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ECONOMIC GROWTH AND EXCHANGE RATE APPRECIATION

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ECONOMIC GROWTH AND EXCHANGE RATE APPRECIATION

ABSTRACT

In this paper we have tried to evaluate, (1) how the often heard argument that growth leads to an appreciating currency relates to existing theoretical models of exchange rate determination and, (2) how empirical evidence supports this argument. Via the money demand equation the monetary exchange rate model includes this relationship. Other types of explanations considered in the paper postulate somewhat indirect links between exchange rate and growth and often are not very precise. Empirical data show that there has been a correlation between growth and exchange rate appreciation in the DEM/USD case especially since 1980, but for DEM/GBP and GBP/USD exchange rates such a relation cannot be found. Thus, neither the theoretical nor empirical aspects support a clear relationship between growth and exchange rate appreciation.

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Economic Growth and Exchange Rate Appreciation

by

Timo Hämmäläinen and Lothar Weniger

May 1985

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1. Introduction

This paper is meant to be a contribution to the newly intensified discussion on exchange rates. The sharp appreciation and the great variability of the US dollar in recent times have been very difficult to explain within the framework of the exchange rate models that were developed over the last years. In reaction to this dilemma new arguments have been made by a number of people to explain the observed strength of the dollar. One line of arguments centres upon issues of confidence in the US economy, its dynamism compared to Europe, and especially its high relative real income growth. Two prominent proponents of this view, representing both sides of the Atlantic, are H. Giersch and M. Friedman.¹⁾ The growth aspect has also moved into the centre of attention in news papers' and market experts' analyses of changes in the value of the dollar.

It seems that these ideas have not been worked out very rigorously yet; at least no such contribution has come to our attention. We have therefore set out to investigate the ways in which growth might affect exchange rates. We do not think it is as obvious as it may seem at first sight.

The paper is only a somewhat rough attempt to tackle the problem, but we hope that it can clarify some issues.

In the first two chapters the theoretical aspects are presented and in the last chapter we present some empirical evidence.

¹⁾ Giersch (1984), Friedman (1985).

2. What Does Theory Tell Us?

2.1 The Elasticity Approach

The traditional, Keynesian, approach focuses on the real sector, and thus on effects of income changes on the current account. The current account in turn determines supply of and demand for currencies. A fixed proportion (m) of income is spent on imports. As domestic income rises the demand for imports rises and the current account deteriorates. This leads to a higher demand for foreign currency and thus to a depreciation of the home currency. It can be illustrated by a simple algebraic expression.

$$(1) \quad CA = Ex - (Im + mY).$$

The current account, CA, is determined by exogenous exports, Ex, the exogenous portion of imports, Im, and an income dependent part of imports, mY.

In this approach, growth is unambiguously related to a depreciation of the currency.

2.2 The Asset Market Approach

It has been argued, of course, that the financial markets are of greater importance in exchange rate determination than goods markets. That leads us to the monetary approach, or more generally, to all versions of the asset market approach. Here, the money market moves into the foreground and we have to analyse the effects of relative income growth on money demand. Clearly, as income rises money demand rises, be it for transactions purposes or for portfolio reasons, when higher income leads to higher wealth and money demand.

Since the monetary policy of the Fed is considered sound¹⁾, money supply should remain stable and the strong growth of the US economy should lead to an excess demand for US money. In the monetary exchange rate theory, assuming purchasing power parity, this results in an appreciation of the currency. Formally, this relationship can be depicted in an equation adopted from Dornbusch (1980):

$$(2) \quad s = m - m^* + h (i - i^*) - k (y - y^*).$$

Money supply is m , the interest rate i , and real income y . Corresponding variables of the foreign country are marked by an asterix. Interest differentials are assumed to be zero in equilibrium or equal to inflation differences in an extended model.²⁾

1) Giersch (1984).

2) See Frankel (1979).

In the sticky price version of the monetary model a rise in the domestic interest rate, following an increase in money demand, will even strengthen the appreciation effect in the short run due to the well known overshooting effect.¹⁾ Within the monetary framework we get the desired result of growth leading to an appreciation. But the approach centres on the money market, and it does not quite seem to reflect the tenor of the new arguments. This may become clear from the following quote:

"The transatlantic time lag in the adjustment to high real rates of interest and to new technologies supports an explanation for the strength of the dollar and for the superior performance of the US economy which has its foundations in the real sector rather than in the monetary-fiscal policy mix." (Giersch, 1981)

2.3 Recent Exchange Rate Models

2.3.1 The Role of the Real Sector

One explanation of exchange rate determination that stresses the role of the real sector is advanced by W. Filc.²⁾

In this approach it is suggested that the exchange rate depends mainly on the relative changes in the market value of real assets. As in stock market theory the market value of real assets is viewed to reflect expected rates of return, i.e. profits, and stock market indices are actually used to represent this variable in the approach discussed here. A decline in profit expectations leads to a decline in private investment and subsequently to a decline in aggregate income growth. It is also argued that returns on real investments have to be seen in relation to returns on financial assets, because investors will switch from one to the other when risk adjusted rates of return differ, but Filc left out this aspect in the eventual formulation and testing of the approach. Thus, the decisive factor determining income growth differences between countries is the relative change of expected profits in this approach.

The same is true for the exchange rate. It is argued that a lowering of the return on domestic real assets leads to investments in foreign real assets and thus to a depreciation of the home currency. One reason for these capital flows could be arbitrage. But it is also argued that foreign investment is the only valve for the excess domestic savings that result from the reduction in investment activity, if the public sector does not absorb it.

¹⁾This cannot be seen directly from the equation. For details see Frankel (1983).

²⁾Filc (1982, 1984).

If the above reasoning is accepted, the model provides an explanation for the comovement of exchange rates and growth. But it depends on capital flows that equalize returns on real assets internationally. This aspect is considered in section 3.1 of this paper.

2.3.2 Fiscal Policy

In this section we would like to take a look at the explanations for the appreciation of the dollar offered by R. Dornbusch and some others.¹⁾ Some people have argued that the growth aspect is supported here, but the approach focuses on the fiscal deficit and its demand effects.

Blanchard and Dornbusch (1984) argue that changes in expected long-term full employment fiscal deficits change aggregate demand for goods and therefore affect both the real rate of interest and the real exchange rate. In an open economy, crowding out takes place not only through interest rates but also via the exchange rate. An increase in aggregate demand, because of increased government spending or tax cuts, creates an excess demand for goods and therefore brings about a real appreciation, i.e. a change in the relative price of foreign versus domestic goods. The real appreciation discourages demand for domestic goods and reduces exports, making room for the increased budget deficit.

Blanchard and Dornbusch analyse the different course of fiscal policy in the US and in Europe in the following two country model. In Figure 1 the schedules rr and r^*r^* are the full employment goods market equilibrium schedules for the US and Europe. Aggregate demand in each country depends on the real rate of interest (r and r^*), the real exchange rate (q) and fiscal policy in both countries. The rr locus is upward sloping and the r^*r^* downward sloping because a dollar depreciation implies an increase in the US real rate of interest for equilibrium to be maintained in the US goods market and a decrease in European rates to clear the European goods market. If assets are perfect substitutes, equilibrium is given by the intersection of the two curves in point A. A US fiscal expansion increases aggregate demand in both countries, with a relative increase in demand for US goods. An increase in interest rates is needed to reduce total world demand and an appreciation of the dollar is needed to satisfy the shift in relative demands. In Figure 1, rr shifts to r^1r^1 , r^*r^* to $r^{*1}r^{*1}$ and the equilibrium is A^1 . Fiscal expansion in the US leads to an appreciation of the dollar, an increase in real interest rates and a US trade deficit, since a part of the US budget deficit is financed by European savings.

¹⁾ Blanchard and Dornbusch (1984), Dornbusch (1984).

Figure 1

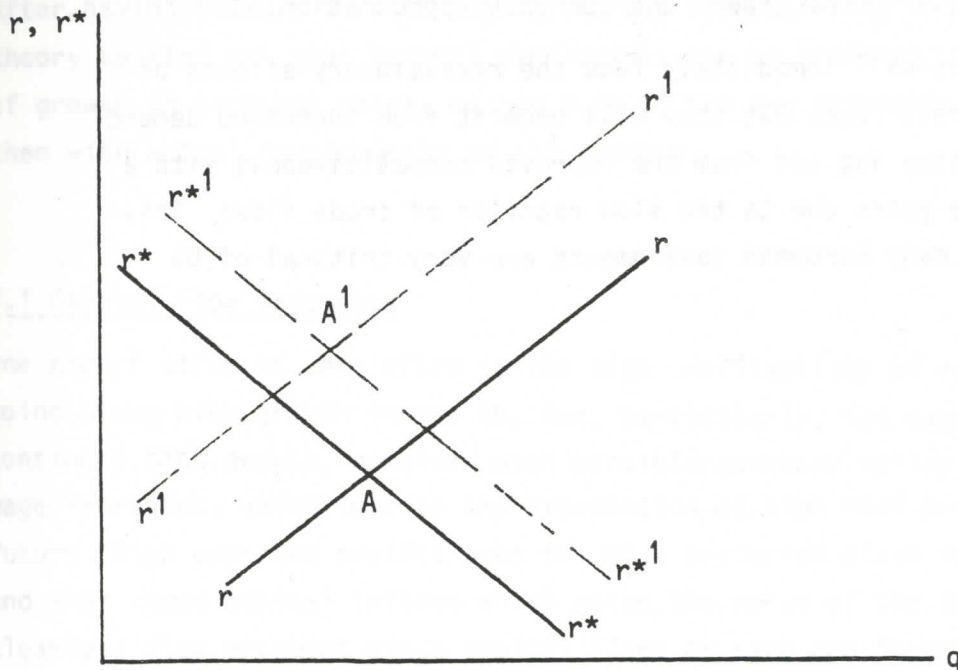


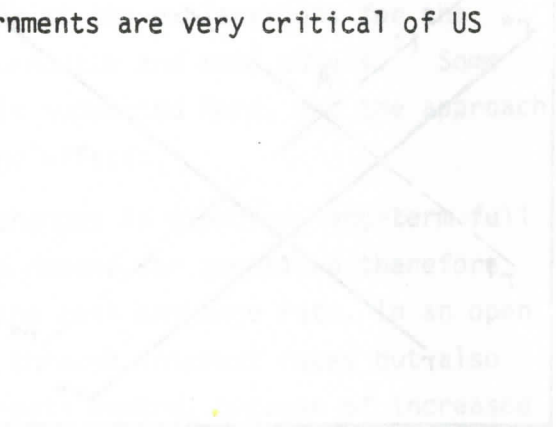
Figure 1 suggests that as long as fiscal expansion remains high in the US and lower in Europe, the dollar will remain strong. However, appreciation is associated with trade deficits, which imply both a transfer of wealth to foreign countries and an increase in foreign holdings of dollar assets. The wealth transfer leads to a depreciation by decreasing the relative demand for US goods. This effect is considered, however, of minor importance. The increased foreign holdings of dollar asset may be more important. If securities were imperfect substitutes, interest rate differentials adjusted for expected exchange rate depreciation would depend on relative supplies of securities. To hold a higher relative stock of US securities investors require a higher rate of return. This can be achieved by a depreciation of the dollar, leading to an expected appreciation. Empirical studies definitely support a risk premium¹⁾ but attempts to explain risk premium in terms of current accounts or wealth changes have not been very successful.

A direct test of the Blanchard-Dornbusch model is to compare the US fiscal deficit with those of other countries, which is actually done in the papers by Blanchard-Dornbusch (1984) and Dornbusch (1984). In the long run equilibrium the Blanchard-Dornbusch model, which is in fact an extended version of Mundell-Fleming model, does not say anything on our theme, the relation between relative income growth and an appreciating currency. If, however, the dynamics involved in the model and the resulting deviations from full

¹⁾See e.g. Hämmäläinen, Sverrisson and Weniger (1985).

employment are taken into account, one can arrive at the appropriate relation between relative income growth and currency appreciation.

The European countries will immediately face the recessionary effects of the higher real interest rate. But they will benefit from increased demand in the US with some time lag and from the improved competitiveness with a delay of two to three years due to the slow reaction of trade flows. This may be one reason why many European governments are very critical of US fiscal deficits.



3. What Is The New Line On Growth And Exchange Rates?

After having taken a tour through different approaches in exchange rate theory to find out what general conclusions can be drawn about the effect of growth on exchange rates, we now turn to the new arguments and compare them with actual developments in the economy.

3.1 Capital Flow Arguments

One aspect stressed very often is the high profitability of real investment going along with growth in the US. And, particularly, the expectations of continued high growth, combined with sensible monetary policy and moderate wage increases, which lead to the expectation of high real profits in the future. High expected profits make the US a preferred place for investment and thus cause capital inflows which raise the value of the dollar. This is clearly a flow argument since capital flows as such are thought to affect the exchange rate. It is only oriented at return differentials and does not take into consideration portfolio composition effects. The argument that such capital flows significantly affect the exchange rate faces two basic problems.

First, the total proportion of foreign real assets in any portfolio is probably quite small so that a change in this proportion does not cause very large capital movements. Second, the capital flows should not so much affect the exchange rate but directly the value of US real assets in foreign portfolios. If the value of the assets increases, the portfolio share rises and rates of return are brought into equilibrium again. If the exchange rate is affected very much, the international financial asset markets, the long run balance of payments and international currency transaction balances would be thrown into disequilibrium. Only if all of these factors push the exchange rate into the same direction, would one expect a strong movement of the exchange rate combined with large capital flows. But such a situation cannot be caused by growth related high profit rates alone.

But the main reason for scepticism regarding this argument comes from the empirical data. To take advantage of high profits, foreigners would have to invest in US stocks or undertake direct investment in the US. One would therefore expect to find sizeable capital flows directed at the purchase of these assets. An analysis of recent changes in the US capital account composition by Pohl (1985) has revealed, however, that:

- foreign direct investment into the US has declined from 1981 to 1983,
- purchases of US financial assets by foreigners have increased relatively little.

The US current account deteriorated by \$ 47.8 billion in 1981-1983. But this change was more than compensated by a reduction of \$ 58 billion in the foreign lending of US banks. Much of this was lending to South American countries and is probably related to the reduction in third world lending due to the debt crisis.¹⁾ Purchases of securities by foreigners increased by only \$ 7.2 billion and usually the bulk of securities traded internationally is bonds and not stocks. Foreign direct investment has actually decreased by \$ 11.9 billion.

These figures do not support the idea that large autonomous capital flows into US real assets have caused the appreciation of the dollar.

3.2 Stock Considerations

3.2.1 Short Run Mechanics

In recent exchange rate theories, the spot exchange rate is considered a combination of the long run equilibrium rate, determined in the real sector, and the short run deviation from it, satisfying capital market equilibrium.²⁾ An exogenous shock can therefore affect the spot rate by changing the long run rate or the adjustment path to it. To evaluate the importance of the short run factors it has to be noted that the adjustment time to the equilibrium rate after a shock is estimated to be longer than two years and possibly more than 5 years.³⁾ The two factors affecting the spot rate deviation from the long run rate are interest differentials and risk premia.

3.2.1.1 Interest Rates

If economic growth brings with it an increase in domestic interest rates, leaving long-run exchange-rate expectations unchanged, incipient capital inflows would lead to an appreciation of the currency. The currency will appreciate until the expected future depreciation exactly offsets the interest differential to satisfy interest rate parity.⁴⁾ But this implies a constant depreciation of the exchange rate after an initial appreciation and not a constant appreciation as observed in the dollar case. Empirically, though, no correlation between nominal interest rate differentials and exchange rates can generally be observed.⁵⁾ During much of the recent dollar appreciation, relative interest rates in the US have actually fallen.

1) IMF Survey (1985).

4) Dornbusch (1984).

2) Isard (1981).

5) For two recent studies, see Willms (1985) and Mudd (1979).

3) Isard (1981).

3.2.1.2 Risk Premium

A reduction in the market evaluation of the riskiness of US assets could also have led to a dollar appreciation. Economic growth may have such an effect on government bonds because it increases the expected tax income. If there is an element of a default risk in government debt, this should be reduced. On the other hand, the risk premium increases with the relative supply of outside assets (government bonds).¹⁾ Since the US government has increased its debt considerably in recent times, in a sense already banking on the expected future income, it seems doubtful whether there can, on balance, be a large positive risk premium effect on the dollar.

3.2.2 The Long Run Equilibrium Rate

3.2.2.1 Productivity

The short run aspects being not very helpful to our case we turn now to the effects of growth on the long run value of the currency.

A rise in productivity, resulting from technological progress, enhances a country's international competitiveness and improves the value of its currency. Economic growth may be closely related to productivity, because it stimulates innovation or is a result of it. Exogenous productivity gains may therefore, in principle, result in an acceleration of economic growth and an appreciation of the currency. In the DM/dollar case this cannot be a very good explanation, though, because productivity in manufacturing has deteriorated in the US relative to Germany.²⁾

3.2.2.2 The Service Sector

Much of the growth of the US economy has taken place in the service sector. And in this sector there has been an increase in productivity relative to other countries. This does not improve the international competitiveness of the US at the present time because manufactures are much more important in trade than services. The huge current account deficit is partly a reflection of this point. If, however, services will increase significantly in international trade, as is expected, there would be an expected increase in the US competitiveness. This may be reflected in a strong dollar already today, since exchange markets are influenced by expectations about future developments. In earlier times, when such expectations were not present, an increase in productivity in the non-traded sector might have led to a deterioration of international competitiveness, because it can cause wage increases in the whole economy and thus raise unit labour costs in the traded goods sector where no compensating productivity increase has taken place.

1) Dornbusch (1980).

2) Dornbusch (1984).

3.2.2.3 The Confidence Factor

Another often proposed explanation for the high dollar is that the basic confidence in the US economy and political system has increased and made the dollar a more desirable currency. Investors, worldwide, desire to hold a higher share of US assets in their portfolios. The international supply of such assets and their value has risen dramatically, though. The confidence effect must have been very large indeed if it is to provide a full explanation for the high dollar. It is never clearly spelled out what confidence is supposed to mean and in what sense it should affect investment decisions. Is it the likelihood of a turmoil in a country, of being taken over by another country, by radical political forces or of the bankruptcy at the central government? All these are factors which certainly affect the value of all claims on a country. But how large is the difference in the probability of such events occurring between the US and Germany? And how much has the probability of such disasters decreased in the US relative to Germany since 1980?

We are somewhat doubtful about the possible magnitude of these effects. To get growth back into the picture one could surely claim that economic growth has positive effects on the stability of a country. But that would just be a partial argument in an already somewhat vague concept.

If the confidence factor is meant to refer to increased business confidence due to deregulation, trade union moderation etc., it should boil down to higher expected profits which leads to investment flows into real US assets. In section 3.1 we looked at this issue and were not able to identify significant capital flows of this type.

3.3 Summary

Our aim is not to provide an overall explanation for the high value of the dollar but just to clarify the growth issue. In this regard it is evident from theoretical survey that there are several indirect ways in which growth can lead to an appreciation of the exchange rate. An increase in money demand and possible risk premium effects on government bonds within the asset market approach to exchange rate determination seem to be the most plausible links. It is difficult to say how important they are.

Different factors may come together and lead to a coinciding of strong economic growth and currency appreciation at any given time for a given economy, though. As will be seen from the empirical data, this may have been the case for the DM/dollar exchange rate in the eighties. But to conclude that growth as such is a fundamental factor in creating a strong currency does not seem justified.

4. Empirical Evidence

4.1 Tests within the Monetary Model

To evaluate the validity of theoretical arguments it is best to look at empirical evidence. Tests regarding the correlation between income differences and exchange rates have often been conducted within the framework of monetary exchange rate theory. The monetary model expresses the exchange rate in terms of supplies of domestic and foreign monies and demands to hold these monies. The often used specification of real money demand in empirical tests is

$$l = k + my - ai$$

when (l) is the log of the demand for domestic real money balances, (y) log of real income, (i) the rate of interest and where (m) and (a) denote the income elasticity and the interest (semi) elasticity of the demand for money. Frenkel and Mussa (1984) point out that a richer money demand equation would take into account a spectrum of rates of return on alternative assets, e.g. under the flexible exchange rate system the possibility that individuals will diversify their currency holdings, the phenomenon of currency substitution. We tried to test the existence of currency substitution using forward premium against the dollar in explaining the real money demand in Germany and in the UK, but the results did not show much support for currency substitution.

Thus in our tests of the monetary model of exchange rates we used the above money demand function. Table 1 gives the results for DM/dollar, DM/pound and pound/dollar exchange rates, when the coefficients of real money supply were not constrained to 1.

The exchange rate equations in Table 1 can explain only very small portions of the variability of exchange rate except in the DM/pound case. Relative money supplies ($m - m^*$) do not get significant coefficients, while interest rate differentials get a significant positive coefficient in the DM/pound case. The coefficient of relative income growth ($y - y^*$), which is the main interest in this paper, is negative and significant only in the DM/dollar equation. For DM/pound and pound/dollar exchange rates the coefficients of relative income growth are positive, but not significant in the latter case.

Table 2 reports the results when the coefficient of relative money supply was constrained to 1 as the monetary model assumes. The possible endogeneity of money supplies is thus avoided. But the results did not improve.

Table 1: The monetary approach to exchange rate determination. Quarterly data 1976.3 - 1984.3 (the coefficients of relative money supplies are freely determined).

Equation	Independent variables				Summary statistics			
	constant	m - m*	y - y*	i - i*	R ²	DW	SEE	F
DM/dollar	-0.05 (0.48)	-0.35 (0.39)	-1.42 (0.84)	-0.17 (0.43)	0.03	1.75	0.05	0.91
DM/pound	1.99 (0.32)	0.09 (0.11)	0.32 (0.16)	1.24 (0.33)	0.37	1.98	0.04	0.66
pound/dollar	-0.30 (1.43)	0.04 (0.47)	0.25 (0.20)	-0.16 (0.37)	0.05	1.79	0.05	0.98

Sources: Exchange rates (log) - Statistische Beihefte zu den Monatsberichten der Deutschen Bundesbank, Reihe 5, Die Währungen der Welt, various issues; Interest rates - Morgan Guaranty Trust Company of New York, World Financial Markets, various issues; Money supplies (M1) and real and nominal incomes - IMF International Financial Statistics, various issues.
Independent variables are: m-log of money supply (M1) deflated by GNP prices; y-log of GNP at 1975 prices; i-three month Euromarket interest rates (interest rates and exchange rates are taken at the end of the second month in each quarter). Standard errors of the coefficients are in brackets.

Table 2: The monetary approach to exchange rate determination. Quarterly data 1976.3 - 1984.3 (the coefficients of relative money supplies are constraint to 1).

Equation	Independent variables			Summary statistics			
	constant	(y - y*)	i - i*	R ²	DW	SEE	F
DM/dollar	0.62 (0.42)	-1.46 (0.92)	0.31 (0.47)	0.02	1.82	0.06	0.86
DM/pound	3.71 (0.14)	0.07 (0.15)	1.28 (0.30)	0.35	2.51	0.03	0.61
pound/dollar	-2.31 (0.16)	0.11 (0.21)	-0.98 (0.39)	0.06	1.98	0.06	0.93

Sources: See Table 1.

The hypothesis that relative income growth is related to an appreciating currency, cannot generally be supported on the basis of the test results given in Tables 1 and 2 within the framework of the monetary model.

Dornbusch (1980) reports monetary model exchange rate equations for the DM/dollar exchange rate covering the period 1973-1979 using quarterly data. These equations with a little different specification show negative coefficients smaller than 1 for relative income growth. The significance of the coefficients, after adjustment for autocorrelation, was, however, rather low.

Frankel (1983) estimated a monetary exchange rate equation for DM/dollar exchange rate for the period 1974-1980 with monthly data. As an income variable he used indices of industrial production and found a negative but insignificant coefficient for relative industrial production. On the other hand, Filc (1984) reports an equation with quarterly data for the period 1977-1983 in which the coefficient of relative income was positive, but insignificant.

4.2 Direct Tests with Relative Growth and Exchange Rates

The results of a test relating directly the nominal exchange rate to relative income growth is reported in Table 3.

Table 3: Nominal exchange rate and relative income growth. Quarterly data in 1976.3 - 1984.3.

Equation	Independent variables		Summary statistics			
	constant	$y - y^*$	\bar{R}^2	DW	SEE	ρ
DM/dollar	0.21 (0.39)	-1.35 (0.79)	0.06	1.71	0.05	0.92
DM/pound	1.73 (0.16)	0.39 (0.18)	0.10	1.55	0.05	0.74
pound/dollar	-1.12 (0.38)	0.24 (0.18)	0.02	1.94	0.05	0.99

Sources: See Table 1.

The direct test confirms the results arrived at within the context of the monetary model. Only in the DM/dollar case is relative income growth positively correlated with an appreciating exchange rate. The link between the dollar appreciation and higher US income growth has been strong only since the beginning of the eighties, as can be seen in Figure 2. This is one explanation why Dornbusch's equations did not give a significant coefficient for the relative income growth variable.

Many of the theoretical arguments were related to changes in the real exchange rate. We therefore deflated the nominal exchange rates by relative GNP price levels. The results are presented in Table 4.

Table 4: Real exchange rate and relative income growth. Quarterly data 1976.3 - 1984.3.

Equation	Independent variables		Summary statistics			
	constant	y - y*	\bar{R}^2	DW	SEE	ρ
DM/dollar	-0.18 (0.28)	-1.54 (0.43)	0.28	2.04	0.05	0.84
DM/pound	1.49 (0.23)	0.08 (0.17)	0.03	1.67	0.04	0.78
pound/dollar	3.49 (3.03)	0.14 (0.21)	0.02	1.89	0.05	0.99

Sources: See Table 1.

Estimated equations with the real exchange rate as a dependent variable produce somewhat higher negative coefficients for the DM/dollar exchange rate, while in the other cases the coefficients become less positive and less significant. Thus, we can conclude that there is a case for a positive relationship with an appreciating currency and relative income growth for the DM/dollar exchange rate. For DM/pound and pound/dollar exchange rates no such relationship seems to emerge.

Our empirical results are rather mixed because we have the DM/dollar case supporting the hypothesis and the other two cases rejecting it. It is especially interesting to note the close correspondence in the DM/dollar case during the eighties that can be seen in Figure 2. What could have caused this phenomenon? If we adopt the monetary framework of analysis, it could be due to shift in the US monetary policy from the interest rate target to a money supply target in late 1979 and in the pound sterling cases to the fact that the UK money demand function is less stable than that of Germany, a result which emerged from our supplementary tests. The US policy shift stabilized the money supply process, increasing the usefulness of the monetary model, whereas the instability of the UK money demand makes the monetary model less applicable.

Figure 2: Exchange Rate and Relative Income Growth US - Germany
(percentage changes versus year ago)

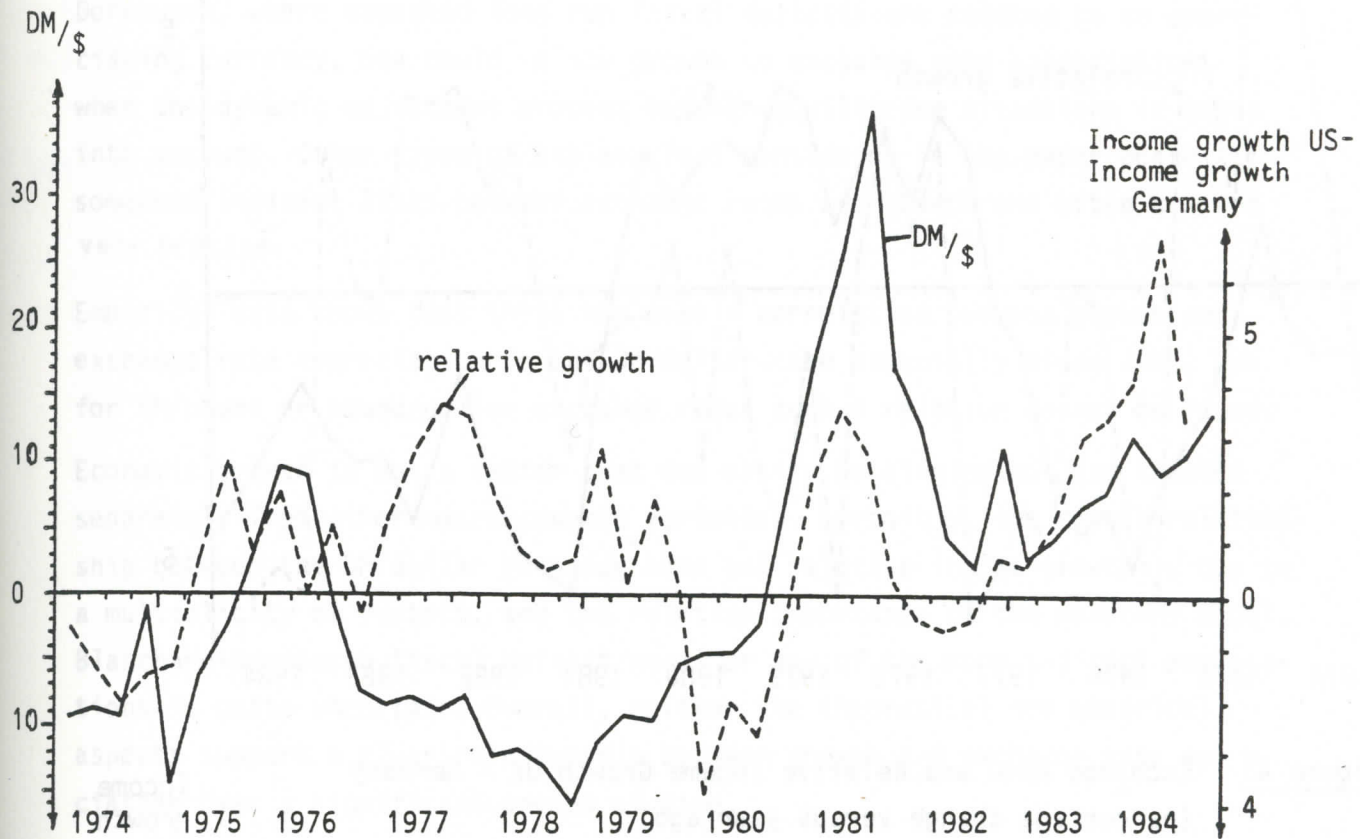


Figure 3: Exchange Rate and Relative Income Growth UK - US
(percentage change versus year ago)

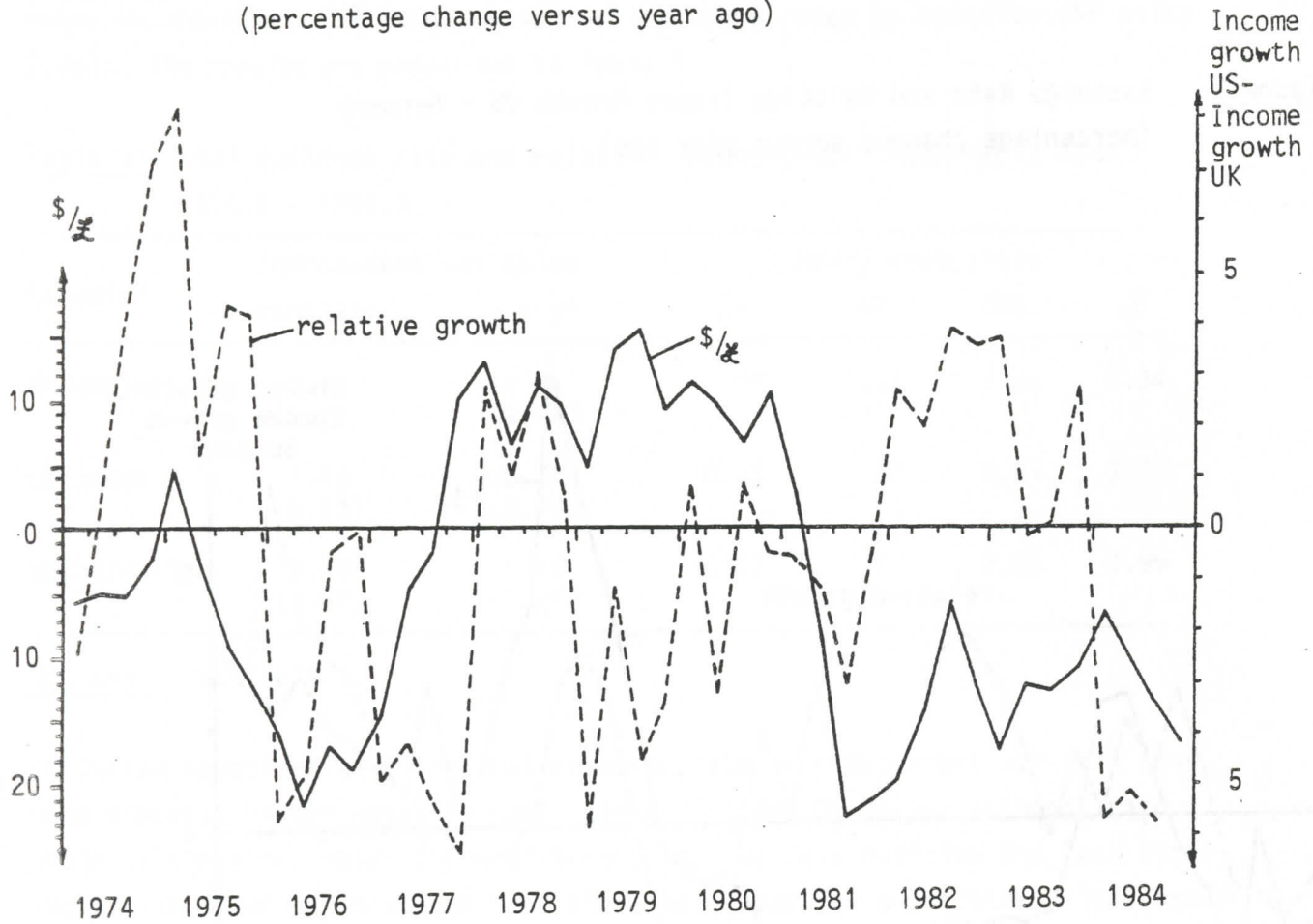
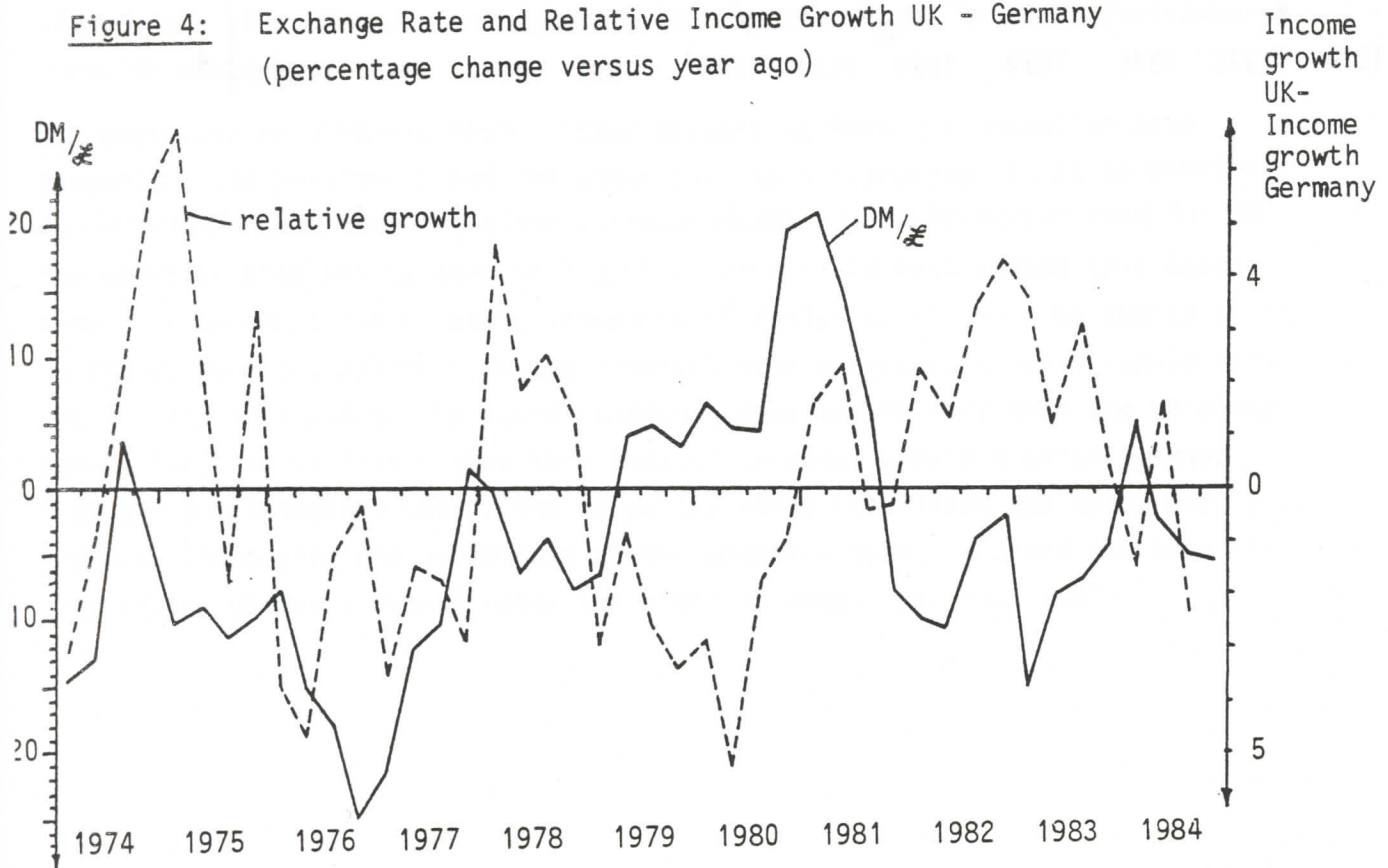


Figure 4: Exchange Rate and Relative Income Growth UK - Germany
(percentage change versus year ago)



5. Conclusions

In this paper we have tried to evaluate how the often heard argument that growth leads to an appreciating currency relates to existing theoretical models of exchange rate determination and how empirical data supports this argument. Via the money demand equation, the monetary exchange rate model includes this relationship. Also, in a model presented by Blanchard and Dornbusch, where expected long run fiscal deficits are related to an appreciating currency, one could relate growth to exchange rate appreciation, when the dynamic adjustment process between equilibrium situations is taken into account. Other types of explanations considered in the paper postulate somewhat indirect links between exchange rates and growth and often are not very precise.

Empirical data shows that there has been a correlation between growth and exchange rate appreciation in the DM/dollar case especially since 1980, but for DM/pound or pound/dollar exchange rates such a relation cannot be found.

Economic growth is not a factor that can easily be singled out and treated separately from other macroeconomic variables. Certainly, the closer relationship between the DM/dollar exchange rate and relative income growth is due to a multiplicity of factors, and the relative importance of the monetary model, Blanchard-Dornbusch fiscal deficit model or any of the more indirect explanations is quite uncertain. Overall, neither the theoretical nor empirical aspects support a clear relationship between growth and exchange rate appreciation over a significant period of time.

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