Foreign currency borrowing of households in New EU Member States

(Preliminary draft)

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Abstract

The post-Lehman phase of the financial crisis has exposed a number of weaknesses in the banking sectors of New Member States (NMS). One of these is the prevalence of lending in foreign currency. While banks themselves in these countries have not taken on sizeable currency risk directly, they passed it on to households and the corporate sector. With large depreciations taking place or looming in the region, the currency risk at households and corporates without a natural hedge is now being transformed into credit risk for the banking sector. This is creating a serious problem in maintaining financial stability and cripples monetary policy in countries where it operates primarily through the exchange rate channel.

The patterns of foreign currency lending to households in NMSs vary widely both across countries and time periods. For example, FX lending to households is virtually non-existent in the Czech Republic while in some Baltic countries its share is close to 100 percent of total household lending. The main goal of the paper is (1) to present the stylized facts of FX lending in NMSs systematically and (2) to try to explain these differing patterns. In order to do so, a panel database of household FX borrowing is compiled, covering 10 NMSs in the period 1999-2008. Preliminary results suggest that the degree of household FX borrowing depends on the interest rate differential (reflecting the progress in disinflation), the institutional features of mortgage financing and the monetary regime. Household FX borrowing tends to be less prevalent if the interest rate differential is small, mortgage financing is facilitated by a sizeable local covered bond market and the monetary authorities' "fear floating" is low, although the evidence for this last effect is relatively weak.

Keywords: Foreign Currency Lending, New Member States, Credit Risk, Monetary Policy

JEL Classifications: E44, E50, G21

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Introduction

The post-Lehman phase of the financial crisis has exposed a number of weaknesses in the banking sectors of New Member States (NMS). One of these is the prevalence of lending in foreign currency. While banks themselves in these countries have not taken on sizeable currency risk directly, they passed it on to households and the corporate sector. With large depreciations taking place or looming in the region, the currency risk at households and corporates without a natural hedge is now being transformed into credit risk for the banking sector. This is creating a serious problem in maintaining financial stability and cripples monetary policy in countries where it operates primarily through the exchange rate channel.

The patterns of foreign currency lending to households in NMSs vary widely both across countries and time periods. For example, FX lending to households is virtually non-existent in the Czech Republic while in the Baltics its share is close to 100 percent of total household lending. There are only a few empirical papers that tried to explain this wide variety in NMSs.

Basso et al. (2007) develop a model to explain the determinants of financial dollarisation in transition economies. The main predictions of their model are that 1) foreign funding availability induces liability dollarisation, 2) interest rate differentials matter both in loan and deposit dollarisation, hence UIP does not necessarily hold, 3) the trade-off between inflation and real exchange rate volatility plays a significant role as well, 4) openness matters. Their theoretical results are underpinned by a panel model estimation for which an impressive database of 24 transition countries' monthly data is used. The dependent variable is the share of FX-loans in total outstanding loans and, in an alternative specification the changes in this share. They note that the interest rate differential have almost no impact on the level of financial dollarisation while it affects the change in dollarisation significantly. They note that the explanatory power of their model is generally lower for households than for corporates and call for more research in this area.

In a recent empirical paper, *Rosenberg and Tirpák* (2008) investigate foreign currency borrowing by the private sector in the NMSs. They estimate a quarterly panel model in which they explain the share of FX loans in total domestic bank loans to the non-financial private sector. They find that the interest rate differential and the availability of foreign funding are of primary importance in explaining liability dollarisation in NMSs. They also find some evidence of regulatory policies aimed at curbing FX lending being effective at least

in the case of borrowing from domestic banks. However, this effect is more limited if direct borrowing from foreign banks is taken into account as well.

A related paper is *Brzoza-Brzezina et al.* (2007), which uses a vector-autoregression framework to assess the substitution between domestic and foreign currency borrowing in the face of a domestic monetary policy shock. Using data for the Czech Republic, Hungary and Poland, they find that there is a significant substitution effect from domestic to foreign currency borrowing after a monetary policy shock (an increase in the interest rate differential). They argue that the widespread availability of FX borrowing limits the effectiveness of monetary policy through this substitution effect.

All of these studies use stock data on FX loans (FX shares in the stock or sometimes changes in this FX share) which may change very slowly even if there are fundamental changes in households' borrowing preferences. The corresponding flow measure, that is, the share of foreign currency lending in total new lending is a much more prompt indicator of borrowers' behavioural changes, but rarely available. One of the contributions of our paper is that we try to proxy this flow measure by the share of the change in FX debt to the change in total debt.

We also add to the existing literature by emphasising an important institutional feature of bank lending, that is, the availability of long-term fixed interest rate domestic currency loans. We argue that if only variable rate loans are available, a monetary regime that exhibits "fear of float" and smoothes the exchange rate actively by interest rate policy may create an additional incentive to borrow in foreign currency. Since a key determinant for the availability of long-term fixed interest rate domestic currency loans is the availability of long-term domestic funding for the banking sector, in the empirical part we proxy this with existence of a sizeable local covered bond market.

We present a brief discussion on how households' liquidity constraints may magnify the effects of the interest rate differential, "fear of floating" and the prevalence of variable rate lending on the choice between FX and home currency lending.

The structure of the paper is the following. Section I presents the stylised facts of household FX borrowing in NMSs focusing on both the cross-sectional and the time dimensions. In Section II we present a simple framework for analysing household borrowing decisions, based on relative risk-adjusted returns. We show the implications of variable rate lending in this framework. Section III briefly discusses the panel dataset of household FX

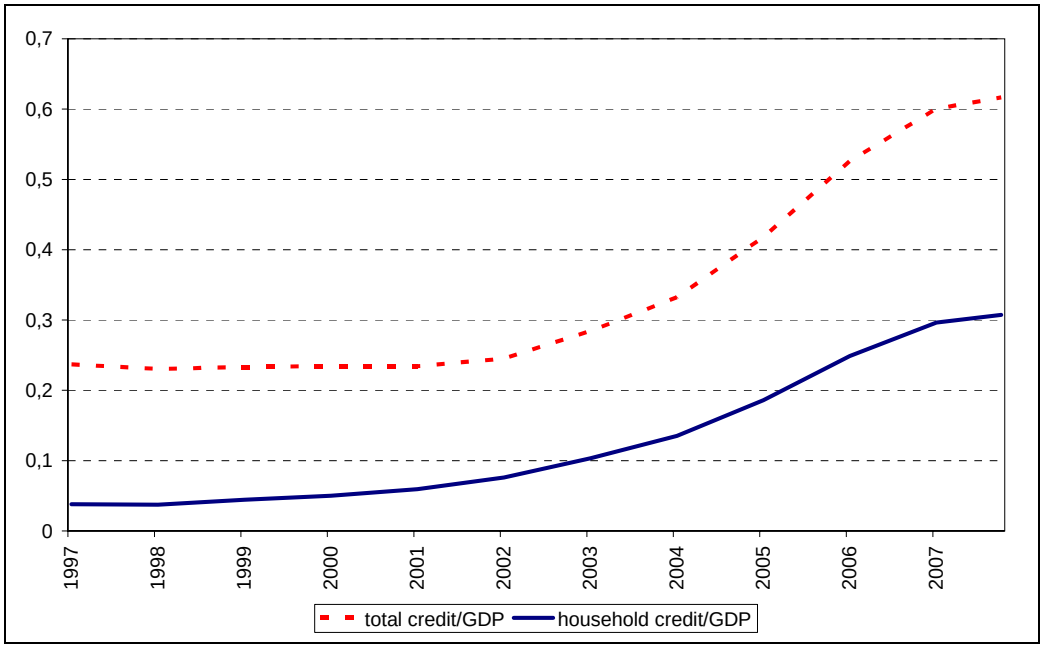
borrowing that we compiled for ten NMSs, our estimation methodology and the results. Finally, Section IV concludes.

I. Stylised facts of household FX borrowing in new EU member states

Financial intermediation in the new EU member states (NMSs) in general has increased in the past decade. This is not surprising, given the initial gap in bank credit-to-GDP ratios in NMSs compared to Europe and the dynamic real convergence that these countries exhibited. However, the increase in bank credit-to-GDP ratios was not gradual, it seems to have gathered more momentum in 2003-2004. This may have been related to the fact that eight of these countries gained EU-membership in 2004 (Bulgaria and Romania joined in 2007). Membership of the EU may have been associated with expectations of a faster future income catching-up in these countries. Such a change in expectations may have increased both credit demand and supply. The other reason for credit growth speeding up after 2003-04 may have been that global liquidity has become increasingly abundant and cheap in this period.

Much of this increase in bank credit-to-GDP ratios was attributable to a steady increase in household borrowing. Starting from very modest levels in 1997, household bank credit relative to GDP grew five to six times larger by 2007. Although the increase was more gradual than that of total credit, household credit growth seems to have picked up somewhat starting in 2003-04 as well.

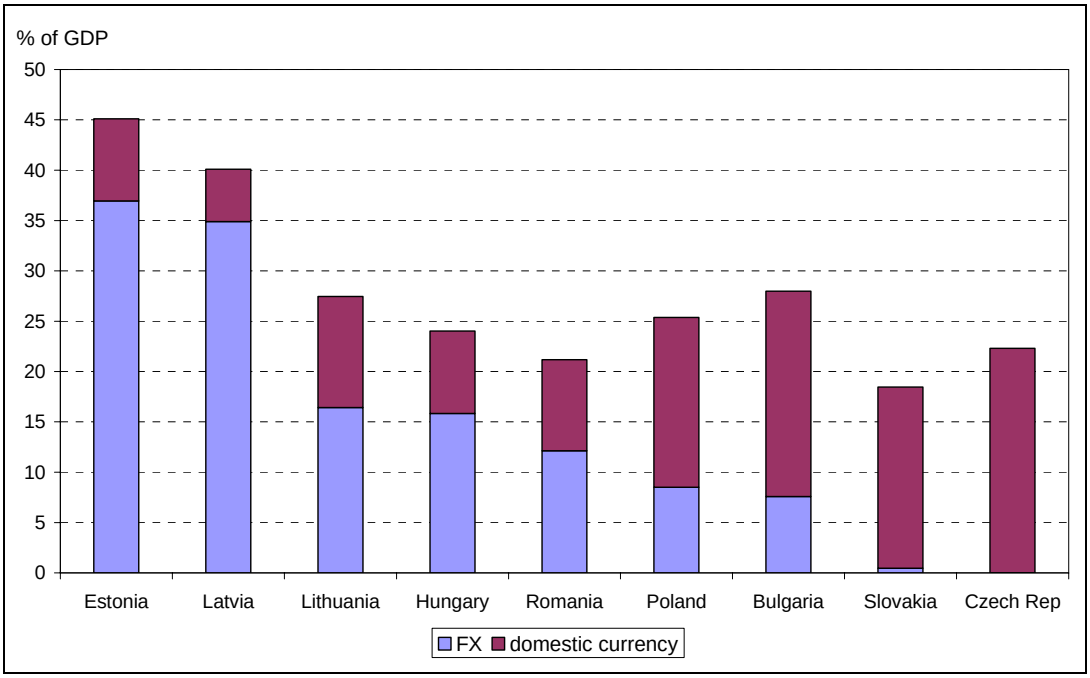
Chart 1.: Bank credit-to-GDP, average of selected NMSs*



* Unweighted average of NMS for which data was available for the whole 1997-2008 period (Czech Republic, Estonia, Hungary, Latvia, Lithuania and Poland). Source: central banks.

The prevalence of foreign currency borrowing by households shows differing patterns in NMSs. At one extreme are the two Baltic states of Estonia and Latvia with very high, 80-90% FX shares in household debt. It is notable that household indebtedness is also notably higher in these two countries than in the rest of the region. At the other extreme are the Czech Republic and Slovakia, where household FX borrowing is virtually non-existent. The rest of the NMSs are somewhere in between, with Lithuania, Hungary and Romania having FX shares larger than 50% of total household debt, while Poland and Bulgaria have somewhat milder, less than 40% figures.

Chart 2.: Household bank credit/GDP, September 2008



Source: central banks

However, the share of foreign currency debt in total debt is only a lagging indicator of changes in households' choice between FX and domestic currency debt. A measure that would promptly reflect behavioural changes is the share of new FX borrowing in total new borrowing. This measure always takes a value between 0 and 1 and can be thought of as the conditional probability at a given point in time of a household choosing a foreign currency loan as opposed to a domestic currency loan if it wants to borrow. Such a measure is unfortunately not available across countries. However, it can be proxied by the contribution of the net change in FX debt (new borrowing minus redemptions) to the net change in total debt:

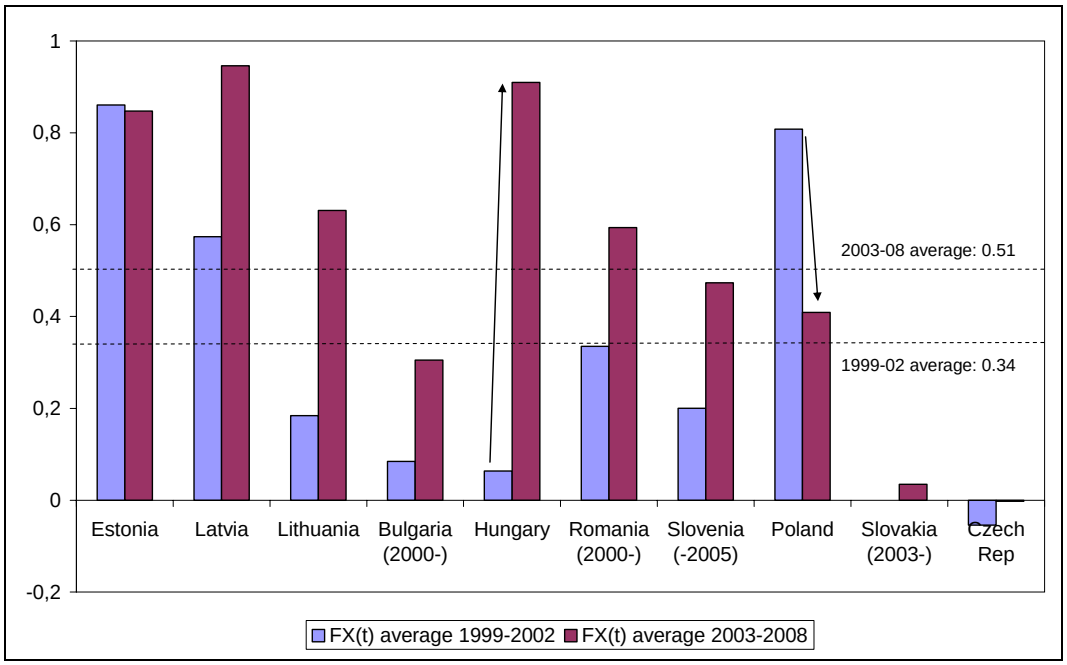
$$FX_t = \frac{D_t^{FX} - D_{t-1}^{FX}}{D_t - D_{t-1}}$$

Just like the share of foreign currency borrowing in total new borrowing, FX_t will generally be between 0 and 1. This is not always the case though: if domestic currency debt drops in absolute terms because redemptions are larger than new borrowing while foreign currency debt increases, then FX_t will be larger than 1. Similarly, if foreign currency debt drops while domestic currency debt increases, FX_t will be smaller than zero.

Even with these limitations, FX_t is a good proxy for households' preference for foreign currency *vis-à-vis* domestic currency borrowing, as it is able to capture behavioural changes much sooner than the foreign currency share of the debt stock.

FX_t in NMSs varies considerably, both across countries and in time as well. To illustrate changes along the time dimension as well, we broke our sample in two periods: before and after 2003, that is the speeding up of credit growth in NMSs.

Chart 3.: Households' willingness to borrow in foreign currency (FX_t)



Source: authors' calculation based on data from central banks

The first observation is that in NMSs households' willingness to borrow in foreign currency on average was high in the past decade. Looking at the cross-sectional differences, the two Baltic states of Estonia and Latvia (both operating currency boards) again stand out with very high FX_t in both periods, while households in the Czech Republic and Slovakia does not seem to borrow in foreign currency. Households in Lithuania, another currency board regime showed strong preference to foreign currency loans only in the second period. In contrast to the developments in the other three currency board regimes, FX_t in Bulgaria, the fourth currency board regime in the NMS group, remained relatively low in both periods. Currency boards are by far not alone in exhibiting households' high willingness to borrow in

foreign currency, with Poland in the first period and Hungary and Romania in the second showing comparably high FX_t figures.

Looking at the time dimension, FX_t on average increased considerably, from 0.34 in the slow credit growth period to 0.51 in the fast credit growth period. The sharp increase in Hungary stands out: from one of the lowest levels of FX_t in the earlier period, households seem to have taken a complete U-turn to almost exclusively borrowing in foreign currency. The increase in FX_t in NMSs was not universal, though. In a completely opposite fashion to what had happened in Hungary, households in Poland switched from a very strong earlier willingness to borrow in foreign currency to a somewhat more modest preference of FX loans by the second period.

To sum up the stylised facts, although households' foreign currency borrowing is widespread in NMSs and its importance has generally increased over time, there are large differences between individual countries. In the following sections we try to explain these differences from the credit demand side, predominantly with the different de facto monetary and exchange rate regimes in place in NMSs. These are as manifold as the observed differences in foreign currency borrowing, ranging from currency boards through exchange rate bands to free float combined with inflation targeting. The monetary regimes have a fundamental effect on the relative risk-return profiles of domestic vs. foreign currency borrowing for households. We will argue that liquidity constraints and certain structural features of financial intermediation (e.g. the lack of long-term domestic currency funding and the resulting prevalence of variable-rate loans) may magnify the effects of monetary regimes.

We do not examine the credit supply side directly. At first glance, differences in the availability of foreign currency loans across the region may not be significant as the banking sector of almost all of the NMSs is predominantly owned by large Western European banking groups. While we note that regulation and government subsidies for certain types of loans may be another source of differences between FX-borrowing patterns in NMSs, due to lack of comparable data, we do not include these in our analysis. Rosenberg and Tirpak (2008) constructed an FX lending regulation index and found it significant in explaining differences in foreign currency debt stock.

II. Households' demand for foreign currency loans

In this section we build a simple framework for analysing households' choice between home and foreign currency loans, based on relative risk-return profiles. Even this

simple framework will demonstrate that the availability of fixed versus variable interest rate loans may be an important factor influencing households' decision.

The main idea is that borrowers compare risk-adjusted returns when choosing between home and foreign currency loans. If fixed interest rate loans are available, the expected return in time *t* on a home currency loan maturing in *T* is $-i_{t,T}$, that is, the negative of the home currency interest rate with a *T-t* year horizon. The expected return on a foreign currency loan with the same maturity is $-\left(i^*_{t,T} + \frac{1}{T-t} E_t \sum_{j=1}^{T-t} \Delta s_{t+j}\right)$, where $i^*_{t,T}$ is the interest rate on the foreign currency loan maturing in *T* and $\frac{1}{T-t} E_t \sum_{j=1}^{T-t} \Delta s_{t+j}$ is the expected average annual depreciation of the home currency until the loan's maturity.

The difference between expected returns is an important determinant of households' choice between home and foreign currency loans. If households are risk averse, they will also care about the relative variance of these returns.[1] We construct a simple measure of risk-adjusted returns (*RAR*s) for home and foreign currency loans by subtracting variance from the expected return.

With fixed interest rates, the home currency loan is riskless, therefore its risk-adjusted return is simply the negative of the domestic currency interest rate:

$$RAR^{home}_{fixed} = -i_{t,T} \qquad (1)$$

The return on the FX loan depends not just on the foreign interest rate (which is fixed and therefore riskless) but on currency depreciation as well, which is a random variable. The risk adjusted return on the foreign currency loan will be:

$$RAR^{FX}_{fixed} = -\left(i^*_{t,T} + \frac{1}{T-t} E_t \sum_{j=1}^{T-t} \Delta s_{t+j}\right) - \lambda \operatorname{var}_t \Delta s\,, \qquad (2)$$

where $\operatorname{var}_t \Delta s$ is the conditional variance of annual currency depreciation given information at time *t* and $\lambda > 0$ is a constant measuring the degree of households' risk aversion.

[1] More precisely, in a consumption CAPM model, households would care about the covariance of loan returns with their consumption or income. Here we do not model household utility or income explicitly, returns on loans are assumed to be uncorrelated with income.

Households will compare risk-adjusted returns when choosing between home and foreign currency loans. To express the risk-return advantage of FX loans, we construct a relative risk-adjusted return (RRAR) by simply subtracting (1) from (2):

$$RRAR_{fixed} = RAR^{FX}_{fixed} - RAR^{home}_{fixed} = i_{t,T} - i^{*}_{t,T} - \frac{1}{T-t} E_t \sum_{j=1}^{T-t} \Delta s_{t+j} - \lambda \operatorname{var}_t \Delta s \ . \qquad (3)$$

The larger $RRAR_{fixed}$ is, the more advantageous the risk-return profile of FX loans and the more willing households are to borrow in foreign currency as opposed to borrowing in domestic currency. According to (3), households care about the interest rate differential, expected depreciation and the perceived exchange rate risk when deciding between the two types of loans. This implies that, beside the interest rate differential, the exchange rate regime in place is an important determinant of households' choice.

One can argue that in equilibrium the interest rate differential should be such that it exactly compensates for expected depreciation and exchange rate risk. In another words, a risk-premium adjusted UIP holds. In this case, households would be indifferent between FX and domestic currency loans. Note however, that even if risk-adjusted UIP holds for money market rates (3) may depart from it for a number of reasons. In particular, the interest rates in (3) are bank lending rates, i.e. they contain certain margins above money market rates. These margins are not necessarily uniform for domestic and FX lending rates. In the NMS setting for example, given that the banks operating in this region are subsidiaries of Western European parent banks, margins on foreign currency rates may be lower than those on domestic currency rates due to easier access to FX funding, as shown in Basso et. al.(2007). The margin policies of banks may also divert (3) from interest parity if banks are more averse to exchange rate risk (have a higher λ) than households.

Analysing the factors on the credit supply side which may divert (3) from risk-adjusted UIP is beyond the scope of our paper. We just allow for the existence of this diversion and focus on the credit demand side.

Let us now turn to the case variable interest rate loans. This is a relevant extension as fixed interest rates, especially on long-term loans like mortgages are not always available.

With variable interest rates, not only depreciation but the (home and foreign) interest rates are random variables as well. Their expected value is the average of expected future short-term rates over the lifetime of the loan and they have conditional variances $\operatorname{var}_t i$ and

$\mathrm{var}_t\, i^*$, respectively and. The risk adjusted return on the home currency variable-rate loan becomes

$$RAR^{\mathrm{hom}\,e}_{\mathrm{var}\,iable} = -\left(\frac{1}{T-t}E_t\sum_{j=0}^{T-t-1} i_{t+j}\right) - \lambda\,\mathrm{var}_t\, i\,. \qquad (5)$$

Assuming that the expectations hypothesis of the term structure (EHT) holds, the average of expected future short-term rates over the lifetime of the loan equals the long-term interest rate:

$$\frac{1}{T-t}E_t\sum_{j=0}^{T-t-1} i_{t+j} = i_{t,T}\,, \qquad (6)$$

where i_{t+j} is the short (one-period) interest rate in time $t+j$.

Combining (5) and (6), the risk-adjusted return on the home currency loan is:

$$RAR^{\mathrm{hom}\,e}_{\mathrm{var}\,iable} = -i_{t,T} - \lambda\,\mathrm{var}_t\, i\ . \qquad (7)$$

The only difference of (7) from the fixed interest case (1) is that now the return has to be adjusted for interest rate risk.

Assuming that the EHT holds for foreign interest rates as well, the risk-adjusted return on the foreign currency variable-rate loan is:

$$RAR^{FX}_{\mathrm{var}\,iable} = -\left(i^*_{t,T} + \frac{1}{T-t}E_t\sum_{j=1}^{T-t}\Delta s_{t+j}\right) - \lambda\left(\mathrm{var}_t\,\Delta s + \mathrm{var}_t\, i^* + 2\,\mathrm{cov}_t\left(\Delta s, i^*\right)\right). \qquad (8)$$

Note that beside exchange rate risk, now interest rate risk enters the risk-adjusted return as well as the conditional covariance between currency depreciation and the foreign interest rate.

We can again express the risk-return advantage of FX-loans in the form of a relative risk-adjusted return by subtracting (7) from (8). After some rearranging, this gives:

$$RRAR_{\mathrm{var}\,iable} = i_{t,T} - i^*_{t,T} + \lambda\left(\mathrm{var}_t\, i - \mathrm{var}_t\,\Delta s\right) - \lambda\left(\mathrm{var}_t\, i^* + 2\,\mathrm{cov}_t\left(\Delta s, i^*\right)\right) - \frac{1}{T-t}E_t\sum_{j=1}^{T-t}\Delta s_{t+j} \qquad (9)$$

The higher $RRAR_{\mathrm{var}\,iable}$, the more households prefer borrowing in foreign currency to borrowing in home currency. Just like in the fixed interest rate case, the interest rate differential and the expected depreciation are important determinants of households' choice.

With variable interest rates we have a richer representation of the domestic monetary regime: now it is not only the exchange rate variance what matters but the *relative* variance of domestic short-term interest rates and the exchange rate, captured by the third term on the right-hand side of (9). This term, $\text{var}_t\, i - \text{var}_t\, \Delta s$, is an expression of perceived "fear of floating", reflecting how aggressively monetary policy is used on average to smooth exchange rate fluctuations. If monetary policy's "fear of floating" perceived by households is strong, it would make foreign currency loans relatively attractive in two ways. First, it would reduce exchange rate risk and secondly, it would increase domestic interest rate risk, making home currency variable-rate loans more risky.

The variance of the foreign short rate and its covariance with the home currency's depreciation reduce the incentive to borrow in foreign currency. For the empirical part of our paper we will assume away the variance in i*. The main reason for this is that, in the period we investigate (prior to the post-Lehman phase of the financial crisis), euro area short-term interest rates changed little, especially compared to short-term rates in the NMSs. However, we note that the crisis may have changed the importance of this term profoundly. Recall that the foreign currency interest rate here is not the money market rate but a bank lending rate. After the crisis, the internal transfer price of FX funds within cross-border banks started to reflect country risk. This means that risk premium shocks suddenly started to have an effect on the interest rate on FX loans. Moreover, as these risk premium shocks tended to coincide with currency depreciation, households may have also learned that sizeable increases in the interest rate of FX loans and depreciation hit them hard at the same time. This experience means that, at least after the crisis, the conditional covariance term may have become something far from negligible, making future borrowing in FX less attractive.

Summarising the key insights from the above analysis, we can say that households' willingness to borrow in foreign currency will be positively affected by the interest rate differential and the perceived "fear of floating" of the domestic monetary regime. Structural features of the loan market may be important as well. In particular, the availability of fixed interest rate loans may reduce the effect of the "fear of floating" and the incentive to borrow in foreign currency.

The role of liquidity constraints

By liquidity constraints we mean households' inability to pay more than a certain share of their disposable income to service their debt. This may stem from the lack of

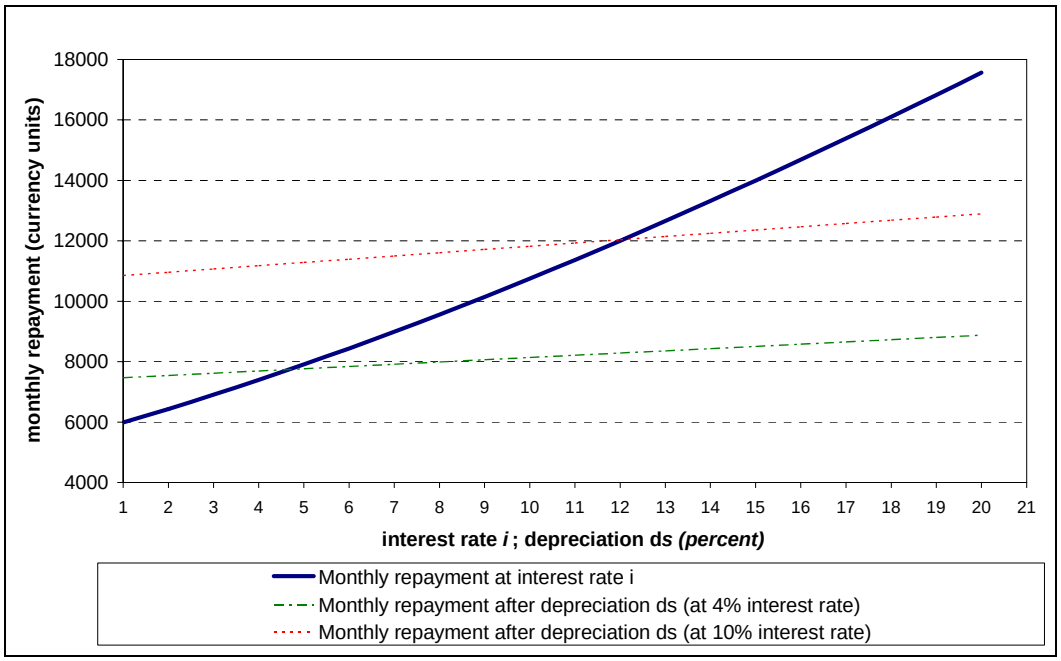
sufficient financial wealth or suitable collateral, which makes it difficult to take additional loans when debt service on the original loan increases and hits a certain threshold. This makes the size of the monthly repayment and its variance crucial factors for liquidity constrained households in the choice between different loans.

If the interest rate on the foreign currency loan is lower than that of the home currency loan, this would result in a smaller initial monthly repayment, or a larger loan size given the same amount of monthly repayment. The longer the maturity of the loan, the larger the effect of the interets rate differential on monthly repayment/loan size. Households in this case will tend to favour foreign currency loans, especially if they take long-term (e.g. mortgage) loans. Note that this motive is different from the one associated with expected return. Expected returns may be the same for FX and home currency loans even if the foreign rate is lower. This may be the case for example if the currency shows a trend depreciation, as can be seen from (3). This trend depreciation may bring about a price and wage inflation, resulting in a continuously growing nominal disposable income. It also means that monthly repayments of the FX loan expressed in home currency increase gradually, but the share of monthly repayment in disposable income may not change very much. This contrasts with the home currency loan's monthly repayment, which is fixed at the level implied by the initial liquidity constraint and cannot grow later on in line with nominal disposable income. To put it more generally, if the exchange rate pass-through is strong, foreign currency loans make it possible for the monthly debt service to be more correlated with nominal disposable income, thereby easing the initial liquidity constraint. This makes foreign currency loans more attractive for households, even if risk-adjusted returns are the same.

There are ways to mitigate this disadvantage of home currency loans with the help of proper loan design. If debt service on home currency loans is indexed for example to inflation or nominal wages instead of being fixed, the long-term correlation of FX loan repayments with income can be replicated. Initial monthly repayments can be made lower and the home currency loan becomes more attractive for households.

Liquidity constraints also magnify the importance of the variance of the monthly repayment. It can be shown that, for a given loan size, monthly repayment is more sensitive to changes in the interest rate than to changes in the exchange rate.

Chart 4.: The sensitivity of monthly repayment to the interest rate and exchange rate*



*Authors' calculation, assuming a 15-year loan of the amount of 1 million currency units.

In the numerical example illustrated in Chart 4, a one percentage point increase in the interest rate on 15-year FX loan with an initial interest rate of 4%, increases the monthly repayment with roughly the same amount as a seven percent depreciation. If the "fear of floating" behaviour of monetary policy is strong (and fixed-rate loans are not available), the resulting variance in the domestic interest rate will have a magnified effect on the monthly repayment on home currency loans. Households will be more likely to hit their liquidity constraint and, as a result, the home currency loan will be less attractive.

In summary, the existence of liquidity constraints makes the effect of the interest rate differential, "fear of floating" and the lack of fixed interest rate domestic currency loans more pronounced on households' choice between FX and home currency loans.

III. Data, estimation method and results

Data description

We compiled a panel dataset including 10 NMSs (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia). The sample contains annual data running from 1999 to 2008 on an annual frequency. We excluded the post-Lehman period from our sample, hence the 2008 annual data are actually 2008Q3 data. The panel is unbalanced, because in case of a few countries, some data were unavailable.

Our dependent variable, FX_t is a proxy for the share of new foreign currency borrowing in the total new household borrowing for each year. To construct it, credit flows are proxied by the difference of end-of-year stocks, as described in Section I. Data to construct FX_t were gathered from central banks. FX credit stock data was available in local currencies, therefore we corrected for exchange rate changes, as we did not want to capture repricing effect on the outstanding loans. As discussed in Section I, the nature of FX_t t measure is such that it does not always fall between 0 and 1, unlike the share of new foreign currency lending in total new lending, the measure it is intended to proxy. For this matter we considered all values of FX_t above 1 to be equal to 1, and all negative values to be equal to 0.

Our explanatory variables capture the main components of our analytical framework described in Section II. For the long-term interest rate differential, $i_{t,T} - i^*_{t,T}$, we used the "lending rate" variable from the IMF's IFS database.[2] This is not a perfect measure of the interest rate differential households might base their decisions upon, because 1) "lending rate" is usually a weighted average of household and corporate lending rates, and 2) the foreign currency lending rate is the Euro Area lending rate, not a country specific effective FX lending rate. Despite these concerns, we regard this variable to be an acceptable proxy of the effective interest rate differential.

We had no appropriate measures for capturing households' long-term exchange rate expectations. We assumed that households view the exchange rate as a random walk process; their best guess of future exchange rate being is its current value. Hence the expected average annual depreciation, $\frac{1}{T-t} E_t \sum_{j=1}^{T-t} \Delta s_{t+j}$, was taken to be zero.

Although we assumed that households' expectation of long-term depreciation is zero, we allowed for non-zero expectations of the variance (conditional variance) of the exchange rate and the short-term rate. The idea behind this asymmetric treatment is that even if households are unable to forecast the long-term exchange rate, they still might have a view on its variance because they have a picture about the monetary authority's tolerance to exchange rate fluctuations. They may also have learnt to what extent the central bank reacts to exchange rate movements by changing short-term interest rates. In other words, they are aware of the degree of "fear of float" that prevails in their country, even if they cannot forecast exchange rate trends. To capture households' perception of "fear of float" in their country, we constructed a measure in Section II, which is a difference between conditional variances of

[2] As this variable for the euro area is available only until 2003M9, we assumed that afterwards its dynamics follows that of the lending rate of household's 5-10 year loans for house purchases and new businesses.

the interest rate and the exchange rate. We assumed that conditional variances are formed based on observed past behaviour of monetary authorities.

The conditional variances of short-term interest rates, $\text{var}_t\, i$, are proxied by the variance of monthly short-term interest rates calculated on a two-year period covering *t-1* and *t*. The variances are expressed in percentage points. The "money market interest rate" variable from the Eurostat database was used for short term interest rates.

The conditional variances of the exchange rate depreciation, $\text{var}_t\, \Delta s$, were constructed the same way as interest rate variances. Data for exchange rates *vis-à-vis* the euro/ECU were gathered from Eurostat.

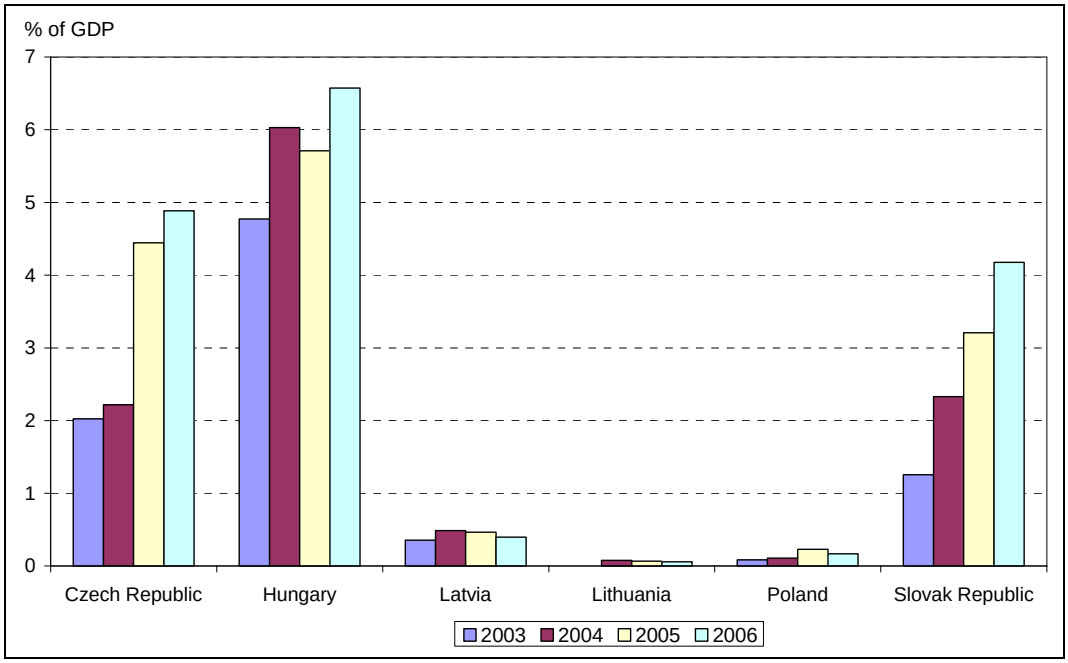
We assumed away the conditional variance in the foreign short rate (and consequently any covariance with home currency depreciation). This is because the bulk of our sample period was characterised by low and stable short-term euro rates and households probably did not regard a sudden increase in euro rate volatility as a potential threat. However, as we noted in Section II, since the financial crisis, in particular since the Lehman episode households may have had learnt that FX lending rates may change quickly, as parent banks started to price in country risk in their internal funding costs for the subsidiaries. We just want to note here that any analysis of NMS households' post-Lehman borrowing behaviour should not omit FX interest rate variance and covariance with the exchange rate.

As we argued in Section II, the availability of fixed interest rate loans may be an important factor in households' decision. However, we did not have comprehensive NMS data on the relative shares of fixed and variable interest rate loans. As a general observation, in countries with less developed financial systems variable rate mortgages are more prevalent.[3] One usual obstacle to the provision of long-term fixed-rate loans is the lack of long-term fixed-rate funding. Long-term funding in domestic currency is more available to the banking sector if a sizeable and well-functioning covered bond market exists in the country. Data on covered bond stocks and issuance in the NMSs is more readily available, from the European Covered Bond Council (ECBC). We have proxied the availability of fixed interest rate domestic currency loans by a dummy variable, which took the value of 1 if there was significant issuance of domestic currency covered bonds in the given year. More specifically, we regarded the dummy variable 1 for a given year and country if (1) the total covered bond stock was greater than 1% of the domestic GDP, and (2) this stock was growing faster than

[3] The UK being a noteable exception from this general rule.

GDP in the given year and (3) the share of domestic currency denominated bonds in new covered bond issuance was larger than 50%.

Chart 5.: Outstanding stock of covered bonds



Source: European Covered Bond Council

The ECBC data suggests that there were only three NMS countries where there was a non-negligible issuance of domestic currency covered bonds: the Czech Republic from 2002 and Slovakia form 2003 continuously, and Hungary between 2002 and 2004. In Hungary, this was obviously related to the generous mortgage subsidy scheme which was launched in 2001 and was restricted at the end of 2003 after it proved to be fiscally unsustainable. Issuance size after 2003 started to decline and the currency composition, which previously was almost entirely home currency, switched more and more towards FX. It is suggestive to see that households in these three countries (in Hungary up to 2003) have exhibited the lowest willingness to borrow in foreign currency.

Estimation method and results

The implication of our analytical framework presented in the Section II is that households' willingness to borrow in foreign currency is a positive function of relative risk-adjusted returns on FX versus domestic currency loans. With the notation of Section I and II:

$$FX_{it} = f(RRAR_{it}), \qquad f' > 0$$

To test this implication we estimate a panel regression model which can be written in the following form:

$$FX_{it} = \alpha + \gamma_i + \theta_t + \beta_1 ir\_diff_{it} + \beta_2 fof_{it} + \beta_3 cbond_{it} + \varepsilon_{it}$$

Where FX_{it} , as defined in Section I, stands for the share of the foreign currency denominated credit in the total credit flow in each year, if_diff_{it} is the difference between domestic and foreign lending rates, fof_{it} – which measures the degree of "fear of floating" – is defined as the difference between the conditional variance of the domestic money market rate and that of currency depreciation, $cbond_{it}$ is a dummy variable which indicates the availability of a well functioning covered bond market in the new member states. γ_i and θ_t are cross-section and period fixed effects to control for heterogeneity among countries and possible common tendencies over time.

Since our approach focuses primarily on the demand side of the credit markets, any potential heterogeneities stemming from the supply side will be captured by the fixed effects (both period and cross section).

The following table shows the least squares estimation results of the fixed effects (FE) panel model:

Table 1. Estimation results

	FE model	**FE model (excluding Romania)**
constant	0.316***	0.297***
	(0.067)	(0.053)
ir_diff	0.028*	0.039**
	(0.015)	(0.016)
fof	-0.004*	0.017**
	(0.002)	(0.007)
cbond	-0.321***	-0.326***
	(0.087)	(0.082)
R^2	0.726	0.761
Adj. R^2	0.644	0.685

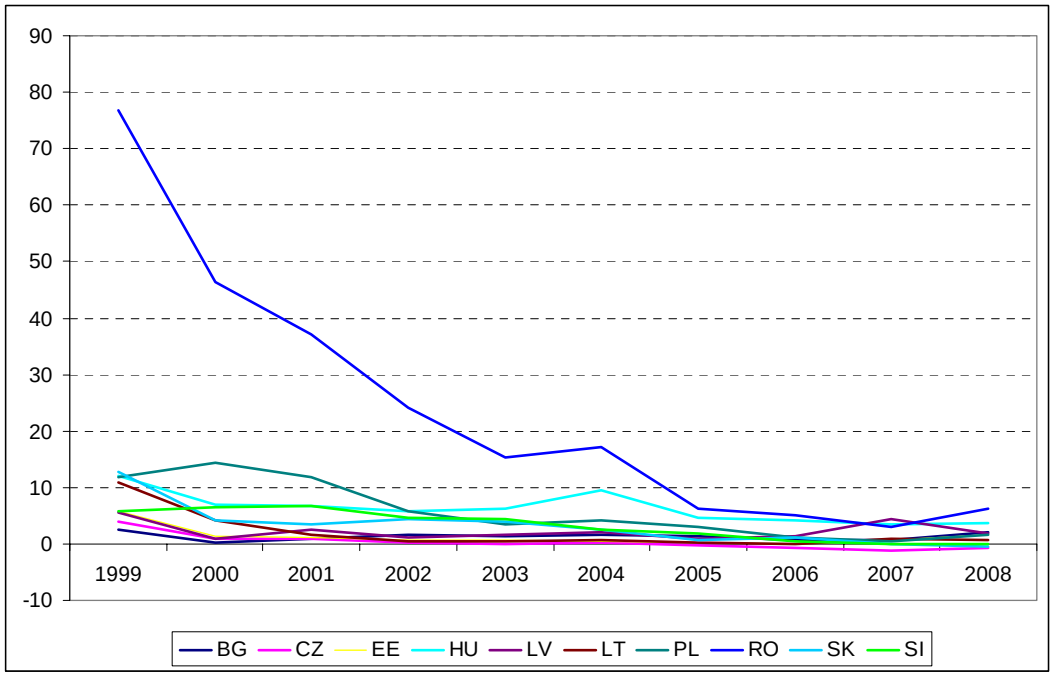
Note: *, **, *** indicate variables significant at 10%, 5% and 1% levels.
Panel corrected standard errors in parentheses.

The first column contains the results of the model estimated on the entire sample. While the signs of the coefficients of variables if_diff_{it} and $cbond_{it}$ are supporting the findings of our analytical framework, the sign of the "fear of floating" variable suggests a negative relationship between the left hand side variable and the difference between the variances of

interest rate and FX-rate changes, which is the opposite what the framework described in Section I suggests. Note also that the interest rate differential and the degree of "fear of floating" are only significant at a 10% significance level.

In the next step we re-estimate the model excluding Romania from the sample. The reason of doing so is that in the last 10 years Romania went through a macroeconomic adjustment and a disinflation process which was significantly different from the other countries, starting from very high initial inflation rates (an average of 45% in 1999) and interest rates (54%-105% in 1999), occasionally showing very strong currency depreciation (reaching 70% in 1999). In such a fast-changing environment conditional interest rate and exchange rate variances, as we constructed them, are very hard to interpret. Indeed finite variances may not exist even on the relatively short, two-year horizon on which we measured these. Chart 6 illustrates the very different nominal path Romania was following compared to the other NMSs, showing the money market rate differentials vis-à-vis euro rates of the countries in the sample.

Chart 6: Interest rates differentials in the NMSs



Percentage point differences vis-à-vis euro money market rates.

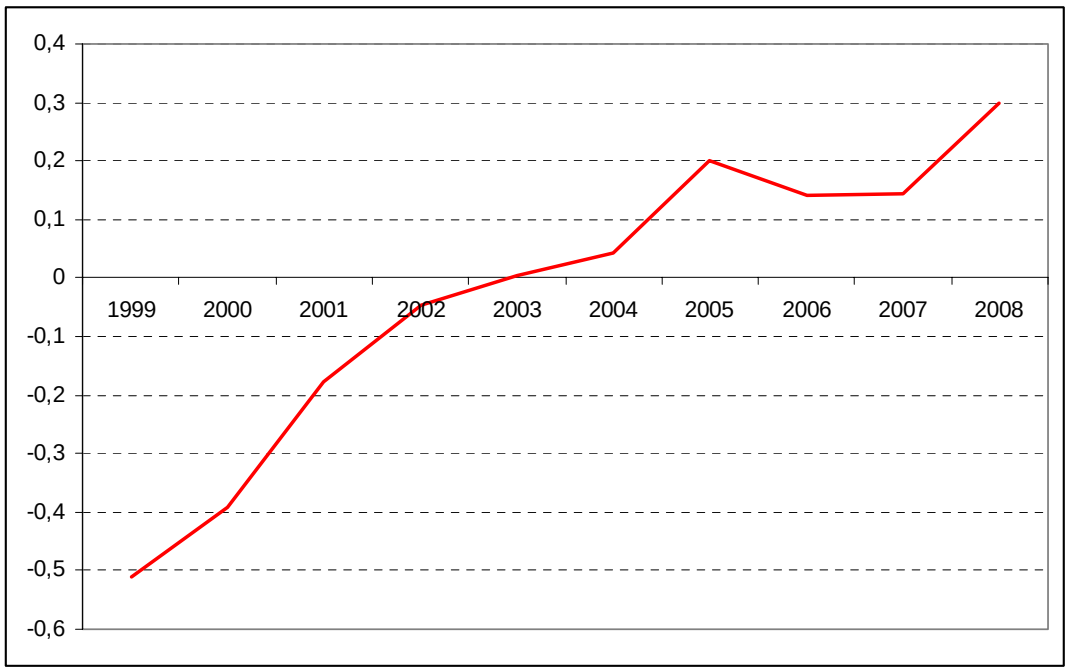
The second column in Table 1 shows the results of the estimation excluding Romania. In this case the explanatory variables have the expected signs. Large interest rate differentials and significant "fear of floating" increases the share of the foreign currency borrowing, while

the presence of a well functioning domestic covered bond market decreases it to a large extent.

One of our key findings is that the availability of a relatively large domestic covered bond market turned out to be significant in both cases and has large effect on the foreign currency lending.

The standard errors in the parentheses are robust for possible heteroscedasticity in the data. Autocorrelation tests do not indicate significant autocorrelation in the residuals. The preference of fixed effects model over the random effects setting is confirmed by the Hausman test. The redundancy of period and cross-section fixed effects were tested with a likelihood ratio test. In both cases the null of redundant period and cross-section fixed effects can be rejected at any significance level.

Chart 7: Period fixed effects



Period fixed effects show an increasing trend (Chart 7). One possible interpretation is that regional FX credit supply factors (for example business models/strategies of parent banks regarding the region, the availability of FX funding), not explicitly included in our analysis, are important drivers of foreign currency borrowing in NMSs, warranting further research in this area.

Conclusion

In this paper we tried to explain differences in household foreign currency borrowing in NMSs focusing on the credit demand side. We set up a simple analytical framework based on relative risk-adjusted returns on FX versus domestic currency loans. The framework identified some demand side explanatory variables that appeared in other empirical papers, such as the interest rate differential and exchange rate volatility. Beyond these, even in this simple framework we were able to show that institutional features of bank lending, such as the prevalence of fixed versus variable rate loans may be an important factor influencing households' choice. The prevalence of variable rate loans implies that what matters is not only exchange rate volatility in itself but its relative size to domestic interest rate volatility, i.e. the "fear of floating".

We briefly discuss that beside risk-return considerations, households' liquidity constraints may magnify the effect of interest rate differentials, "fear of floating" and the lack of fixed interest rate domestic currency loans on households' choice between FX and home currency loans.

We test the implications of our analytical framework with a panel estimation on a data set covering ten NMSs. Our dependent variable is a proxy for the share of new FX loans in total new loans, which is better able to capture changes in households' choice promptly than the share of FX loans in the total stock, the preferred dependent variable in other empirical studies. Just like the other studies, we found the interest rate differential a significant explanatory variable. The availability of fixed interest rate domestic currency loans, proxied by the existence of sizeable local covered bond markets is also very significant and has a large negative effect on household foreign currency borrowing. The performance of our "fear of floating" variable is somewhat less convincing, although it is significant and assumes the right sign in a specification which excludes Romania, a country which followed a nominal path very different to the rest of the NMSs in a large part of our sample period. Our results also suggest that there may be some role for supply-side factors in explaining FX borrowing in NMSs, something that other papers have already demonstrated.

There are some policy implications that emerge from our analysis. First, in an environment where foreign currency loans are increasingly available, monetary policy should aim at quick disinflation, which will help reduce the interest rate differential. Secondly, a strong and prolonged "fear of floating" behaviour of the monetary authority may induce the unwarranted build-up of currency mismatches. Thirdly, the (fiscally sustainable) promotion of

local covered bond markets may increase the availability of fixed-interest rate loans and may make home currency borrowing more attractive for households.

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