustment via exchange rate changes. However, interest rate changes (influencing $f(r,r^*,\lambda)W$)could also be the equilibrating force.[12]. This subject will be explored further in the following chapter.

4. INTEREST RATE ADJUSTMENT OR EXCHANGE RATE ADJUSTMENT? ON THE SIGNIFICANCE OF MONEY DEMAND AND MONEY SUPPLY IN ASSET MARKET MODELS

a. The comparative statics

The short-run comparative statics of the Branson model is described in Branson et al. (1977). Below, the same model will be used - supplemented by a shift parameter 'λ'. To keep the exposition simple only this one 'shock parameter' has been introduced. λ may represent various kinds of shocks. The signs of the partial derivatives $\frac{\delta b}{\delta \lambda}$ and $\frac{\delta m}{\delta \lambda}$ depend on the nature of the shock. Thus, if a shift out of money into bonds is represented by an

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[11] The wealth effect of exchange rate changes can contribute to adjustment only when the net foreign currency position is positive. See Fröhlich (1986), 65. Otherwise the stability of the model is not guaranteed. See Branson/Henderson (1985), 778. Therefore, Koromzay/Llewellyn/Potter (1987), 32 and Ragnitz (1989), 224 doubt that this effect is significant.

[12] Some models do not even include interest rates or assume them to be constant. See Kouri (1976) and (1983) and Dornbusch/Fischer (1980).

increase in λ $\frac{\delta m}{\delta \lambda}$ is negative and $\frac{\delta b}{\delta \lambda}$ is positive. Since there are three markets linked by a wealth constraint and since instantaneous adjustment is assumed, it is sufficient to analyze just two markets.[13]

(9a) $$M = m(r, r^*, \lambda)W$$

(9b) $$B = b(r, r^*, \lambda)W$$

Taking total derivatives and rearranging yields:

(10) $$\begin{pmatrix} \frac{\delta m}{\delta r}W & mF \\ \frac{\delta b}{\delta r}W & bF \end{pmatrix}\begin{pmatrix} dr \\ de \end{pmatrix} = \begin{pmatrix} -\frac{\delta m}{\delta r^*}W & -\frac{\delta m}{\delta \lambda}W & (1-m) & -m & -me \\ -\frac{\delta b}{\delta r^*}W & -\frac{\delta b}{\delta \lambda}W & -b & (1-b) & -be \end{pmatrix}\begin{pmatrix} dr^* \\ d\lambda \\ dM \\ dB \\ dF \end{pmatrix}$$

(11) $$\begin{pmatrix} dr \\ de \end{pmatrix} = \frac{1}{\det}\begin{pmatrix} bF & -mF \\ -\frac{\delta b}{\delta r}W & \frac{\delta m}{\delta r}W \end{pmatrix}\begin{pmatrix} . & . & . \\ & & \end{pmatrix}\begin{pmatrix} dr^* \\ d\lambda \\ dM \\ dB \\ dF \end{pmatrix}$$

(12) $$\det = \left(\frac{\delta m}{\delta r}WbF - mFW\frac{\delta b}{\delta r}\right) < 0$$

Since we are interested in the capacity of the portfolio approach to explain the influence of financial markets on exchange rates and interest rates, the focus will be on λ. The effects of changes in λ on the interest rate and the exchange rate can be derived from

[13] The assumption that an excess demand for one of the three assets is equal to an excess supply of the other two assets is problematic. An excess demand for money, for instance, can go hand in hand with an excess supply of goods. See Pippenger (1984, 271).

equation (11) setting dM, dB, dF and dr^* to zero.

$$\begin{pmatrix} dr \\ de \end{pmatrix} = \frac{1}{\det} \begin{pmatrix} bF & -mF \\ -\frac{\delta b}{\delta r} W & \frac{\delta m}{\delta r} W \end{pmatrix} \begin{pmatrix} -\frac{\delta m}{\delta \lambda} W d\lambda \\ -\frac{\delta b}{\delta \lambda} W d\lambda \end{pmatrix} \tag{13}$$

$$\begin{pmatrix} dr \\ de \end{pmatrix} = \frac{1}{\det} \begin{pmatrix} -FWd\lambda \left(b\frac{\delta m}{\delta \lambda} - m\frac{\delta b}{\delta \lambda} \right) \\ WWd\lambda \left(\frac{\delta b}{\delta r}\frac{\delta m}{\delta \lambda} - \frac{\delta m}{\delta r}\frac{\delta b}{\delta \lambda} \right) \end{pmatrix} \tag{14}$$

Equation (14) shows, that a desired change in the structure of the portfolio affects the exchange rate only if the demand for money is elastic with respect to the interest rate ($\frac{\delta m}{\delta r} \neq 0$) and/or if there is a direct change of preferences for local money ($\frac{\delta m}{\delta \lambda} \neq 0$). In other words, if the demand for money is constant there will be no exchange rate changes, no matter how large the desired portfolio shift between foreign and local bonds is. In the following, it will be attempted to explain why money remains of crucial importance even in a portfolio model of exchange rate determination.

b. The special role of money

It is worthwhile to explore the intuition of the above result in some detail because it helps to get a better understanding of the interaction of financial market activity and exchange rate determination. In order to highlight the significance of money in portfolio models of exchange rate determination three different scenarios will be analyzed. In one case money is primarily a medium of transaction and not very sensitive in the short run to interest rate changes. In the second scenario money is held for speculative purposes and

the demand for money can be highly sensitive to changes in expected yields. Finally, the adjustment in a system of interest rate pegging will be analyzed.

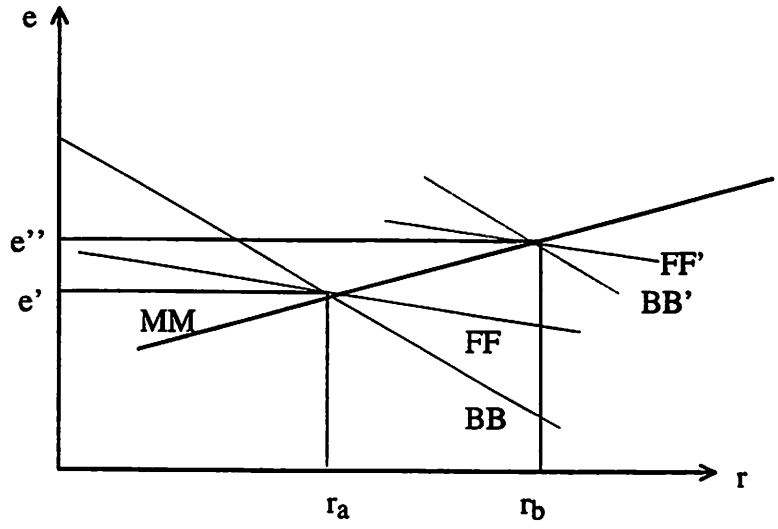
Scenario 1: Money as a medium of transactions

In this scenario money is regarded solely as a medium of transactions. The local and the foreign interest rate and the expected depreciation represent the opportunity costs of holding money. Therefore, economic agents adjust their money holdings when these variables change. However, the elasticity of the demand for money is comparatively low, especially in the short run. In this case, the MM-curve is upward bound - although only slightly reflecting low short-run elasticities (see chart 3). Under this assumption, portfolio shifts can have only little effect on exchange rates. Suppose, there is an exogenous change in asset preferences (or exchange rate expectations) triggered by an election, an announcement by an important politician or some other event. This change of expectations creates an excess supply of DM-bonds and an excess demand for dollar-bonds.

If expectations as well as preferences of investors are homogeneous, then adjustment will be brought about mostly by changes in bond prices but there will be hardly any transactions in the bond markets. Every owner of DM-bonds will try to sell a certain proportion of his DM-bond holdings (shift from BB to BB' in chart 3) but there will be only few buyers because all investors are trying to sell at the same time. Only to the extent that the rise in interest rates (the fall in bond prices) reduces the demand for money will investors be able to sell part of their bonds. The funds obtained in this way can be used to buy foreign exchange driving up the price of foreign currency (from e_1 to e_2). In so far as

portfolio shifts induce shifts in the demand for money, they can produce exchange rate changes.

Chart 3: Adjustment in the case of moderately elastic money demand



To describe the change of the interest rate an equation analogue to equation (8) can be used.

(15) $$dr = \gamma[b(r,r^*,\lambda)W - B]$$

where γ is an adjustment parameter.

If the local interest rate r clears the bond market after a shock (say $d\lambda$) the foreign exchange market must also be cleared at the given exchange rate – unless the money market is affected by the change in interest rates.

If the demand for money is totally inelastic[14], however, the price of DM-bonds falls until the interest rate on DM-bonds is so high that investors are again willing to hold

[14] In this case the MM curve is horizontal. See Pippenger (1984, 258) for a related discussion.

all DM-bonds. In the new equilibrium interest rates have been raised from r_a to r_b. Adjustment takes place only in bonds markets. The foreign exchange market is not involved, supply and demand remain constant because as a group investors cannot raise money by selling bonds to themselves. Consequently, there are no exchange rate changes. The same applies when expectations are heterogeneous (between locals, between foreigners or between locals and foreigners). However, in this case there will be a lot of trading in financial markets while local interest rates are rising. A portion of market participants will be able to sell bonds. This makes it possible for them to demand foreign exchange. But the buyers of the bonds must have acquired local currency. If dishoarding can be ruled out they must have acquired funds by selling foreign assets. Thus, after the interest rate adjustment, there is a simultaneous increase in the supply of local and foreign bonds and of local and foreign currency. Unlike in the case of homogenous expectations turnover can be high, concealing the fact that no (or only little) excess demand for foreign exchange is created.

This discussion shows why the interest elasticity of money demand is crucial for the derivation of exchange rate changes from portfolio shifts.[15] As long as price movements are ultimately caused by excess demands, a price change in the market where 'money A' is traded against 'money B' must be due to changes in the demand or supply of these two types of money. But with this insight, the asset market approach does not give a new explanation for exchange rate changes. This result could have been derived in a

[15] The significance of the demand for money is seldom recognized. Exceptions are: Niehans (1981), 63-4, Dornbusch (1988), 146-7 and Ragnitz (1989), 218-9.

simple monetary model - the only difference being that proponents of the monetary approach assume local and foreign assets to be perfect substitutes. This assumption has the effect that interest rates and exchange rates react stronger in monetary models. In the asset market models, part of the adjustment is brought about by changes in the structure of the portfolio that are due to exchange rate changes (and changes in bond prices; see below). A depreciation raises the value of foreign assets (eF). This partly satisfies the additional demand for foreign assets. Therefore, interest rates do not have to adjust as much as in a monetary model.

In so far as changes in the demand for money cause exchange rate changes, the wealth effect of exchange rate changes can take effect. But since it is a secondary effect, it can not carry the main burden of adjustment. The wealth effect (due to exchange rate changes) requires interest rate changes and an elastic reaction of the demand for money. In addition, what is usually ignored in portfolio models, changes in interest rates or bond prices also have wealth effects.[16] A decline in the price of local bonds does not only raise the return on local bonds but also reduces their portfolio share. If investors do react to changes in the composition of their portfolios the interest rate effects will be smaller than in the case without wealth effects.

It should be noted that it is questionable whether it is appropriate to model changes in the demand for transactions balances as instant stock adjustments. Rather, they should be interpreted as flow adjustments that require some time. After all, a net capital export

[16] If wealth is defined as discounted future cash flow, interest rate changes have wealth effects even if the bonds are short-term bonds.

that is financed by dishoarding is equal to an increase of net foreign wealth (i.e. an increase that is not the product of pure re-valuations) and a surplus on current account, phenomena are excluded from the short-run analysis by assuming that F is fixed. Therefore, in the very short run the constant money demand assumption does not seem to be wide off the mark.

Scenario 2: Money as a store of value

If money is used as a store of value, the MM-curve is steeply sloping upward - indicating a high (absolute) value of the interest rate elasticity of money demand. If an event occurs that induces investors to increase their holdings of dollar assets, they can use their DM balances to purchase dollars. This will usually take place much faster than the reduction of transactions balances that was analyzed above. Therefore, the assumed relationship between portfolio shifts and exchange rate changes seems appropriate whenever economic agents hold large balances of idle money that they can shift from one currency to the other on short notice.[17] In this case unstable expectations can create erratic exchange rate behavior. This result leads to the question, how big such speculative money balances are. When analyzing exchange rates 'money' should be defined as base money plus sight deposits. Sight deposits are the 'good' that is traded in foreign exchange markets. Base money is the component that can be controlled by the central bank. It

[17] If money serves mainly as a store of value, the assumption that economic agents hold only local money should be dropped – as in currency substitution models. See Boyer (1978), Calvo/Rodriguez (1977), Miles (1978), Girton/Roper (1981) and, critical, Cuddington (1983).

restricts the capability of the banking system to create additional deposits. Other liquid assets, however, do not qualify as 'money'. Any attempt of investors to reduce liquid asset holdings in order to acquire more deposits would increase the banks' demand for central bank money. If the supply of central bank money is fixed banks are forced to bid up interest rates. So basically the same mechanism is at work as with bonds. However, deposits are only a small portion of investors' portfolios. Moreover, a large part of deposits is likely to be used for transactions purposes. Therefore, it is highly unlikely that there are large speculative holdings of sight deposits that can be readily used for the purchase of foreign securities.

The result that portfolio shifts can be expected to affect exchange rates only to a small extent looks counter-intuitive. After all, actual experience seems to indicate that financial markets do, indeed, influence exchange rates. This may, however, be due to flow effects (see Dluhosch/Freytag/Krueger 1996 and Pippenger 1997) or to an elastic *supply* of money. Given interest rate pegging, the supply of money may be much more elastic in the short run than the demand for money.

5. IMPLICATIONS

Under the assumptions, that the money supply is exogenous and money demand constant, the attempt to rebalance a portfolio that consists of various kinds of bonds does not (in the first place) influence the exchange rate. Adjustment is brought about by interest rate changes, as was the case after the announcement of German monetary union. This result is not that much of a surprise. After all, it simply implies, that a disequilibrium in

the market for bonds leads to a change in the price of bonds (= 1/interest rate, in the case of consols). In those variants of the asset market approach that have been discussed above, exchange rate changes can be derived from portfolio shifts only if the demand for money changes. These results are similar to those that can be obtained from a simple monetary model.

Since the Branson model and other asset market models with similar features are assumed to explain the large exchange rate fluctuations since the end of the system of Bretton Woods and not the variability of interest rates,[18] implicitly, a high interest elasticity of the demand for money has to be assumed. This (implicit) assumption rests on the monetary theoretic foundations of these models. The asset market approach in exchange rate theory strongly draws on the work of James Tobin (see Tobin 1958 and 1969). In his seminal contributions to portfolio theory, Tobin interprets money primarily as a store of value.[19] Therefore, money is just an asset like any other. But his justification of a demand for money that is independent of the transactions function of money has not remained undisputed. Several authors have pointed out, that there are other assets that are - like money - suitable to reduce the risk of the portfolio, and that carry interest all the same

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[18] Some asset market models do not even include interest rates. Others assume them to be fixed. See fn. 12.

[19] Tobin does not deny the importance of the transactions function of money. See Tobin (1956) and (1958). But in the portfolio theoretic literature on exchange rates this point is usually neglected. This neglect is hard to understand, since Tobin himself criticizes exchange rate models that focus only on the store of value function. See Tobin (1982a).

(see Barro/Fischer 1976, Chang/Hamberg/Hirata 1983, and Tsiang 1989, pp. 221). Therefore, the argument for holding money derived by Tobin, no longer applies. Consequently, stocks of speculative cash should be very small. Money should be primarily interpreted as a medium of transactions. But this insight has been usually neglected in the exchange rate literature, although Tobin has been stressing the transactions function of money again, recently (see Tobin 1982b).

The fact that money is demanded mainly for transactions purposes does not imply that the assumed effects of portfolio shifts on exchange rates do not exist. Since the demand for transactions balances is also dependent on the interest rate (Baumol 1952, Tobin 1956), portfolio shifts can influence exchange rates via interest rate changes. However, this effect is probably not very significant in the very short run since it cannot be expected, that the demand for money adjusts immediately, when interest rates change. As buffer stock theorists have been pointing out adjustment of transactions balances will take a certain amount of time.[20] If the demand for money reacts relatively inelastic in the case of interest rate changes (especially in the short run), than it can be expected that portfolio shifts cause relatively strong interest rate adjustments and relatively weak exchange rate adjustments. Even if speculative balances are taken into account, this result does not have to be modified, because such balances are too small.[21]

In a technical sense, the interpretation of the asset market approach given above is

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[20] Since the monitoring and adjustment of money balances is costly, it does not occur continuously. See Goodhart (1989), 79, Laidler (1984) and Pippenger (1984), 271.

[21] See Goodhart (1989), 89.

just a special case of the Branson-model. Short-run money demand is simply assumed to be (nearly) completely inelastic with respect to interest rate changes. However, in a broader sense, a completely different interpretation of foreign exchange market activities is given. In the traditional interpretation asset holders adjust the exchange rate so that existing stocks of assets are willingly held. Disequilibria in international bonds (or other asset) markets directly translate into exchange rate changes. According to the interpretation given in this paper, much of foreign exchange trading is due to the (indirect) exchange of interest bearing assets, where the price to be determined is the interest rate differential - not the exchange rate. Stocks of bonds (shares etc.) denominated in different currencies continuously change hands. This creates large foreign exchange turnover but hardly any excess demand for foreign exchange.

In practice, central banks usually peg short-term interest rates. This is a severe short-coming of the model and limits its practical applicability. Therefore, an important task for future research would be to develop a more realistic model with two interest rates: a short-term (money) rate fixed by central banks and a long-term rate determined in capital markets. In such a model the quantity of money would be endogenous. In addition, it might be interesting to incorporate hedging. If hedging is possible it is not necessary for investors to sell foreign bonds to reduce foreign exposure.[22]

[22] On the relationship between hedging and short-term capital flows see Krueger (1996).

APPENDIX 1

The slope of FF

(1') $$eF = f(r, r^*)W$$

(2') $$e = f(r, r^*)\frac{M + B + eF}{F}$$

(3') $$e = \frac{f(.)\frac{M + B}{F}}{1 - f(.)}$$

(4') $$\frac{de}{dr} = \frac{\frac{df}{dr}\frac{M + B}{F}}{\left[1 - f(.)\right]^2} < 0$$

The slope of MM

(5') $$M = m(r, r^*)W$$

(6') $$M = m(.)(M + B + eF)$$

(7') $$e = \frac{1 - m(.)}{m(.)}\frac{M}{F} - \frac{B}{F}$$

(8') $$\frac{de}{dr} = -\frac{M}{F}\frac{\frac{dm}{dr}}{\left[m(.)\right]^2} > 0$$

For smaller values of the interest elasticity of money demand the slope of MM becomes more horizontal. In the border case of a completely inelastic money demand *(dm/dr=0)* the slope of MM becomes horizontal.

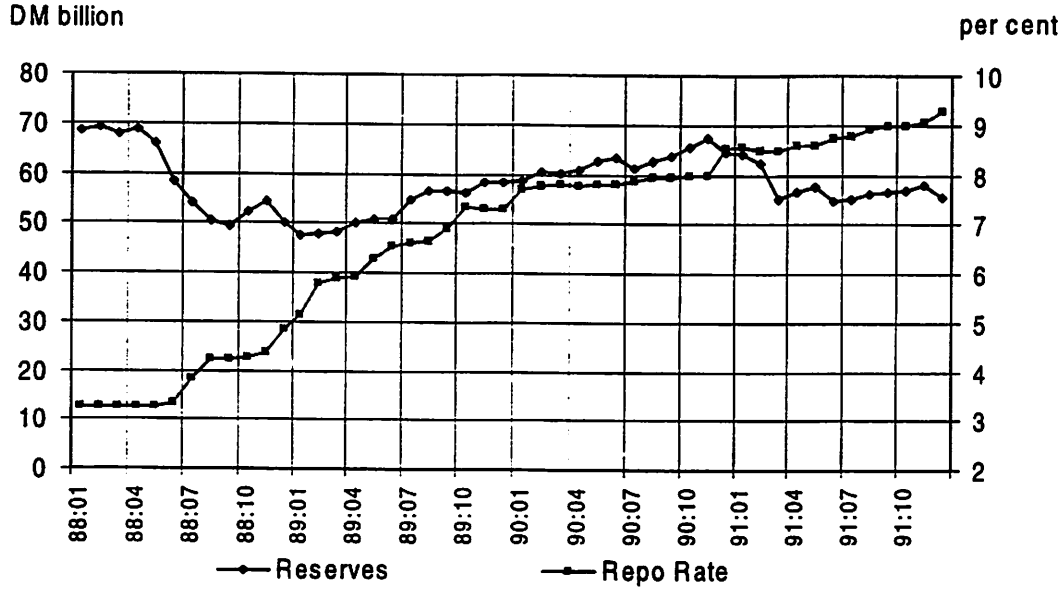
The slope of BB is derived just like the slope of MM. It is given by equation (9').

(9') $$\frac{de}{dr} = -\frac{B}{F}\frac{\frac{db}{dr}}{[b(.)]^2} < 0$$

APPENDIX 2

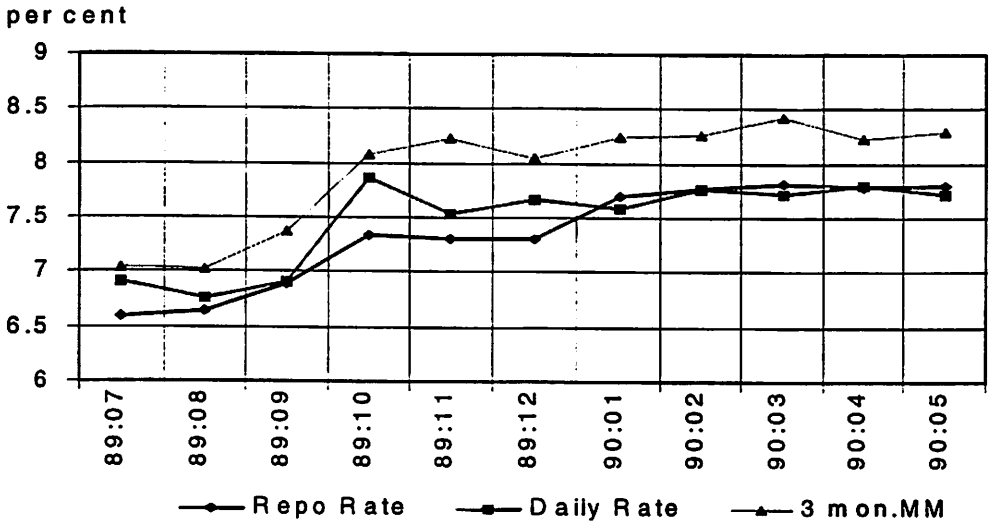
Further Indicators of German Monetary and Exchange Rate Policy

1. International Reserves and the Repo Rate



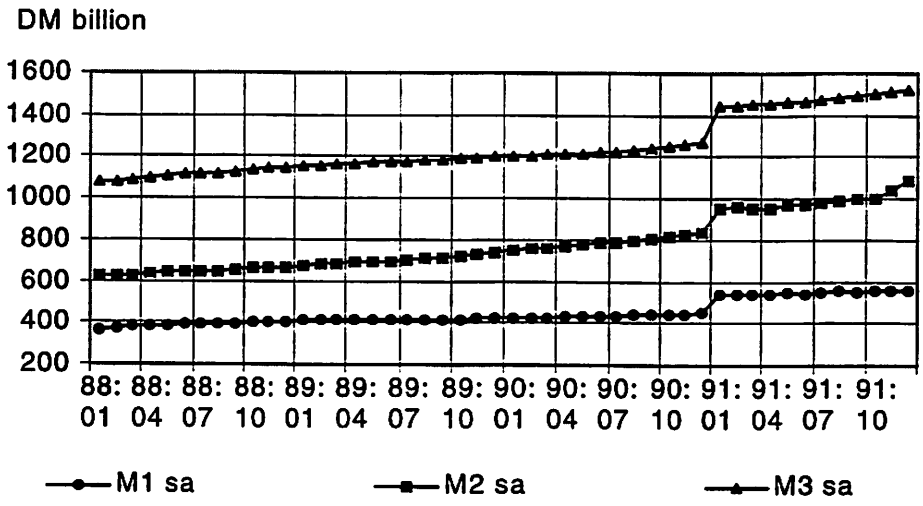
Source: Deutsche Bundesbank

2. Short-term Interest Rates



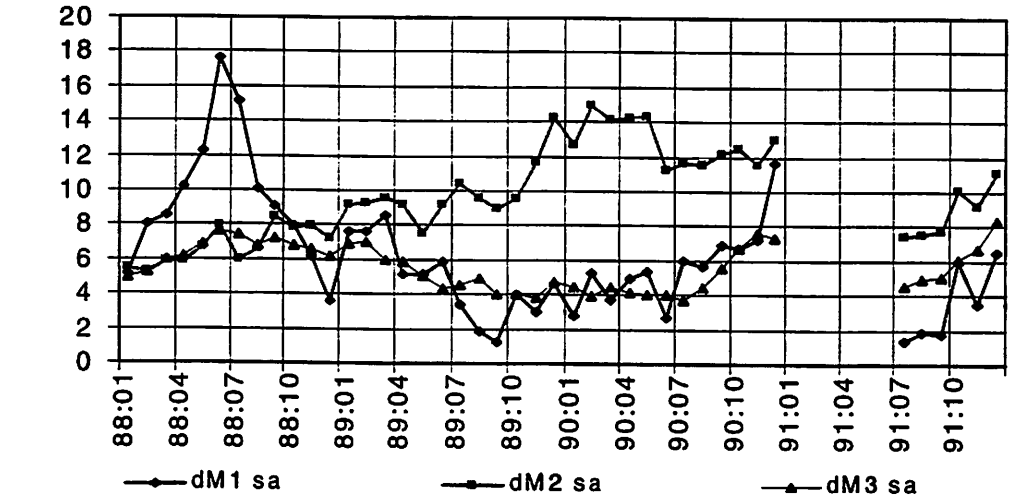
3 mon. MM: three months money market rate
Source: Deutsche Bundesbank

3. Monetary Aggregates
Seasonally Adjusted



sa: seasonally adjusted
Source: Deutsche Bundesbank
(In the seasonally adjusted series the jump due to German monetary union has been shifted to the beginning of 1991.)

4. Changes in Monetary Aggregates
Seasonally Adjusted



sa: seasonally adjusted
dM: change over the last six months in per cent per annum
Source: Deutsche Bundesbank
(Because of the jump in monetary aggregates after German monetary union the Bundesbank did not calculate the values for the period from January 1991 to June 1991.)

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