Capital Flows and the Exchange Rate of the Krone

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INTRODUCTION AND SUMMARY

Capital flows across national borders have increased in volume in recent years, both to and from Denmark as well as internationally. At the same time, the economic literature has turned more attention to the relationship between capital flows and exchange rates.

Conventional exchange-rate models have sought to explain exchange rates in terms of the development in different macroeconomic variables such as the money stock, interest rates and inflation. These models have had limited empirical success, however. More recent research has introduced microeconomic explanations instead, e.g. foreign-exchange dealers' inventory management. The underlying intuition is that foreign-exchange dealers normally adjust their bid and offer prices to and from their inventories to match purchase and sales orders in the foreign-exchange market. In this way foreign-exchange dealers ensure that their inventories are not undesirably large or small. An overweight of purchase orders pushes prices up, while they are reduced if there is an overweight of sales orders. To the extent that capital flows trigger purchase or sales orders in the foreign-exchange market, they may therefore influence the exchange rate.

This article considers the short-term relationship between capital flows to and from Denmark and the development in the krone vis-à-vis the euro in the period 1999-2004.

Initially it is demonstrated that while there is a significant relation between the krone rate and capital flows from portfolio investments on a monthly basis, it is not possible to identify an impact on the krone rate from capital flows from direct investments and other capital imports.

Consequently, the rest of the analysis concentrates on portfolio investments. Portfolio investments during this period can be compiled on a weekly basis, and it is thus possible to operate with a higher frequency than in other studies, which apply monthly or quarterly data.

A significant relationship is found between weekly changes in the krone rate and capital flows related to portfolio investments. On aver-
age, capital imports of kr. 10 billion strengthen the krone by kr. 0.12 per 100 euro (e.g. from kr. 746.00 to kr. 745.88 per 100 euro).

Subsequently, various breakdowns of portfolio investments by instruments, sectors and counterparty countries are examined. Among other things, the results indicate that Danish residents’ trade in foreign equities has a greater impact on the krone rate than equivalent trade in foreign bonds. The reason may be that the exchange-rate risk on bond investments is hedged to a larger extent than the exchange-rate risk on equity investments.

The insurance and pension sector’s trade in both foreign equities and bonds contributes significantly to explaining changes in the krone rate. The significance of this sector to the krone rate appears to have increased in recent years.

Portfolio investments to and from the euro area have a greater impact on the krone rate than equivalent portfolio investments to and from the rest of the world. The explanation could be that market participants are less inclined to hedge the exchange-rate risk on investments to and from the euro area due to Denmark’s fixed-exchange-rate policy vis-à-vis the euro.

The overall results are robust to the inclusion of further variables (Danmarks Nationalbank’s intervention in the foreign-exchange market and the interest-rate spread between Denmark and the euro area) to explain the development in the krone rate.

**CAPITAL FLOWS AND THE KRONE RATE**

Danmarks Nationalbank compiles capital flows to and from Denmark on a monthly basis. Chart 1 shows the capital flows broken down as portfolio investments, direct investments and other capital imports. Throughout most of the period 1999-2004, portfolio investments resulted in net capital exports, and the fluctuations from month to month were considerable. At the beginning of the period, direct investments led to an inflow of capital to Denmark, but since then direct investments have balanced overall, and the fluctuations have been smaller than for portfolio investments.

In the period 1999-2004, portfolio investments were reported to Danmarks Nationalbank’s payment statistics on a daily basis, and consequently they can be compiled with a higher frequency than other capital flows. However, at the start of 2005 the payment statistics were restruc-
tured so that in future portfolio investments are also reported on a monthly basis, cf. Danmarks Nationalbank (2005).¹

Chart 2 shows a 12-week moving average of portfolio investments together with the krone rate (kroner per euro).² The Chart gives a first-hand impression of the relationship between portfolio investments and the krone rate in recent years. While it is possible to e.g. identify periods in which a capital outflow from Denmark (net capital imports relating to portfolio investments) has coincided with a weakening of the krone (an increase in the price of euro in kroner), it is also evident that other factors have also had an impact on the krone rate.

In the analysis of the relationship between portfolio investments and the krone rate, the following sections set up a number of regression models for the period 1999-2004. These models are applied to test the article’s basic hypothesis, i.e. that an inflow of capital to Denmark leads to a strengthening of the krone. On the basis of the models it is also possible to calculate the extent to which changes in the krone rate may be attributed to capital flows related to portfolio investments. Chart 3 shows the actual weekly krone-rate changes and the predicted weekly krone-rate change implied by one of the models. Again, it

¹ The reporting structure has been changed in order to achieve a more robust data basis for future compilation and also to reduce the reporting burden on the corporate sector significantly.
² The fixed-exchange-rate policy vis-à-vis the euro entails that the rate of the krone against other currencies is primarily driven by the fluctuations in the euro vis-à-vis other currencies.
is clearly seen that the krone rate is not determined solely by portfolio flows to and from Denmark.

Note: Positive values indicate weakening of the krone vis-à-vis the euro. Model estimates are fitted values based on the model in Table 2.
LITERATURE ON EXCHANGE RATES AND CAPITAL FLOWS

Conventional exchange-rate models have been poor at explaining the development in exchange rates, in the short term at least. However, recent economic literature includes several examples of how capital flows have been included in exchange-rate models in an attempt to improve the models' ability to explain the development in exchange rates.

Brooks, Edison, Kumar and Sløk (2001) examine, *inter alia*, whether capital flows related to portfolio investments and direct investments can contribute to explaining the development in the dollar vis-à-vis the euro and the yen. The empirical analysis is based on quarterly data from 1988 to 2000. Using regression analysis it is found that capital flows related to portfolio investments between the USA and the euro area had a significant impact on the euro/dollar exchange rate, while the impact of capital flows related to direct investments was not significant. For the yen/dollar rate, however, only an impact from the long-term yield spread was registered.

Hau and Rey (2002) argue that investors' portfolio restructuring will lead to order flows in the foreign-exchange market. Given the findings of the "microstructure" literature, i.e. that order flows are significantly related to exchange-rate changes, their hypothesis is that there is also a relationship between portfolio investment flows and exchange rates. Using monthly data from 1980 to 2001, Hau and Rey test whether there was a relationship between the inflow of portfolio investments in equity and the exchange rate. In the period from 1990 the correlation is found to have been positive and significant for the 17 OECD countries taken as one vis-à-vis the USA.

Siourounis (2003) also contains an empirical analysis of the relationship between capital flows and exchange rates. The data set is monthly data from 1988 to 2000 for the USA vis-à-vis the UK, Germany, Japan and Switzerland. Siourounis finds that net inflows of portfolio investments in equity to the USA from the UK, Germany or Switzerland led to significant appreciation of the dollar in accordance with Hau and Rey's (2002) theoretical model, while portfolio investment flows in bonds do not have any impact on the dollar. Siourounis also reports that a model that includes portfolio flows in equities for some of the currencies and during some periods is better at predicting the exchange rates than a "random walk" model.

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2 Cf. e.g. Lyons (2001).
**CAPITAL FLOWS AND THE KRONER RATE ON A MONTHLY BASIS**

Table 1 shows a simple model for the relationship between capital flows and the krone rate, estimated on monthly data. Like most of the subsequent models, the model is estimated using ordinary least squares (OLS), as in e.g. Brooks et al. (2001). Castrén (2004) applies GMM estimation, arguing that causality also goes from exchange rates to portfolio investments. In the present analysis it is assumed that the low volatility of the krone means that decisions concerning portfolio investments do not depend on the development in the krone rate.

Net capital imports are broken down into three types, cf. Chart 1: portfolio investments, direct investments and other capital imports. Capital flows in connection with portfolio investments have a significant impact on the krone rate, and the sign of the estimated coefficient is as expected – an inflow of capital to Denmark leads to strengthening of the krone. The regression shows that on average net capital imports in the form of portfolio investments of kr. 10 billion strengthen the krone by 10*0.0018 = 0.018 per cent, corresponding to kr. 0.13 per 100 euro. The two asterisks after the coefficient estimate indicate that the coefficient is significantly different from zero at a 5-per-cent level.

On the other hand, capital flows connected to direct investments and other capital imports have not had any significant impact on the krone rate in the period under review, but the signs are as expected. As regards direct investments, the reason why there is no significant effect could be that mergers and acquisitions often involve exchange of equity rather than cash settlement.¹ On some days, market participants report that exchange-rate changes are attributable to rumours of acquisitions, implying that the exchange rate is influenced before payment has been

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¹ Cf. e.g. Brooks et al. (2001).
effected. In addition, direct investments in some months are dominated by large transactions, which may contribute to increasing the uncertainty of the estimated impact on the krone rate.

Capital flows explain 11 per cent of the changes in the krone rate, which is low but not unusual compared with similar analyses of other countries.

If the insignificant variables (direct investments and other capital imports) are omitted from the model, the estimate of the krone-rate impact from portfolio investments changes from -0.00180 to -0.00111 and the coefficient of determination falls slightly to 10 per cent.

**WEEKLY PORTFOLIO FLOWS AND THE KRONE RATE**

The initial analysis on the basis of monthly data indicated that capital flows relating to portfolio investments could contribute to explaining the development in the krone rate, while there was no significant relationship between the krone rate and, respectively, direct investments and other capital imports. The following section therefore focuses on portfolio investments, which are available on a weekly basis for the period 1999-2004, as described above.

**Total net inflow of portfolio investments**

First, a model is estimated in which it is sought to explain the weekly changes in the krone rate by the total net inflow of portfolio investments to Denmark.\(^1\) The regression results are shown in Table 2.

Inflow of capital related to portfolio investments has a significant impact on the krone rate in the same week and the subsequent week.\(^2\)

In the period under review, if a week has seen a net inflow of portfolio investments for kr. 10 billion, the krone has on average strengthened by kr. 0.06 per 100 euro in the same week and by a further kr. 0.06 per 100 euro in the subsequent week. The overall impact is thus estimated at kr. 0.12 per 100 euro, which is slightly higher than in the model estimated on monthly data (kr. 0.08 per 100 euro).\(^3\)

The model explains 5 per cent of the weekly changes in the krone rate. As far as is known, there are no other studies of the relationship

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1. To ensure a well-specified dynamic structure in the models, one lag is included for each explanatory variable as a starting point. Subsequently, the model is tested down to a more simple structure via iterative elimination of variables whose parameters are insignificant at a 10-per-cent level.
2. Including the change in the krone rate in the preceding week as an explanatory variable does not change this: the associated coefficient is not significantly different from zero, and the other parameter estimates and the coefficient of determination are virtually unchanged.
3. Compared with the above monthly model, in which the insignificant explanatory variables (direct investments and other capital imports) have been eliminated.
between capital flows and exchange rates on a weekly basis that can be used to assess the coefficient of determination. There may be several reasons why the portfolio flow in the preceding week also contributes significantly to explaining the krone rate. Firstly, as stated in the Appendix, the dating of the variables in the model is not completely synchronised. Due to the approximation used to change the date of the portfolio investments from the settlement date to the transaction date, an impact that is, in fact, simultaneous may appear as a delayed impact in the model. Another possible explanation is that the banks do not always hedge a given customer transaction in the foreign-exchange market immediately, but take a foreign-exchange position themselves instead. In that case the impact on the exchange rate may be delayed. More generally, investors do not necessarily trade foreign exchange on the same day as they trade equities and bonds.

It is interesting to compare the estimated impact of capital imports related to portfolio investments with existing estimates of the impact on the krone rate from Danmarks Nationalbank’s interventions in the foreign-exchange market. Andersen (2005) analyses Danmarks Nationalbank’s interventions in the period January 1999 – September 2004 and finds that an intervention purchase of kroner for kr. 10 billion strengthens the krone by kr. 0.14 per 100 euro on average.1

The estimates of the krone-rate impact of intervention and capital flows related to portfolio investments are not fully comparable as they are based on different models and estimation methods. With this reservation, the concordance between the results indicates that Danmarks Nationalbank’s purchase and sale of foreign exchange in the market in recent years has not had a significantly different impact on the

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1 The estimate is subject to the intervention meeting the “direction criterion”, i.e. that the krone actually strengthens after intervention to buy kroner, cf. Andersen (2005).
The similar krone-rate impacts of intervention by Danmarks Nationalbank and overall portfolio flows to and from Denmark are consistent with the theoretical results in Lyons (2001, Chapter 8). Within the framework of an economic model, Lyons argues that central banks' sterilised interventions in the foreign-exchange market should have the same exchange-rate impact as private capital flows if the interventions do not contain signals about future monetary policy. Most of Danmarks Nationalbank's interventions in the foreign-exchange market in recent years are best described as sterilised, as they have taken place in periods when the foreign-exchange market has been stable and they have not had any impact on the short-term interest rate. Abildgren (2005) discusses the difference between sterilised and non-sterilised intervention.

### Equities and bonds

Previous studies have shown a greater exchange-rate impact from capital flows related to portfolio investments in equities than from flows related to investments in bonds.\(^1\) This section examines whether this also applies to the relationship between the krone rate and portfolio investments to and from Denmark.

Table 3 shows the estimation results for a model in which portfolio investments are broken down into four instruments: non-residents' trading in Danish equities and bonds, and residents' trading in foreign equities and bonds. It is not possible to identify any significant impact on the krone rate from capital flows related to investments in Danish equities, but flows related to the other three instruments have significant impacts, with the expected sign. In addition, the coefficient of determination has increased slightly compared to the model with the total portfolio flow.

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\(^{1}\) Cf. e.g. Siourounis (2003).
The point estimate of the impact from capital flows attributable to portfolio investments in foreign equities is considerably larger in numerical terms than the corresponding estimate for foreign bonds, and a statistical test shows that the equity coefficient is numerically significantly larger than the bond coefficient.\(^1\) A possible explanation for this result is that the exchange-rate risk on equity purchases is hedged to a lesser extent than the risk on bond purchases (Brooks et al., 2001).\(^2\) However, the result is not also seen for flows related to Danish securities since there is no significant impact on the krone rate from capital flows related to portfolio investments in Danish equities in the period under review.

**The Danish insurance and pension sector\(^3\)**

Market participants mention the foreign-exchange transactions of domestic insurance and pension companies as being of importance to the development in the krone rate. To gain an impression of whether the insurance and pension sector differs from other sectors of the economy, a model is estimated in which the total Danish portfolio investments in foreign equities and bonds are broken down on the insurance and pension sector and other sectors, respectively.

The insurance and pension sector's trade in foreign securities is a significant factor in explaining the krone rate, cf. Table 4. For other domestic sectors taken as one, only flows related to investments in foreign equities are significant in the model. There is no significant difference between the equity and bond coefficients within the insurance and pension sector, nor between the equity coefficients for the insurance and pension sector and other sectors.

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1. The P value is 8 per cent (one-sided test).
3. In this context, the pension and insurance sector includes social pension funds (e.g. ATP – the Labour Market Supplementary Pension Fund).
An investigation of the model's stability properties shows signs of a structural break in the second half of 2000. Estimations of models for two subperiods – before and after the referendum on Denmark's adoption of the euro in the autumn of 2000 – yield rather different results.\(^1\) In the period before the referendum, flows in connection with other sectors' purchases of foreign equities are significant with the expected sign, while no significant impact on the krone rate is identified from flows related to the insurance and pension sector's purchase of foreign securities. After the referendum, the result is generally the opposite: the insurance and pension sector's purchase of both foreign equities and bonds is significant with the expected sign\(^2\), while the variables related to other sectors' portfolio investments abroad are not significant. The change in the composition of significant explanatory variables from the first to the second subperiod indicates that the insurance and pension sector has become more important to the development in the krone rate over time.\(^3\)

The euro area

As a result of the fixed-exchange-rate policy, the krone has been stable vis-à-vis the euro in the period under review, while against other currencies the krone has fluctuated in step with the fluctuations of these currencies vis-à-vis the euro. A hypothesis is that this difference in exchange-rate volatility has been reflected in differences in investors' hedging of exchange-rate risks. More specifically, the hypothesis is that Danish investors hedge the exchange-rate risk on purchase of euro-denominated assets to a lesser extent than on purchase of assets denominated in other currencies, while investors from the euro area hedge purchases of Danish assets to a lesser extent than investors from the rest of the world. If that is the case, flows in connection with portfolio investments to and from the euro area can be expected to have a greater impact on the krone rate than flows to and from the rest of the world.

First a model is estimated in which the capital flows related to portfolio investments are broken down by whether they relate to the euro area or the rest of the world. The result is that flows to and from the euro area have a numerically significantly greater impact on the krone rate. If the flows are also broken down by instrument, the model is as shown in Table 5.

\(^1\) The exact choice of time of break is partly arbitrary.
\(^2\) For the insurance and pension sector, the equity coefficient is numerically greater than the bond coefficient at a significance level of 8 per cent.
\(^3\) A possible explanation is portfolio restructuring in connection with regulatory changes within the insurance and pension sector.
Capital flows from euro area investors' purchase and sale of Danish bonds have a significant impact on the krone rate, as do flows from Danish residents' trade in both equities and bonds from the euro area. The strongest impact on the krone rate comes from flows related to Danish residents' trade in euro area equities, and this impact is numerically significantly greater than the impact of Danish residents' trade in euro area bonds.\(^1\)

In general the results are in accordance with the hypothesis put forward, i.e. that portfolio investments to and from the euro area are hedged to a lesser extent than investments to and from the rest of the world.

**THE ROBUSTNESS OF THE RESULTS TO THE INTRODUCTION OF OTHER EXPLANATORY VARIABLES**

So far the models have focused on the significance of portfolio investments to the weekly changes in the krone rate. However, as discussed above, other factors also have an impact. Consequently, the following section examines whether the results change when the impact of two other explanatory variables is taken into account: Danmarks Nationalbank's interventions, and changes in the short-term interest-rate spread between Denmark and the euro area.\(^2\)

First, Danmarks Nationalbank's interventions to purchase foreign exchange are included in the simple model shown in Table 2. Unlike the portfolio flows, Danmarks Nationalbank's intervention cannot, however, be taken to be exogenous and not affected by changes in the krone rate. Consequently, instrumental variable (IV) estimation must be applied instead of ordinary least squares. The instruments used are

\(^1\) There is no significant difference between the coefficients for Danish residents' trade in foreign bonds from, respectively, the euro area and the rest of the world.

\(^2\) Omission of relevant explanatory variables is a problem since it gives biased coefficient estimates.
intervention in the preceding week and changes in the krone rate in previous weeks.

The regression results are shown in Table 6. Portfolio flows in the current and preceding week are significant, as in the model without intervention, and the coefficient estimates are virtually unchanged compared to Table 2. In this model, the intervention variable is not significant, but the point estimate has the correct sign (purchase of foreign exchange by Danmarks Nationalbank entails weakening of the krone), and its magnitude is in line with the results in Andersen (2005).

Another potentially important explanatory variable is the interest-rate spread to the euro area since changes in this spread are normally assumed to affect the krone rate vis-à-vis the euro. On the other hand, changes in the krone rate vis-à-vis the euro may also influence the short-term interest-rate spread between Denmark and the euro area, e.g. via an expected or actual unilateral change in the Danish monetary-policy interest rates. Consequently, the interest-rate spread cannot be seen as an exogenous variable in relation to the krone rate, and once again IV estimation must be applied.

If the change in the short-term interest-rate spread (measured as the weekly change in the spread between 3-month Cibor and Euribor) is included in the basic model, the coefficients for the portfolio flows remain virtually unchanged. The change in the interest-rate spread is not significant, but the sign is as expected – widening of the interest-rate spread to the euro area makes the krone appreciate vis-à-vis the euro.

1 The reason for the non-significance of the intervention in the regression in Table 6 may be that regression analysis is not the best method for analysing the relationship between intervention and exchange-rate changes, cf. Fatum and Hutchison (2003). Using event analysis, Andersen (2005) finds that Danmarks Nationalbank’s interventions have had a strongly significant impact on the krone rate in the period 1999-2004.

THE KRONE RATE EXPLAINED BY THE NET INFLOW OF PORTFOLIO INVESTMENTS AND DANMARKS NATIONALBANK’S INTERVENTIONS

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Coefficient estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danmarks Nationalbank’s interventions to buy foreign exchange (endogenous)</td>
<td>0.00252</td>
</tr>
<tr>
<td>Total portfolio flow</td>
<td>- 0.00076 **</td>
</tr>
<tr>
<td>Total portfolio flow (-1)</td>
<td>- 0.00100 ***</td>
</tr>
<tr>
<td>Constant term</td>
<td>- 0.00240</td>
</tr>
</tbody>
</table>

| Number of observations: 299 | Number of instruments: 3 | Chi² test: 12.745 *** |

Note: IV estimation. Weekly data. "(-1)" after the variable name indicates that the variable is lagged by one week. The explained variable is weekly changes in the krone rate in per cent. Danmarks Nationalbank’s interventions and portfolio flows are stated in billion kroner. For Danmarks Nationalbank’s interventions, a positive coefficient means that interventions to purchase foreign exchange weaken the krone vis-à-vis the euro. For portfolio flows, a negative coefficient estimate means that the inflow of capital to Denmark strengthens the krone vis-à-vis the euro. As described in the Appendix, some observations have been omitted in the estimation. The Chi² test is a test of the null hypothesis that all explanatory variables except the constant term have a coefficient of zero.
Overall, the inclusion of Danmarks Nationalbank’s intervention and the short-term interest-rate spread as explanatory variables does not lead to substantial changes in the results.

**SOURCES FOR DANMARKS NATIONALBANK’S FUTURE ANALYSIS OF THE FOREIGN-EXCHANGE MARKET**

The analysis has shown that portfolio investments can contribute to explaining weekly changes in the krone rate, and the statistics have been used by Danmarks Nationalbank on an ongoing basis to analyse the foreign-exchange market for Danish kroner. With the introduction of new payment statistics at the beginning of 2005, it is no longer possible to compile portfolio investments on a weekly basis.

Danmarks Nationalbank operates with a number of sources to analyse developments in the Danish foreign-exchange market, including daily reporting of foreign-exchange positions and turnover by a number of banks, cf. Krabbe and Pedersen (1998). The reporting structure was revised as from 1 December 2004 with a view to improving the information content.

It is an implicit assumption of the above analysis of portfolio investments that these have an impact on order flows and thus on the krone rate. Among other things, the daily reporting by the banks allows for direct calculation of order flows from customers (customers’ trade in kroner against foreign exchange with the banks).

Table 7 shows the result of an estimation in which daily changes in the krone rate in the period 1 December 2004 to 8 April 2005 are explained by customer transactions. The latter have a significant impact on the krone rate and explain 5 per cent of the daily exchange-rate changes. The coefficient estimate indicates that on average a bank customer’s purchase of kr. 10 billion against foreign currency strength-
ens the krone by 10*0.0023 = 0.023 per cent, i.e. kr. 0.17 per 100 euro. This impact is similar to that found in connection with portfolio investments (kr. 0.12). The slightly greater coefficient may reflect that customer transactions are a more direct indicator of order flows in the foreign-exchange market than capital flows related to portfolio investments.

Initial experience with the revised statistics is generally positive and indicates that in future the statistics can support Danmarks Nationalbank's analysis of the foreign-exchange market.
LITERATURE


Castrén, Olli (2004), Do financial market variables show (symmetric) indicator properties relative to exchange rate returns?, ECB Working Paper, 379.


Rangvid, Jesper (2004), Hedging of exchange-rate risk in the portfolio (in Danish), Finans/Invest, 1/04.


APPENDIX – DATA AND METHOD

The krone rate applied is Danmarks Nationalbank’s exchange rate vis-à-vis the euro on a daily basis. The percentage changes in the krone rate are calculated as the change in the natural logarithm of the krone rate.

Data for capital flows to and from Denmark stems from Danmarks Nationalbank’s external financial payments statistics, for which portfolio investments in the period under review were reported on a daily basis. However, some elements of the portfolio investments, including the banks’ trading for their own account, can only be compiled on a monthly basis, cf. Tryde (1999), and are therefore not included in the weekly analysis. Capital flows are stated as net capital imports in billion kroner.

Since portfolio investments are reported by settlement date, the securities transaction takes place 1-3 days before registration in the statistics. In Denmark, among other countries, securities are traded three days prior to settlement. Consequently, it is sought to explain the change in the krone rate from e.g. Wednesday in calendar week x-1 to Wednesday in calendar week x by portfolio investments settled in calendar week x.

A few observations have been removed from the data set. In the weeks before and after 28 September 2000, the krone rate was greatly influenced by the special circumstances relating to the referendum on Denmark’s adoption of the euro. Since this article focuses on analysing the relationship between the krone rate and capital flows under more normal market conditions, the weeks before and after the euro referendum have not been included. In addition, a few observations have been omitted since reclassification of the capital flows in the statistics (typically as a result of mergers and acquisitions) gives a misleading picture of the underlying capital flows in relation to this analysis.