The determination of long-term interest rates in the Netherlands

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Introduction

The determination of long-term interest rates in the Netherlands presents a case which may be characteristic for small open economies maintaining a fixed exchange rate with an anchor country. In the typical standard text book situation, under the assumption of perfectly integrated capital markets, the spread between the domestic and the anchor country's nominal long-term interest rates will reflect expected exchange rate changes and risk premia. In this paper on the Dutch long-term interest rate, the assumption of perfectly integrated capital markets is not imposed a priori, but viewed rather as a hypothesis which has to be confirmed by empirical evidence. As we will argue, in the Dutch case with Germany as the anchor country, it is difficult to find a satisfactory empirical specification for this model of long-term interest rate determination, at least for the entire period since the establishment of the EMS (1979-1994). The empirical evidence on the Dutch nominal long-term interest rate presented here does not point to perfectly integrated Dutch and German capital markets, although the German long-term interest rate is found to be by far the most dominant factor in explaining its Dutch counterpart. The failure to find fully integrated capital markets may be due, for instance, to transaction and information costs, the existence of restrictions on foreign portfolio investments by institutional investors, differences in the taxation of capital income and the higher liquidity of the German bond market. As a result, the Dutch nominal long-term interest rate is partly affected by domestic economic conditions as signalled by variables such as the short-term interest rate, the inflation rate, the government financial deficit, and the current account. Indeed, there exists a large empirical literature of models of the long-term interest rate in open economies, the Netherlands in particular, explaining a role for domestic economic conditions (e.g. Fase and Van Nieuwkerk, 1975; Knot, 1995; Correira-Nunes and Stemitsiotis, 1995; Fase and Van Geijlswijk, 1996).

In the approach pursued in this paper, the short-term interest rate is one of the domestic variables affecting the long-term rate. Hence, developments and sentiments in the exchange market affect the determination of the long-term interest rate through the response of the short-term interest rate, which is closely linked to the policy-controlled interest rate. In view of the interdependencies between exchange, money and capital markets a three equation system is presented featuring the guilder/D-mark exchange rate, the short-term interest rate and the long-term interest rate as endogenous variables. The equations are estimated using quarterly data. Section 1 provides a further analysis and background of the empirical results, including an investigation of simulation properties, a decomposition analysis of the direct causes of movements in the exchange rate and interest rates, and a comparison with other studies. Section 2 presents some impulse response exercises, showing the response of interest rates to changes in domestic and foreign fundamentals. In order to allow for various feedback mechanisms, the three equations are embedded in a larger model of the Dutch economy, i.e. the Bank's quarterly macroeconomic policy model MORKMON (Fase et al., 1992). For the analysis of a change in the German price level, the accompanying response of the German interest rates is computed using the Bank's new model EUROMON of the EU-countries (Boeschoten et al., 1995). The final section concludes the paper.

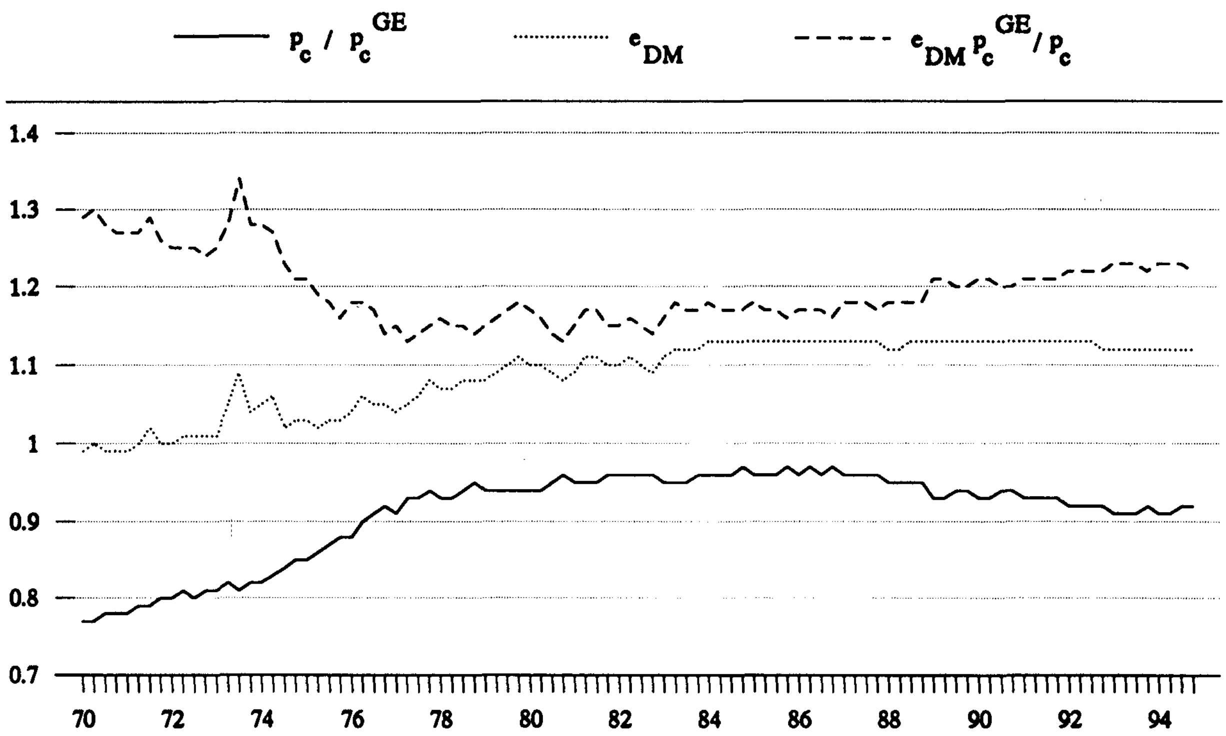
1. Empirical results

1.1 The guilder/D-mark exchange rate

The Netherlands has a long monetary policy tradition in fostering exchange rate stability. Since Germany is by far the most important trading partner of the Netherlands and the Deutsche Bundesbank has a solid low-inflation reputation, maintaining a stable guilder/D-mark rate, in accordance with relative competitiveness, has always been, and still is, considered of major importance (e.g. Wellink, 1994). With the collapse of the Bretton-Woods system in the early seventies, the guilder/D-mark peg was enhanced by the so called "Snake Agreement". Within the snake, in which seven other European countries also participated, bilateral exchange rate movements were limited to stay within relatively narrow bands of plus or minus 2.25%. In March 1979 the Snake was replaced by the European Monetary System (EMS).

Although exchange rate stability, and, therefore, a stable guilder/D-mark rate, has been the focus of Dutch monetary policy for several decades, the way real exchange rate stability is achieved has changed with the introduction of the EMS. Until 1979, inflation rates were higher in the Netherlands than in Germany (Figure 1). From time to time the central parities were realigned to (partly) offset price differentials. Within the EMS, the Netherlands pursued a strict guilder/D-mark peg and more emphasis was laid on economic convergence, to avoid parity realignments. As a consequence, Dutch inflation rates converged to German ones (e.g. Berk and Winder, 1994). Realignments became rare and from March 1983 on they were even absent. Since the end of the eighties, Dutch inflation rates have on average been lower than German ones, resulting in a slight real depreciation of the guilder/D-mark rate. By the end of 1994 the real guilder/D-mark rate was still lower than the one in the early seventies, however (Figure 1).

Figure 1
Price differential between the Netherlands and Germany and nominal and real D-mark rate



The model for the guilder/D-mark rate e_{DM}, i.e. the value of the D-mark measured in guilders, is given by equation (1) below. It is based on both purchasing power parity (ppp) and uncovered interest parity (uip). According to the ppp-framework the expected long-run exchange rate depends on the price level ratio p_c / p_c^{GE}. The uip-condition implies that the difference between the Dutch and German interest rate equals the expected change of the exchange rate plus a risk premium. As could be expected from Figure 1, the hypothesis of relative purchasing power parity, here interpreted as a coefficient of 1 for the log of the price ratio, has to be rejected[1]. In the long run, two thirds of a price differential is compensated for by a change in the exchange rate. A possible explanation for the less than complete compensation is that the consumer price indices used in this study are not representative of the price of tradables. Another explanation might be that authorities did not want to fully offset price differentials by means of parity realignments in order to enhance domestic policy discipline and to prevent a further divergence of inflation performances between the two countries due to imported inflation. In any case, changes in price differentials do not have to result in exchange rate changes as long as one is willing to maintain a higher (lower) short-term interest rate r_k relative to the German short rate r_k^{GE} in case of a positive (negative) price differential, thereby offsetting the exchange rate risk for international investors.

$$\Delta \ln e_{DM} = \underset{(3.9)}{-0.0051}\left(r_k - r_k^{GE}\right) \underset{(4.5)}{-0.1725}\left(\ln e_{DM_{-1}} \underset{(6.6)}{-0.6662} \ln\left(p_c / p_c^{GE}\right)_{-1}\right) \underset{(5.6)}{-0.1645} dum_{70831} \Delta \ln e_{DOL}^{DM} \underset{(5.0)}{+0.215} \quad (1)$$

Sample: 1972Q1-1994Q4 SE = 0.0082 Q(12) = 17.10

Until 1983 the guilder/D-mark rate was also affected by the strength of the dollar. As international investors preferred the D-mark to the Dutch guilder, a depreciation of the D-mark/dollar rate, e_{DOL}^{DM}, resulted in a higher demand for D-mark investments rather than guilder investments, thereby weakening the guilder relative to the D-mark. After the last devaluation of the guilder, this link could no longer be detected.

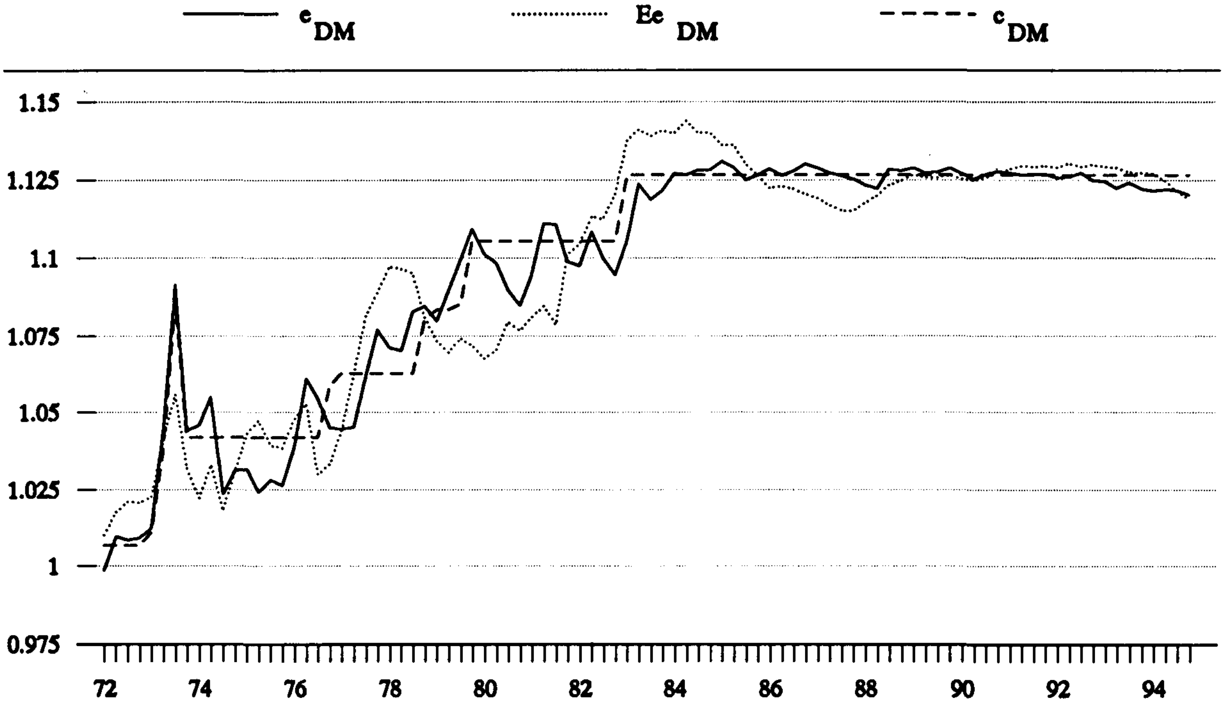
Other potential explanatory variables not included in (1) are the central parity and the current account. A significant impact of the current account on the exchange rate could only be found for the unlagged one quarter current account balance. However, although insignificant, the coefficients of the one year balance had the wrong sign. Since current account data are published with a long time lag, just including the unlagged one quarter deficit would be undesirable on economic grounds. In addition, the fact that export and import data display clear seasonal differences makes the one quarter deficit hard to interpret. The influence of the lagged central parity was not significant, probably because the parity has been realigned several times over our sample. Moreover, the impact of the price differential could no longer be found if the parity was included. Neither could it be detected if the sample was restricted to the EMS-period. This is probably due to the small changes in the differential over this sample.

In Figure 2, a dynamic simulation of the guilder/D-mark rate, Ee_{DM}, is shown together with its actual realisation, e_{DM}, and the central parity, c_{DM}. The dynamic simulation gives a good prediction of the actual exchange rate movements, in particular since 1988.

1 To avoid simultaneity problems, the equation was estimated by two-stage least squares. The one period lagged interest rate differential was used as an instrument for the interest rate differential.

Figure 2

Actual and dynamically simulated guilder/D-mark rate and central parity



1.2 The short-term interest rate

The short-term interest rate in the Netherlands (three-month euro-deposit rate) is to a large extent controlled by the central bank. As the direct or intermediate target of Dutch monetary policy since the start of the EMS has been a stable guilder/D-mark exchange rate, Dutch interest rate policy is primarily dictated by German monetary policy and the strength of the guilder relative to the D-mark. Hence, changes in the official German interest rates almost always lead to similar changes in the Netherlands. If the strength of the guilder, measured by the distance of the guilder/D-mark rate from its central parity, diminishes, the short-term interest rate differential with Germany has to rise. Also, if there are signs that the exchange rate is, or will become, overvalued, interest rates may have to rise since international investors will then demand a higher risk premium. Therefore, an increase in inflation relative to Germany and a weakening of the current account are likely to increase Dutch interest rates. Due to the fluctuation margin around the central parity, the Dutch central bank has some room for manoeuvre left. If the guilder is strong relative to the D-mark, the Dutch central bank may lower its policy-controlled interest rates independently from the Bundesbank. Further requirements here are that inflation is (expected to remain) low - the ultimate objective of monetary policy - and that the position of the current account is appropriate. Likewise, if inflation performance is (expected to be) poor, the Dutch central bank may raise interest rates independently from Germany.

$$
\begin{aligned}
\Delta r_k \; &= \Delta r_k^{GE} - \underset{(2.6)}{70.42}\,\Delta\left(\left(\textstyle\sum_{j=0}^{3}(B-M)_{-j}\right)\Big/\left(\textstyle\sum_{j=0}^{3}(B+M)_{-j}\right)\right) \\
&+ \underset{(8.9)}{96.92}\,\Delta\left((e_{DM}-c_{DM})/c_{DM}\right)_{-1} - \underset{(7.5)}{0.8238}\left(r_{k_{-1}} - \underset{(22.3)}{0.8019}\, r_{k_{-1}}^{GE}\right. \\
&+ \underset{(5.8)}{26.68}\left(\left(\textstyle\sum_{j=1}^{4}(B-M)_{-j}\right)\Big/\left(\textstyle\sum_{j=1}^{4}(B-M)_{-j}\right)\right) - \underset{(22.3)}{121.24}\left((e_{DM}-c_{DM})/c_{DM}\right)_{-2} \qquad (2) \\
&\left. - \underset{(4.3)}{0.1786}\right)\dot{p}_{c_{-1}} - \underset{(10.2)}{2.3158}\Big)
\end{aligned}
$$

Sample: 1979Q2-1994Q4 SE = 0.3525 Q(12) = 10.76

Given these considerations, the following reaction function for the short-term interest rate, given by (2), is postulated[2]. In the short run, changes in German short-term interest rates are fully transmitted to Dutch short-term interest rates. In the long run, due to the limited room for manoeuvre provided by the fluctuation margin, the hypothesis of complete domination of the German interest rate has to be rejected. Only 80% of a change in the German interest rate level is ultimately transmitted directly to the Dutch rate. In addition, a higher current account surplus, defined as the one year exports, B:, minus imports, M:, of goods and services scaled by exports plus imports, results in a lower short-term interest rate. This effect may either reflect a risk premium, demanded by international investors, or the central bank policy not to lower interest rates independently from the Bundesbank in case of a possible current account deficit. The short-run effect is higher than the long-run effect, which could point towards a learning effect of market participants concerning the importance given by the authorities to the current account deficit. No direct effect of the deviation of the D-mark rate from its central parity c_{DM} could be found. When included, the sign of the coefficient was wrong. This may be due to a simultaneity problem. If the guilder is weak, the Dutch interest rate is expected to rise, but if the Dutch interest rate rises the guilder strengthens. With a time lag of one quarter the strength of the guilder is a very important determinant of the Dutch short-term interest rate, however.

Finally, the Dutch inflation rate $\dot{p}_c$ affects the Dutch short-term interest rate only in the long run. No effect could be found for the German inflation rate. This probably indicates that inflation differentials were no cause for risk premia, which could be explained by the small magnitude of this differential over the sample period. On the other hand, cumulative inflation differentials, resulting in price level differentials, do affect the short-term interest rate through the response of $e_{DM} - c_{DM}$. The separate domestic inflation effect reflects the high priority the authorities give to inflation as the ultimate objective of monetary policy.

In Figure 3, the short-term interest rate differential between the Netherlands and Germany is shown, together with the dynamically simulated differential, $Er_k - r_k^{GE}$, and the German rate. Although the German interest rate is by far the most important determinant of the Dutch interest rate, the graph clearly illustrates the significance of the other variables as well. The dynamically simulated interest rate differential closely resembles the actual differential, which in turn clearly deviates from zero most of the time.

Figure 4 shows the contribution of the domestic explanatory variables to the dynamically simulated short-term interest rate (as deviation from the average contribution). The strength or weakness of the guilder, measured by $e_{DM} - c_{DM}$, was very important until the mid eighties. The difference between its highest and its lowest contribution to the determination of the short-term interest rate is about 3.5 percentage points. For the current account, B: - M:, this difference amounts to almost 2.0 percentage points, whereas for the inflation rate it is 1.5 percentage points.

2 The equation for the short-term interest rate is estimated together with the one for long-term interest rates, by means of iterated three stage least squares. The same set of instruments was used for both equations. For the unlagged variables, other than the German interest rates, the one period lagged equivalents were used as instruments.

Figure 3
German short-term interest rate and actual and simulated differential with the Netherlands

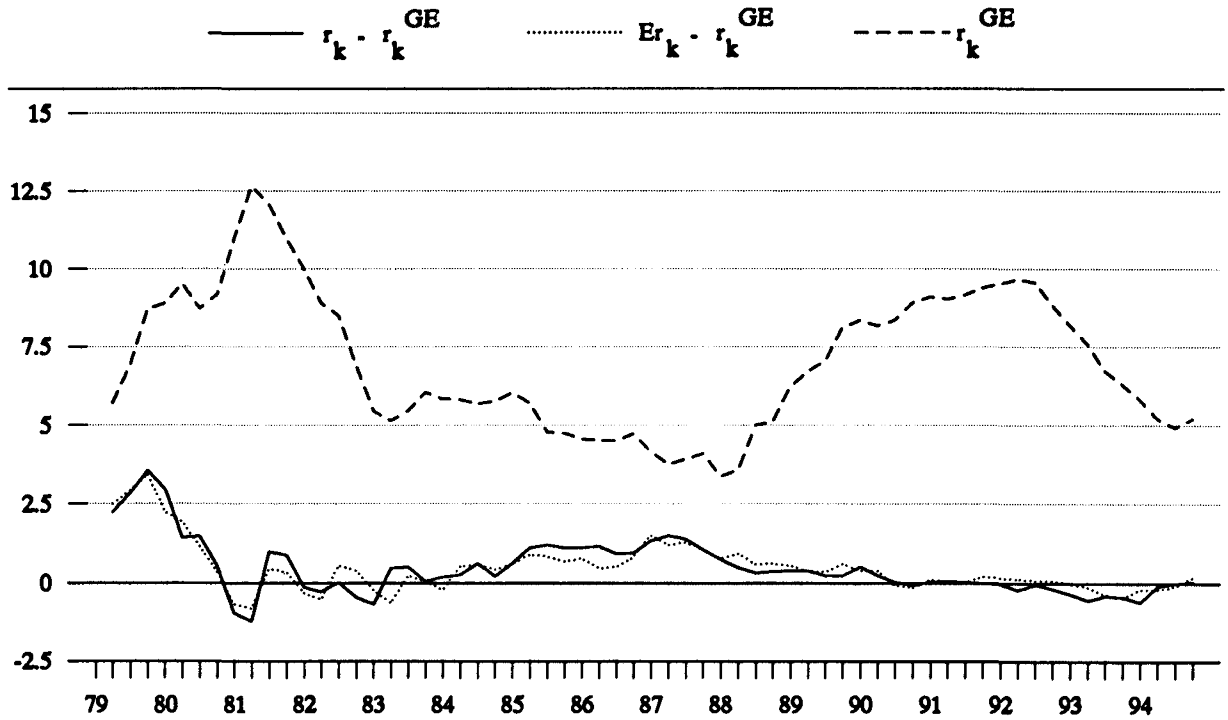
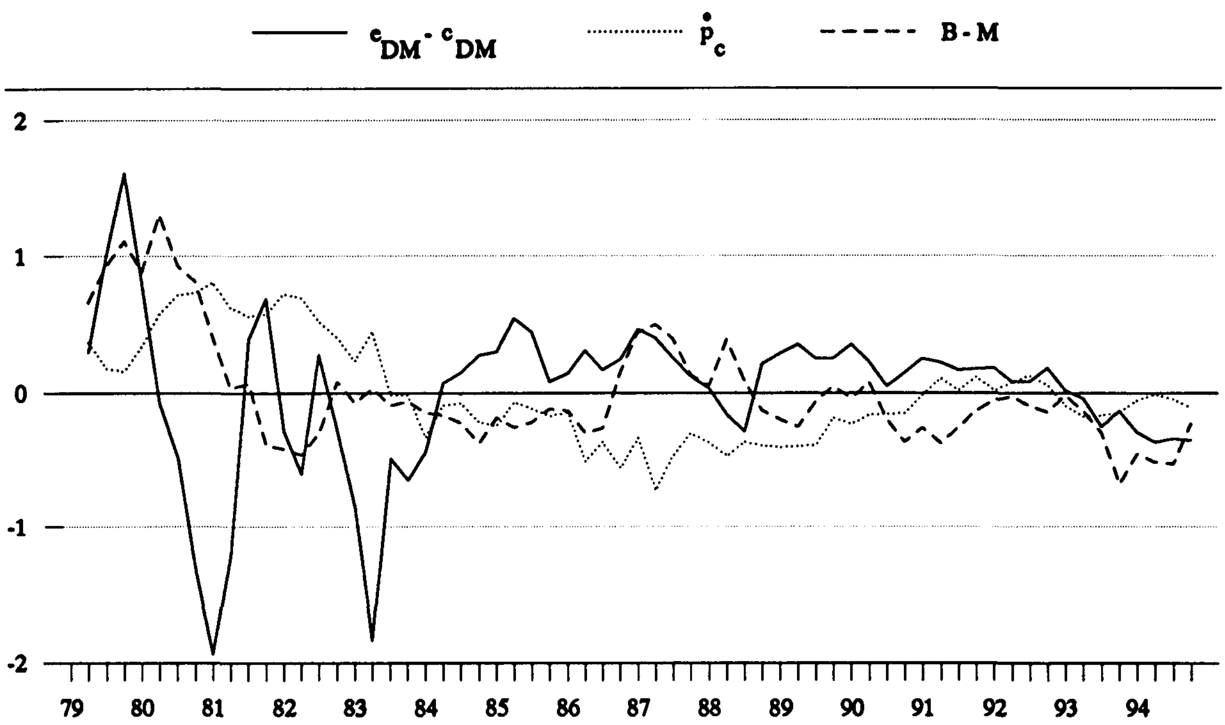


Figure 4
Contribution of domestic influences to the dynamically simulated short-term interest rate
As a deviation from the average contribution



1.3 The long-term interest rate

The Dutch long-term interest rate r_ℓ, represented by the yield on ten-year government bonds, is largely determined by its German counterpart r_ℓ^{GE}. As there are no capital controls effective in the markets for either Dutch or German bonds, one should expect all deviations between Dutch and German long-term interest rates to be accounted for by expected depreciations and risk premia. These risk premia may represent both a devaluation risk or other factors such as for instance liquidity. As the liquidity of the Dutch bond market is not as high as that of Germany, Dutch interest rates will be slightly higher. In practice however, the markets for Dutch and German bonds are not integrated completely. Many institutional investors, for instance, are restricted in the relative amounts they are allowed to invest abroad. Also, the presence of transaction and information costs will contribute to some degree of segregation of bond markets. The fact that world capital markets are less than perfectly integrated in practice can also be deduced from the well documented fact that the share of domestic assets in the portfolios of investors is much too high according to diversification motives (e.g. Hatch and Resnick, 1993). Owing to the segregation, domestic economic conditions still play an important role in the formation of long-term interest rates, over and above the role they play in the determination of the risk premium. In our model the less than perfect integration of Dutch and German bonds markets results in coefficients for the German interest rates that are significantly smaller than 1.

In equation (3) below, which is based on a loanable funds framework, the relevant domestic factors determining the long-term interest rate are the short-term interest rate, inflation and the one year government deficit, D:, scaled by gross domestic product, Y:. The relevance of the short-term interest rate also follows from the term structure theory, according to which the long-term interest rate reflects the expected development of future short-term interest rates. The current inflation rate reflects the expected future inflation rate which is an important component of nominal interest rates. In the loanable funds approach, the government deficit is an important determinant of the demand for long-term funds. Unless the supply of funds schedule is infinitely elastic with respect to the long-term interest rate (i.e. through perfect substitutability between domestic and foreign assets) and unless full Ricardian equivalence holds, a higher demand for long-term funds by the government ceteris paribus increases the long-term interest rate.

$$\begin{aligned}\Delta r_\ell =\ & \underset{(2.7)}{0.1343}\Delta r_k + \underset{(13.1)}{0.8361}\Delta r_k^{GE} - \underset{(5.4)}{0.4238}\Big(r_{\ell_{-1}} - \underset{(3.5)}{0.1844}\, r_{k_{-1}} \\ & -\underset{(7.0)}{0.6804}\, r_{\ell_{-1}}^{GE} - \underset{(4.5)}{0.1869}\,\dot{p}_{c_{-1}} + \underset{(2.6)}{15.72}\Big(\big(\textstyle\sum_{j=0}^{3} D_{-j}\big)\Big/\big(\textstyle\sum_{j=0}^{3} Y_{-j}\big)\Big)_{-1} \\ & -\underset{(0.8)}{0.2977}\Big)\end{aligned} \qquad (3)$$

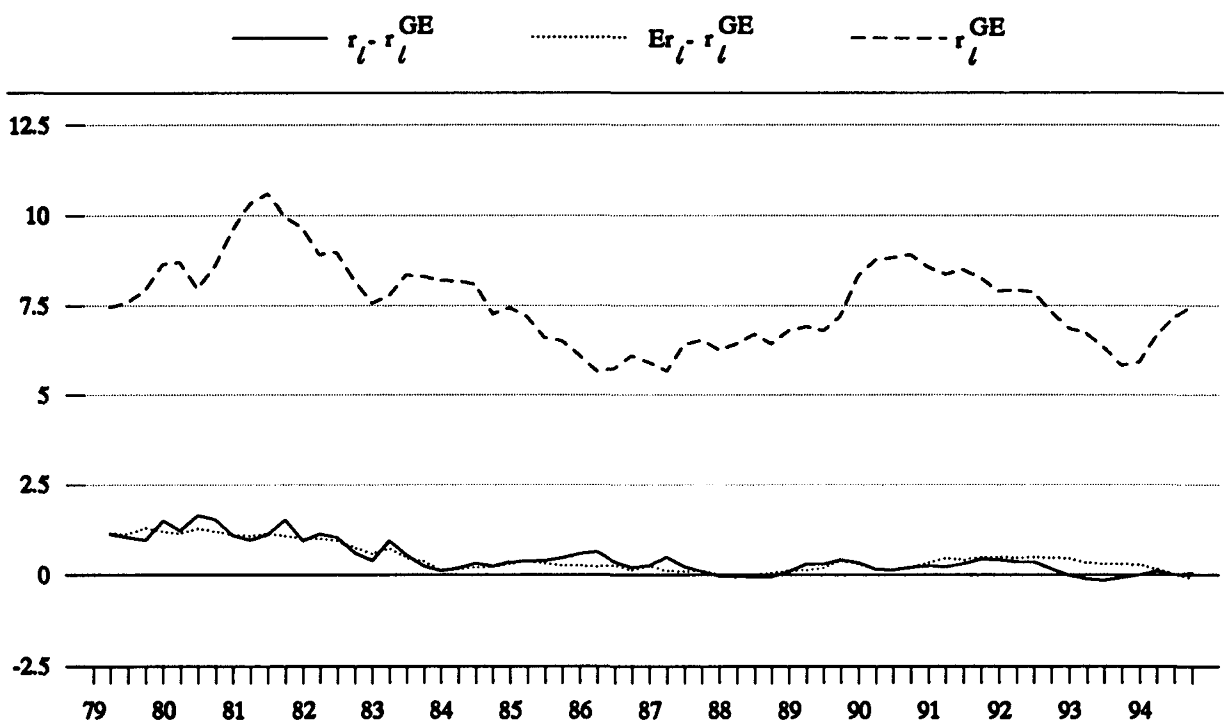
Sample: 1979Q2-1994Q4 SE = 0.1781 Q(12) = 12.53

Moreover, a high government deficit may induce future governments to inflate the debt burden. This both increases the risk premium demanded by foreign investors and the nominal interest rate demanded by domestic investors.

Apart from these variables, others were included as well, but were found to be insignificant. The influence of the German inflation rate turned out to be negligible. The irrelevance of this variable means that the effect of domestic inflation cannot be explained by a loss of competitiveness. Segregation of bond markets seems to be more important than exchange rate risk premia for the Netherlands. Another possible candidate for the exchange rate risk premium, the current account, was not significant either. A possible explanation for the lack of significance of this variable could be that there were no sustained periods of current account deficits over the sample period. Finally, the influence of interest rate volatility turned out to be insignificant as well. This might be due to the resemblance of the volatility patterns of Dutch and German bonds. Therefore, the influence of volatility on Dutch interest rates is already captured by the German rate.

Figure 5 depicts the dynamically simulated long-term interest rate differential between the Netherlands and Germany, $Er_\ell - r_\ell^{GE}$, together with the realised differential and the German long rate. Although the German interest rate is by far the most important determinant of the Dutch rate, domestic influences cannot be discarded. The actual differential was positive most of the time, and in line with the model predictions.

Figure 5
German long-term interest rate and actual and simulated differential with the Netherlands



In Figure 6 the contributions of the three domestic factors to the Dutch long-term interest rate are shown. The short-term interest rate and the Dutch inflation rate are the most important. Their contributions show fairly similar patterns, which is not very surprising since monetary authorities will change short-term interest rates in response to (anticipated) changes in inflation rates. It is interesting to see that the interest rate effect precedes the inflation effect by almost a year most of the time. The influence of the government deficit is also substantial, as the contribution of the deficit was over 0.5 percentage point higher in 1983 than it was in 1992.

Table 1 provides a summary of recent empirical research with respect to the Dutch long-term interest rate. The coefficients reported refer to the long-run or equilibrium impact of the explanatory variables on the level of the long rate. In five out of the eight studies considered (including the present), the German long-term interest rate is the dominating explanatory factor. For this variable, Knot (1995) reports the highest coefficient (0.96), but this perhaps reflects the fact that his model does not allow for domestic term structure effects. Boeschoten (1989) reports the lowest coefficient for the German long rate (0.60), but also allows for a separate effect of the US long rate.

Figure 6

Contribution of domestic influences to the dynamically simulated long-term interest rate

As a deviation from the average contribution

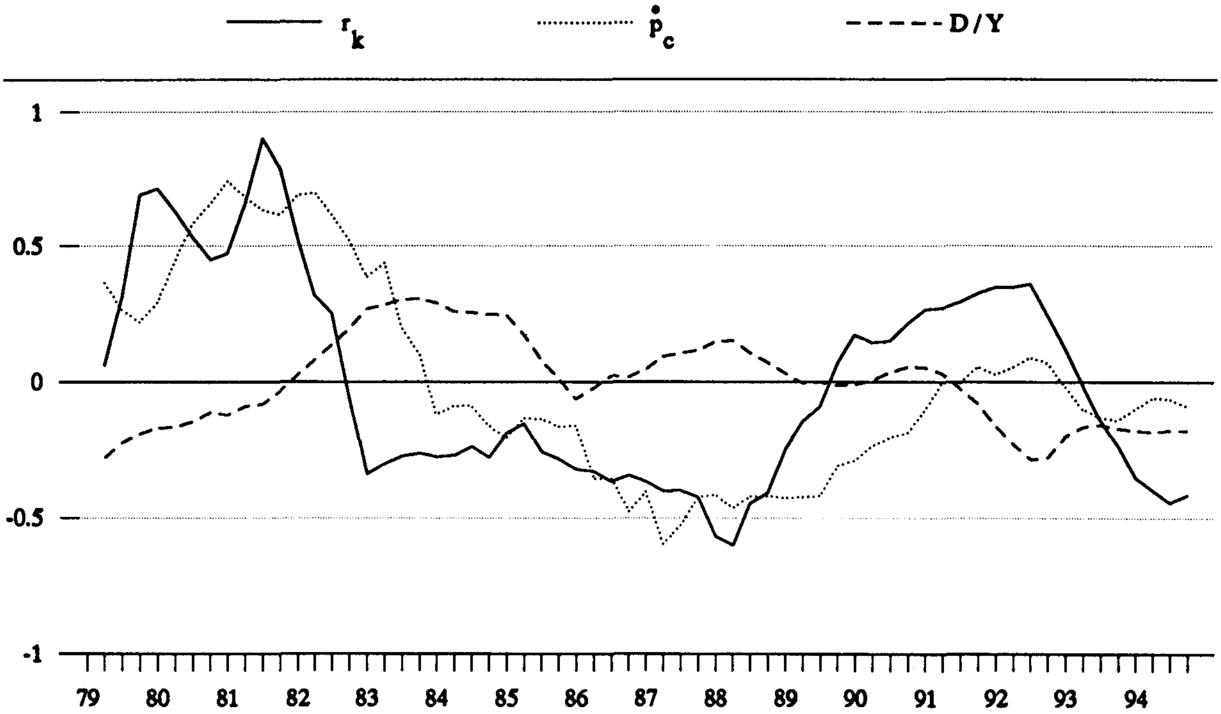


Table 1

Comparison of recent estimated long-term interest rate equations for the Netherlands

Author, model and sample	Long-term coefficient of					
	Long rate GE	Long rate US	Short rate NETH	Inflation rate	Deficit ratio	Other
Boeschoten (1989) 1980Q1-1987Q3	0.60	0.13	0.24	0.04 [1]	..	0.04 [2]
MORKMON II 1979Q1-1987Q4	0.83	..	0.16	0.07 [1]	..	0.09 [3]
Douven (1995) 1960-1991	..	..	0.74	0.09	..	..
Knot (1995) 1960-1991	0.96	..	..	0.20	0.56	0.19 [4]
Fase/Van Geijlswijk (1995) 1979Q2-1991Q4	0.75	..	..	0.32	..	..
EUROMON 1971Q2-1992Q4	..	..	0.49	0.25	..	..
Correira-Nunes/Stemitsiotis (1995) 1979-1993	..	..	0.45	0.49	0.50	..
This study 1979Q2-1994Q4	0.68		0.18	0.19	0.16	..

[1] Coefficient of inflation differential with Germany.

[2] Effect of an increase in the current account by 1% of GNP.

[3] Effect of an increase in the net excess demand for funds in the domestic capital market by 1% of GNP.

[4] Effect of a 1% increase in the capacity utilisation rate.

Douven (1995) and EUROMON (Boeschoten et al., 1995) concentrate on term structure and inflation effects in long-run equilibrium, with foreign long-term interest rates having a direct impact in the short run only. Correira-Nunes and Stemitsiotis (1995), too, focus on the domestic short- term interest and inflation rate as explanatory factors. In the equations featuring the inflation differential with Germany, the direct impact of domestic inflation on the long-term interest rate is rather weak compared to the equations which include the domestic inflation rate only. In the equations which include both domestic term structure effects and the German long-term interest rate, the coefficients reported for the short-term interest rate are close to 0.2. Both the present study and those by Knot and by Correira-Nunes and Stemitsiotis report a significant positive influence of the government financial deficit on the long-term rate. The fact that in the latter two a much stronger impact has been found (0.56 and 0.50, respectively, versus 0.16 in the present study) may in addition to the use of a different specification and annual data, be attributed to the longer sample period, which also covers the sixties (Knot) and seventies. Indeed, these findings are in line with the simulation effects of a 1% higher budget deficit (relative to GNP) on the long-term interest rate according to a range of Dutch econometric policy models whose sample periods only include the sixties and seventies (Van Loo, 1984). In those decades, capital mobility and the international integration of capital markets were still fairly limited. Hence, domestic economic conditions had a relatively large impact on interest rates. The equation of the Nederlandsche Bank's model of the Dutch economy MORKMON II (Fase et al., 1992) also allows for a small effect of public financial policy on interest rates via the response of the net excess demand for funds in the domestic capital market.

Apart from the equations reported in Table 1, which are of the reduced-form type, various models of the Netherlands' economy exist in which the long-term interest rate clears the domestic capital market. Examples of these models are the Central Planning Bureau's model FREIA-KOMPAS (Van den Berg et al., 1988), CESAM (Kuipers et al., 1990), DUFIS (Sterken, 1990), and more recently the IBS-CCSO model (Jacobs and Sterken, 1995). According to these models, changes in foreign long-term interest rates have a strong impact on Dutch long rates, as is the case for most of the equations presented in Table 1. Moreover, for FREIA-KOMPAS and CESAM, an increase in the government financial deficit by 1% of national income leads to a rise in long-term interest rates of about 0.35 percentage points and 0.20 percentage points, respectively. According to DUFIS, the increase in the long rate amounts to over 1.7 percentage points, which may be considered a rather extreme result. A similar exercise with the IBS-CCSO model is not available. Other benchmark simulations based on that model, however, indicate rather weak interest rate responses to domestic policy actions.

1.4 Dynamic system simulations

Dynamic simulations with the three-equation system presented above provide further information on its stability when shocks to one equation are allowed to influence all three dependent variables over time, as is the case in reality. If the dynamic interdependencies between the exchange and interest rates in the model system are such that lasting or systematic differences between the simulated and observed values occur, this would question the quality of the model. Figures 7 to 9 show the observed and simulated paths of the exchange rate, the short-term and the long-term interest rates, respectively. Of particular interest are Figures 7 and 8, as they indicate substantial forecast errors in the 1979-1985 period for the guilder/D-mark exchange rate and the Dutch short-term interest rate. These errors mainly originate from relatively large residuals in the exchange rate equation. However, the deviations, though persistent in the short run, are by no means systematic and die out in the course of time. Since the mid eighties, the deviations for the exchange rate and short-term interest rate almost never exceed the level of 1 per cent and 1 percentage point, respectively. For the long-term interest rate, the simulated values are quite close to the observed ones. It must be noted, however, that the simulations are based on the strong assumption that all explanatory factors other than the exchange rate and domestic interest rates are exogenous and deterministic variables.

Figure 7
Actual and dynamically simulated guilder/D-mark exchange rate in the three-equation system

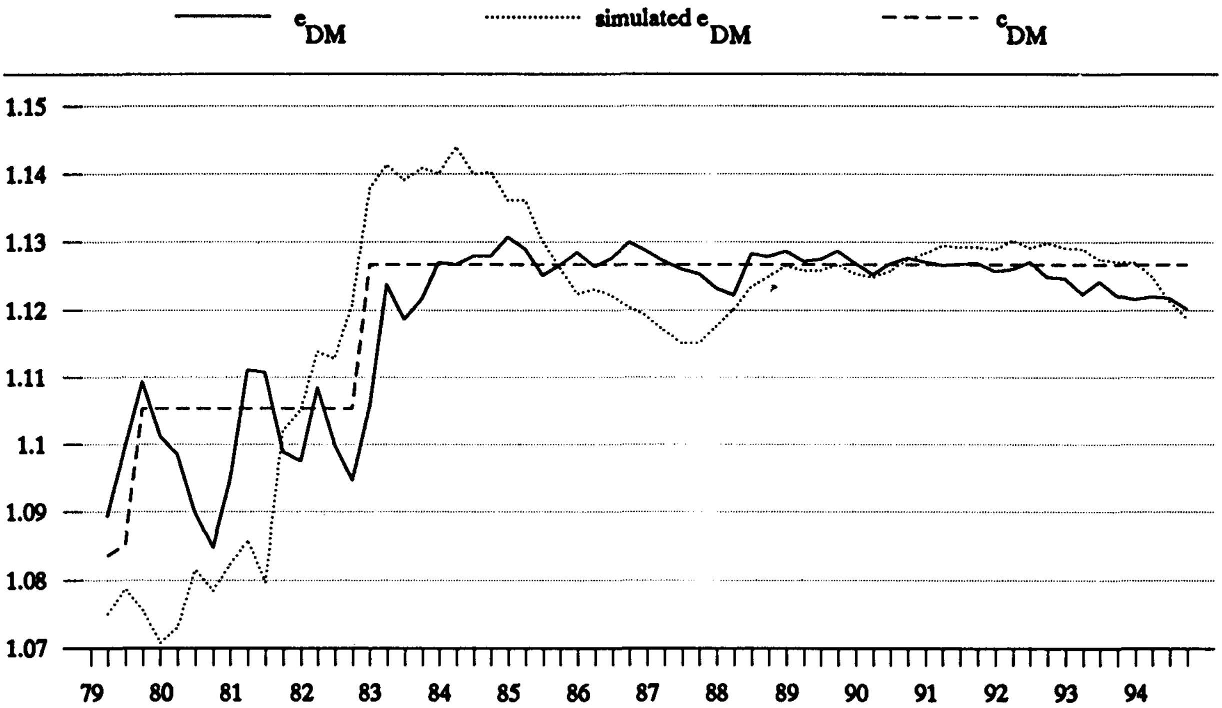


Figure 8
Actual and dynamically simulated short-term interest rate in the three-equation system

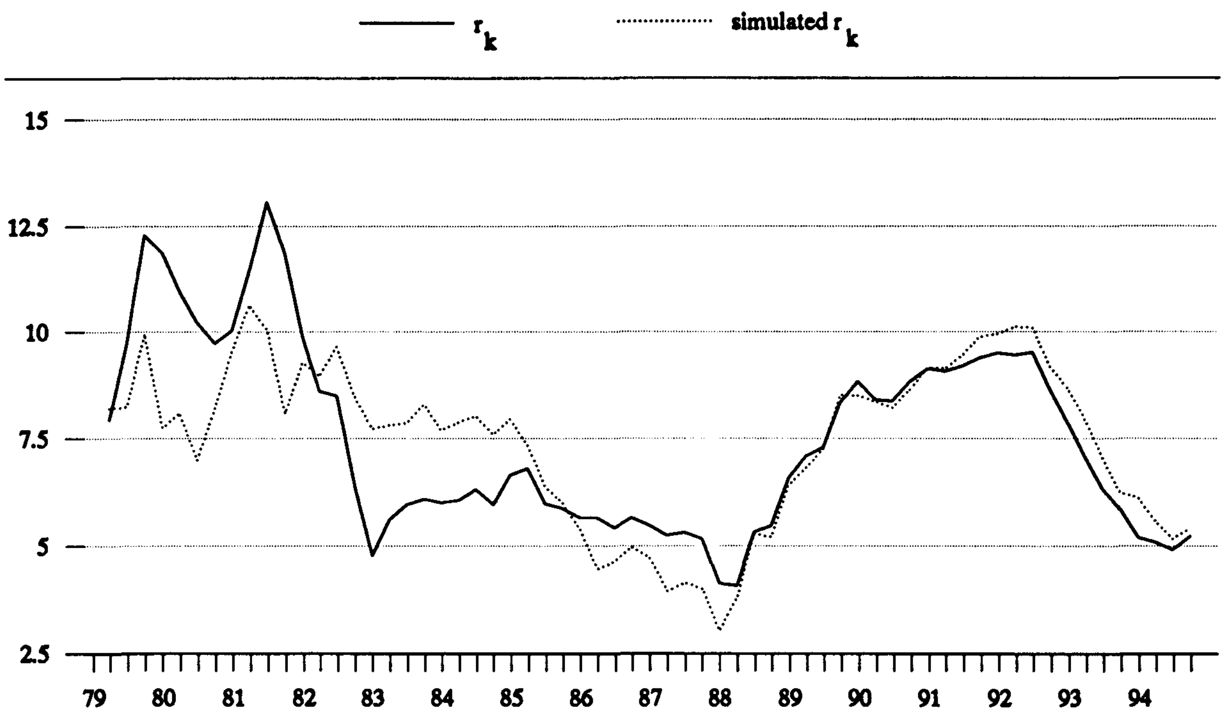
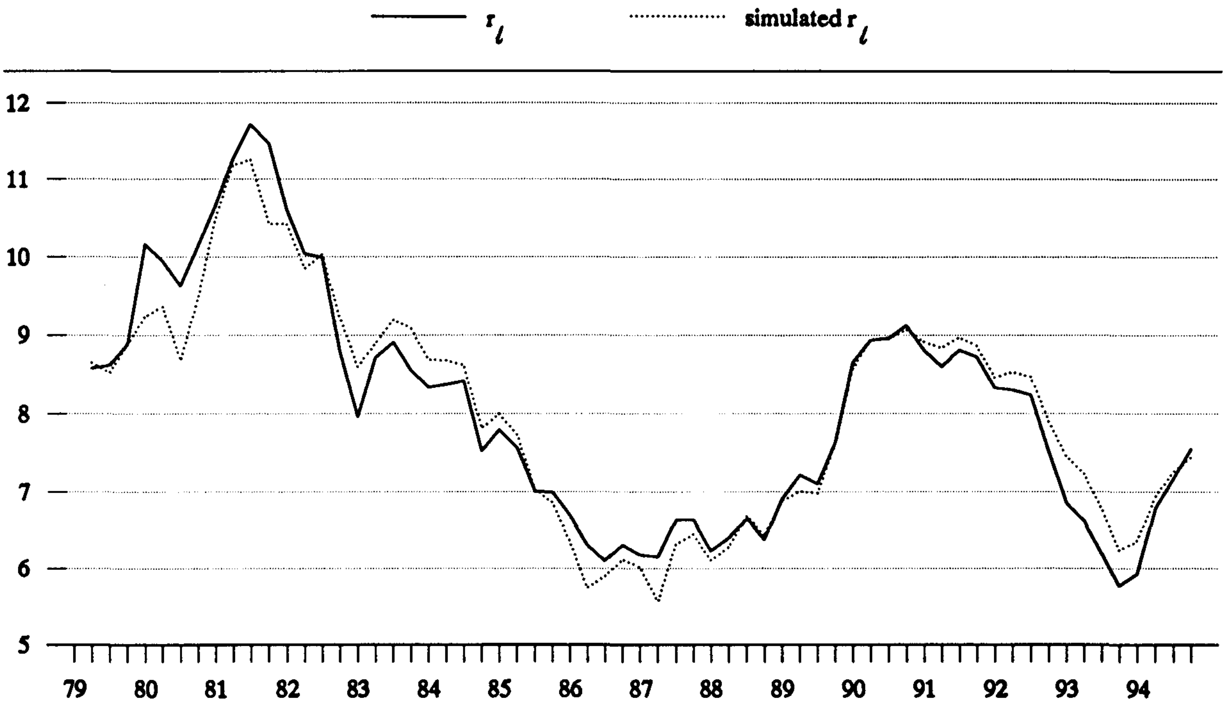


Figure 9
Actual and dynamically simulated long-term interest rate in the three-equation system



2. Changes in fundamentals: evidence from impulse responses

This section analyses the impulse responses of Dutch interest rates and the exchange rate of the guilder vis-à-vis the D-mark to changes in fundamentals, concentrating on domestic fiscal policy and a German price increase. The impulse responses are computed by including equations (1)-(3) presented above in the Bank's macroeconometric model MORKMON II[3]. Hence, the endogeneity of the domestic factors affecting the exchange and interest rates is explicitly taken into account. In the case of the German price increase, accompanying responses of the German short- and long-term interest rates have been computed using the Bank's model of the EU-countries EUROMON. The simulation period is 1990,Q1-1994,Q4, being the most recent period for which actual data are available on a consistent basis. Owing to the nearly linear character of the model, the effects reported in the tables below would be very much the same for other simulation periods.

Table 2 presents the impulse responses to an increase in government expenditure by 1% of GDP. This increase is attended by a lower current account balance by 0.8% of GDP. For this reason, the short-term interest rate rises by about 10 basis points. Since a plausible and significant impact of the current account on the exchange rate of the guilder could not be established empirically, a depreciation of the exchange rate does not occur. Instead, the higher short-term interest rate leads to a small appreciation of the guilder vis-à-vis the Deutsche mark, which in turn mitigates the increase in the short rate. The fiscal impulse also leads to a increase by the government financial deficit by 0.75% of GDP and a gradual rise of the price level, which stabilises at about 0.20 per cent above base level. As a result, the long-term interest rate rises, also reinforced by the term structure effect of the increase in the short-rate. Eventually, the long-term interest rate is 15 basis points above base level. This result is broadly in line with the outcomes for the models FREIA-KOMPAS and CESAM mentioned earlier.

3 Boeschoten and Van Els (1995) analyse the model's monetary transmission channels.

Table 2

Effects of a permanent increase in government expenditures by 1% of GDP

Effects measured in percentages, unless stated otherwise

Variable	Effects after			
	1 year	2 years	3 years	5 years
Real GDP	0.46	0.41	0.37	0.36
Private consumption deflator	0.02	0.19	0.25	0.20
Unit labour costs, enterprises	–0.22	0.15	0.33	0.25
Government financial deficit (% of GDP)	0.76	0.74	0.77	0.93
Current account balance (% of GDP)	–0.69	–0.18	–0.79	–0.86
Guilder/D-mark exchange rate*	0.09	0.11	0.08	0.09
Short-term interest rate (% points)	0.09	0.06	0.08	0.09
Long-term interest rate (% points)	0.04	0.13	0.16	0.15

* + = appreciation of guilder.

Table 3 summarises the results of a permanent increase in the German price level by 1 per cent. According to the model EUROMON, this impulse is attended by an increase in the German short and long rates by 62 and 21 basis points, respectively, in the first year. The increase in the German price level relative to Dutch prices leads to a small appreciation the guilder vis-à-vis the D-mark, despite the fact that the rise of the German short rate exceeds that of its Dutch counterpart. In the second year, the German short rate approaches its base level again, as inflation returns to base value. Due to the strong position of the guilder, the Dutch short-term interest rate remains 13 basis points below the German short rate. In the first year, the Dutch long-term interest rate rise is slightly higher than the rise of the German long rate. The aggregate impact of both the domestic short rate and the German long rate implies somewhat stronger term structure effects in the Netherlands. From the second year on, when inflation stabilises, the same mechanism results in lower Dutch long-term interest rates relative to their German counterparts. All in all, Dutch and German long-term rates move closely in line. An additional sensitivity analysis shows that the outcomes in Table 3 are robust to changes in the semi-elasticity of the German short-term interest rate with respect to inflation. Indeed, doubling the long run value of this elasticity in EUROMON from 0.65 to 1.3, which typically has been reported by others in the literature (Willms, 1983; Vlaar, 1994; Stokman and Schächter, 1995), only leads to minor changes.

Table 3

Effects of a permanent increase in the German price level by 1 percent

Effects measured in percentages, unless stated otherwise

Variable	Effects after			
	1 year	2 years	3 years	5 years
Assumptions				
Private consumption deflator, Germany	1.00	1.00	1.00	1.00
Short-term interest rate, Germany	0.62	0.07	–0.03	0.00
Long-term interest rate, Germany	0.21	0.15	0.03	0.01
Results				
Real GDP	0.03	–0.01	0.01	0.04
Private consumption deflator	0.18	0.23	0.24	0.26
Unit labour costs, enterprises	0.11	0.24	0.29	0.33
Government financial deficit (% of GDP)	–0.03	–0.04	–0.08	–0.11
Current account balance (% of GDP)	0.10	0.14	0.13	0.07
Guilder/D-mark exchange rate*	0.04	0.06	0.10	0.10
Short-term interest rate (% points)	0.51	–0.06	–0.16	–0.13
Long-term interest rate (% points)	0.26	0.12	–0.01	–0.04
Interest differentials with Germany				
– short rate (% points)	–0.11	–0.13	–0.13	–0.13
– long rate (% points)	0.05	–0.03	–0.04	–0.05

* + = appreciation of guilder.

Conclusion

The main conclusions from this paper are the following:

1. The guilder/D-mark exchange rate over the period 1972-1994 can be explained by a combination of (less than complete) purchasing power parity and short-term uncovered interest parity.
2. The short-term interest rate in the Netherlands is determined by the German interest rate, the strength of the guilder, the current account balance and the domestic inflation rate.
3. The long-term interest rate in the Netherlands is significantly influenced by the German long rate, the domestic short-term rate, the domestic inflation rate and the government financial deficit.
4. In the long-run interest rates in the Netherlands do not respond 100% to changes in German interest rates. For the money market, this points to some room for manoeuvre for monetary policy provided by the existence of fluctuation margins around the central parity. For the bond market, this probably means that the Dutch and German markets are not perfectly integrated in practice.
5. Econometric evidence of a direct influence of German inflation rates on interest rates in the Netherlands could not be found. This suggests that risk premia are not based on inflation differentials. On the other hand, differences in price level movements between the Netherlands and Germany have an impact on the short-term interest rate through the response of the strength of the guilder. The fact that inflation-based risk premia are hard to find underlines the credibility of the guilder/D-mark peg over most of the sample period.
6. Impulse response simulations show that shocks to domestic fundamentals of regular magnitude have only a modest impact on Dutch interest rates and the exchange rate.
7. Despite the fact that we did not find a one-to-one relationship between German and Dutch interest rates empirically, simulation exercises show that interest rates in both countries tend to move together in the presence of shocks to the German (or world) economy.
8. The magnitude of changes in the spread between German and Dutch interest rates caused by shocks to domestic and foreign fundamentals is consistent with the magnitude of fluctuations in the spread observed in reality.

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Comments on paper by P.J.A. van Els and P.J.G. Vlaar by Benjamin Cohen (BIS)

This paper offers a good illustration of the strengths and weaknesses of the style of econometric forecasting which tries a large number of variables and keeps the ones that are significant. The primary strength of this method is that one is more likely to pick up unexpected patterns and correlations, without being constrained by a theory that may or may not be plausible. It is thus interesting to see certain textbook relationships confirmed by the model, given that the model's parameters are based solely on past statistical relationships. The primary weakness is that parameters estimated by past experience may not be very informative about the results of a hypothesised policy experiment.

The first part of this paper presents parameter estimates of structural equations for quarterly changes in the Netherlands guilder/Deutsche Mark exchange rate, quarterly changes in the difference between Dutch and German short term interest rates, and quarterly changes in long-term Dutch interest rates. These equations seem to fit the data fairly well, though their forecasting ability improves markedly from the mid-1980's onward.

Significant effects on changes in the exchange rate are found for lagged differentials between Dutch and German short-term interest rates and prices, for lagged levels of the exchange rate, and, before 1983, for changes in the US dollar/DM exchange rate. The effect of price differentials, however, is not strong enough to indicate purchasing power parity; price differentials do not lead to equivalent compensating nominal exchange rate movements.

The authors attribute the negative effect of short interest rate differentials on the contemporaneous exchange rate movement -- an interest rate differential in favour of the guilder is accompanied by the guilder's appreciation -- as evidence for uncovered interest parity. To correct for simultaneity problems -- such as, perhaps, that a currently weak guilder might lead the central bank to raise rates -- the previous quarter's interest rate differential is used as an instrument. It is not clear to me that this is an adequate test of the uncovered interest parity hypothesis. I would be more convinced if relatively higher three-month interest rates in the Netherlands on the last day of the *previous* quarter were followed, on average, by an equivalent depreciation of the guilder in the current quarter, and lower rates were followed by an appreciation; this would suggest that investors' expectations regarding the guilder's movements were correct on average.

Significant effects on changes in the Dutch-German short rate differential are found for the change in and lagged level of the trade surplus, the lagged change in and lagged level of the exchange rate, the lagged levels of short rates in the two countries, and lagged inflation. The authors test the differential, rather than the level of the Dutch rate alone, because they find the two countries' short rates to have been so highly correlated as to drown out other effects.

It is somewhat curious that the model assigns current account conditions a role in interest rate determination but no role in exchange rate determination. It is also curious that the short- and long-term rate equations are estimated simultaneously, but not the exchange-rate equation, even though exchange rates enter into the short-term rate equation and, via short rates, the long-rate equation as well.

Even though the short-rate differential is the variable being modelled, the lagged values of the two country's short-rates enter the model separately on the right-hand side. The authors explain this as an attempt to separate long and short term effects of German rates on Dutch rates. I would think there are easier ways to do this, for example comparing the coefficient from a regression using quarterly changes to the coefficient using annual or multi-year changes. The results presented here suggest that the two rates are closely, but imperfectly correlated, through the "backdoor" method of demonstrating that they have different serial correlation coefficients, but these results do not seem especially informative as to the time horizon over which this correlation is effective.

Significant effects on changes in the long-term interest rate are found for changes in and lagged levels of the Dutch short rate and the German long rate, for the lagged Dutch long rate, for inflation, and for the government budget deficit.

Having decided previously that the differential between Dutch and German short rates, rather than the level of either, is the relevant short-rate variable, the authors look only at the Dutch short rate here. This, too, makes their results difficult to interpret, because it is unclear whether long rates respond only to the level of short rates, as they would in a naive expectations-based term-structure hypothesis, or also to the Dutch-German spread, which may indicate exchange rate or inflation trends.

The second part of the paper, after revealing that these three equations form part of the Netherlands Bank's macroeconometric forecasting model, presents the model's forecast results for two policy changes: a permanent, debt-financed increase in government spending, and a permanent increase in the German price level.

The exchange rate effects of the fiscal experiment follows orthodox macroeconomic theory (though not the current "journalistic" consensus) in that a spending increase leads to an appreciation of the guilder. The results for long-term interest rates also accord with textbook macroeconomics, in that more borrowing raises rates. An expansive fiscal policy also leads to higher short-term interest rates. The authors explain that the government spending increase leads to a current account deficit, which has historically led to higher short rates, either because sustainability issues lead to a higher risk premium or because it leads the central bank to tighten policy. Higher prices in Germany lead, as one might expect, to a stronger guilder and lower Dutch interest rates.