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Duesternbrooker Weg 120
24105 Kiel (Germany)

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Macroeconomic Shocks and Foreign Bank Assets

by

Claudia M. Buch, Kai Carstensen and Andrea Schertler

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Claudia M. Buch (University of Tübingen and Kiel Institute for World Economics)
Kai Carstensen (Kiel Institute for World Economics)
Andrea Schertler (Kiel Institute for World Economics)

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Abstract

Changes in foreign asset holdings are one channel through which agents adjust to macroeconomic shocks. In this paper, we test whether foreign bank assets change as a result of domestic and foreign macroeconomic shocks. We frame our empirical analysis in a standard new open economy macro model in which financial markets are imperfectly integrated. We test the implications of this model using dynamic panel models for changes in foreign bank assets. We find evidence that nominal interest rate differentials and inflation differentials drive changes in foreign bank assets permanently, while growth rate differentials and exchange rates have only a temporary effect.

Key words: international banking, macroeconomic shocks
JEL classification: F3, F41

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* Corresponding author: Claudia Buch, Eberhard-Karls-University Tübingen, Mohlstrasse 36, 72074 Tübingen, Germany, Phone: +49 7071 29 781 66, Fax: +49 7071 29 50 71, E-mail: claudia.buch@uni-tuebingen.de

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1 Introduction

Changes in foreign bank assets are an important source in fluctuations of the balance of payments. In the Euro area, for instance, the volatility of foreign bank assets has been higher than the volatility of foreign direct investment or portfolio investments in recent years.[1] Moreover, despite the ongoing disintermediation of financial services, foreign bank assets accounted for roughly one-third of global financial assets or 130 percent of world GDP at the end of 2003 (IMF 2005, Table 3). It is thus important to understand whether changes in foreign bank assets follow systematic patterns or whether these changes merely reflect residual adjustments of other balance of payment items. In this paper, we analyze whether foreign bank assets react to macroeconomic shocks in a way predicted by economic theory and how valuation effects influence changes in foreign bank assets. Our research strategy is special in several respects and, thereby, extends the recent literature.

First, using a panel of OECD countries, we allow for the bi-directional transmission of macroeconomic shocks between all the countries in our sample. The Bank for International Settlements (BIS) provides bilateral time-series data on consolidated foreign bank assets on a quarterly basis.[2] Therefore, we model each country in our sample both as a source and a host country for foreign bank assets. Since time-series data are not available for foreign direct investment and portfolio investment, Lane and Milesi-Ferretti (2004) use only cross-sectional data on foreign portfolio investments. Focusing on the uni-directional transmission of macroeconomic shocks, other authors have taken the time dimension into account. Goldberg (2002, 2005), for instance, analyzes the response of foreign claims of US banks on macroeconomic developments in the US and in the host countries. Her results suggest that US

1 More specifically, the coefficient of variation of foreign bank assets has been 1.4 as compared to values of 0.6 for foreign direct investment and 0.4 for portfolio investment. These numbers are for the years 1998-2004 and have been calculated from the International Monetary Fund’s April 2005 issue of the International Financial Statistics.

2 Weder and Van Rijckeghem (2003) use a similar dataset but their focus is on changes in lending patterns to emerging markets during financial crises.

macroeconomic developments are not transmitted to the host countries of US bank claims to any great extent. Peek and Rosengren (1997, 2000) and Klein, Peek, and Rosengren (2002) focus on financial linkages between the US and Japan and find that adverse developments in the Japanese financial market had a negative impact on lending of Japanese banks in the US.

Second, we take into account the three main macroeconomic shocks, namely, supply, demand, and monetary shocks. The recent literature has also focused on the impact of macroeconomic developments on foreign bank assets. However, the number of shocks or indicator variables used as proxies for shocks is typically smaller. Iacoviello and Minetti (2003), for instance, concentrate on productivity shocks only. Goldberg (2002, 2005) uses GDP growth and interest rates as explanatory variables.

Third, we approximate these shocks using two different methods to check the sensitivity of our results. In our baseline model, we use observable macroeconomic indicators. In an alternative model, we use empirical shocks derived from a structural vector autoregressive (VAR) model. The latter approach has been followed in the literature studying the impact of monetary shocks on domestic bank lending (see, e.g., Kashyap and Stein 2000, Worms 2003).

Finally, we motivate our empirical analysis with a dynamic new open economy macro (NOEM) model developed by Sutherland (1996), who adds transaction costs on international financial transactions to the original NOEM model (Obstfeld and Rogoff, 1995). In this model, adjustment to shocks comes through changes in foreign asset holdings, not through variations in the terms of trade (Corsetti and Pesenti 2001). Except for Iacoviello and Minetti (2003), who base their empirical analysis on an open economy real business cycle (RBC) model with credit frictions, most of the recent empirical literature on the response of foreign bank assets to macroeconomic shocks has used informal arguments to motivate their empirical analysis

Our paper is organized as follows. Section 2 presents the theoretical model upon which our empirical model is based. Section 3 informs on our data and offers descriptive statistics.

Section 4 presents our empirical model and results, and Section 5 summarizes the main results.

2 The Theoretical Model

We are interested in the response of changes in foreign bank assets to macroeconomic shocks. We use the NOEM model of Sutherland (1996) to motivate the empirical model estimated later in Section 4.[3] In this model, households aim at smoothing consumption intertemporally and thus change their foreign assets in response to macroeconomic shocks. In the following, we first discuss the underlying assumptions of the model and describe how we interpret the role of banks. Then, we simulate the reactions of the model after macroeconomic shocks.

2.1 Underlying Assumptions

Since the standard new open economy macro model has been described elsewhere, we do not present the formal model here but rather highlight the main underlying assumptions.[4]

In the baseline NOEM model, the world consists of two symmetric countries that are of equal size.[5] Each country is inhabited by infinitely-lived identical households. These households form rational expectations and maximize their expected lifetime utility, which depends on a real aggregate consumption index, on domestic real money balances, and on the

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[3] Alternatively, we could use microeconomic, partial equilibrium models of international banking. However, these models do not allow the endogenous response of assets to macroeconomic shocks to be analyzed. For instance, the model proposed by Allen and Gale (2000) provides an analysis of the regional transmission of banks' liquidity shocks but not of other macroeconomic shocks considered here. Another candidate would be portfolio models, which distinguish between the effects of macroeconomic shocks on the return and the volatility of foreign assets. However, in the empirical analysis below, we will estimate a reduced form which does not allow risk and return effects to be distinguished.

[4] For a formal treatment, see Sutherland (1996).

[5] Since the foreign economy is essentially a mirror image of the domestic economy, it suffices to describe the domestic economy.

households' labor supply. The aggregate consumption index is defined as an aggregate over a continuum of differentiated domestic and foreign consumption goods.

Each country is populated by a continuum of firms. Each country's households own the respective domestic firms. Hence, equity markets are fully segmented. The firms sell differentiated products in a monopolistically competitive goods market. Prices are sticky, and there is a positive exogenously given probability that firms will change their prices in each period. This goods market friction implies that changes in nominal variables can have real effects until prices have adjusted fully. The capital stock is fixed, and the only production factor used by the firms is labor. Firms hire labor in a perfectly competitive labor market, and labor is immobile internationally.

The domestic government collects lump-sum taxes and uses taxes and seignorage revenues to finance real government purchases. We assume that monetary and fiscal policy do not aim at stabilizing the economy but rather follow first-order autoregressive processes and are subject to random shocks.

Fluctuations of macroeconomic variables around the steady state[6] are thus the result of three underlying shocks:

- Supply shock. Disutility of labor is given by $\hat{\kappa}_t = \rho_\kappa \hat{\kappa}_{t-1} + \varepsilon_{\kappa,t}$, where $\rho_\kappa \in [0,1]$, and $\varepsilon_{\kappa,t}$ is a serially uncorrelated stochastic disturbance term with standard deviation σ_κ, which we label *supply shock*. Note that an *increase* in $\varepsilon_{\kappa,t}$ has to be interpreted as a *negative* supply shock. Since, in the baseline NOEM model, changes in labor supply translate directly into changes in output, we can also interpret this as a shock to labor productivity.

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6 A variable with a hat denotes a percentage deviation from the steady state.

- Demand shock. Fiscal policy is given by $\hat{G}_t = \rho_G \hat{G}_{t-1} + \varepsilon_{G.t}$, where $\rho_G \in [0,1]$, and $\varepsilon_{G.t}$ is a serially uncorrelated stochastic disturbance term with standard deviation σ_G, which we label *demand shock.*
- Monetary shock. Money supply is given by $\hat{M}_t = \rho_M \hat{M}_{t-1} + \varepsilon_{M.t}$, where $\rho_M \in [0,1]$, and $\varepsilon_{M.t}$ is a serially uncorrelated stochastic disturbance term with standard deviation σ_M, which we label *monetary shock.*

Whereas the standard NOEM model assumes that bond markets are perfectly integrated across countries, Sutherland (1996) assumes that domestic and foreign bonds are imperfect substitutes. We assume that the international asset holdings of households are represented by claims held on the foreign banking system by domestic banks. Hence, we assume that banks act as intermediaries between households in different countries and that they fulfill a function similar to that of international bond markets. Our implicit assumptions are that banks have lower transaction costs than households in accessing international financial markets and that banks operate in a perfectly competitive environment (and hence earn no positive profits in equilibrium).

This re-interpretation of the model is, of course, not innocent. Rather, there are many reasons why bonds and loans are not perfect substitutes (see, e.g., Bolton and Freixas 2000). Since our focus is on the impact of macroeconomic developments on international (bank) assets and since we are not studying the impact of heterogeneity across agents for the choice of debt finance, we put these issues aside.

Households can hold domestic and foreign nominal one-period banking assets, which are traded internationally. We follow Sutherland (1996) in departing from the standard NOEM model by introducing a real transaction cost denominated in terms of the consumption index, a cost that drives a wedge between domestic and foreign interest rates. Adjustment costs are given by

$$Z_t = \frac{\psi}{2} I_t^2 \tag{1}$$

where ψ is the adjustment cost parameter, and I_t denotes the level of real funds transferred from the domestic to the foreign banking market. This formulation assumes diseconomies of scale in transferring assets between markets. The reason for this could be technological costs due to fixed capacity of communication systems, government regulations, and learning costs.

Optimal foreign bank assets can be derived from the first-order conditions and the budget constraint of households. The total income received by households consists of the yield on domestic and foreign bank assets, wage income, and profit income. Using this total income, households determine their consumption level, and asset and money holdings. The respective first-order conditions are derived in Sutherland (1996).

2.2 Simulation Results

Following Sutherland (1996), our model is log-linearized around a symmetric flexible-price steady state in which foreign bank assets are zero. Then, the dynamics of the model are analyzed numerically using the methods proposed by Klein (2000). Since the dynamics of this model have been discussed elsewhere (Sutherland 1996), we focus on the response of foreign bank assets to macroeconomic shocks. To highlight the effects of financial integration, we consider two different levels of transaction costs. High costs of transferring assets from the domestic to the foreign economy ($\psi_1 = 6.1$) characterize a situation of financial autarky, while low costs ($\psi_1 = 0.1$) characterize a situation of high financial integration.[7]

Figure 1 presents our simulation results for the three shocks considered. We present impulse response functions for foreign assets of domestic banks in response to persistent

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[7] Note that the exact choice of these parameters does not affect the qualitative results of our analysis. All other parameter values are as in Sutherland (1996).

shocks $(\rho_{\kappa} = \rho_G = \rho_M = 1)$. We look at a situation of asymmetric shocks, i.e., a situation in which the domestic and the foreign economy are hit by unit shocks with opposite signs.

Supply Shocks

A contractionary labor supply shock, which is modeled as the disutility of labor increasing by 1 percent at home and decreasing by 1 percent abroad, induces banks to hold more foreign assets (Figure 1, top panel). The relative increase in the disutility of labor causes a reduction in the domestic labor supply and output. The shock leads to a once-and-for-all relative fall in domestic consumption, which exceeds the output reaction. The negative consumption differential induces a real and nominal depreciation of the exchange rate. This exchange rate adjustment dampens the negative impact of the reduction in the labor supply on domestic output. Since consumption falls more in relative terms than output, households accumulate foreign assets. The effect of a supply shock on foreign bank assets is larger the lower transaction costs are. Under incomplete mobility of capital, the yield differential between the home and the foreign economy becomes negative, thus stimulating further the accumulation of foreign assets.

Demand Shocks

A positive demand shock, which is modeled as a tax-financed increase in government expenditure of 1 percent at home and a decrease in expenditure of 1 percent abroad, lowers foreign bank assets (Figure 1, middle panel). Frictions in the goods market allow the demand shock to have a positive output effect. However, consumption falls because of higher tax payments. In the case of low transaction costs, consumers smooth consumption by lowering their foreign bank assets, i.e., by borrowing from abroad. In the case of high transaction costs, there is again less scope for consumption smoothing, leading to a reduced accumulation of foreign liabilities. Therefore, foreign bank assets decrease less than in the low transaction cost scenario.

Monetary Shocks

An expansionary money supply shock, which is modeled as the money supply increasing by 1 percent at home and decreasing by 1 percent abroad, induces banks to hold more foreign assets (Figure 1, bottom panel). Due to frictions in the goods market, the shock leads to an immediate increase in domestic output. In the case of low transaction costs, domestic consumers can achieve a flat consumption profile by initially increasing consumption less than output and, thus, accumulating foreign assets, which helps to spread the output gains over time. High transaction costs dampen international capital movements. Consumption smoothing is incomplete, and the foreign asset position increases less than in the low transaction cost scenario.

From the theoretical model, we can thus derive a number of guidelines for our empirical analysis. First, the theoretical model predicts how foreign bank assets should react to macroeconomic shocks. More specifically, foreign bank assets should increase in response to an expansionary domestic monetary shock, a contractionary domestic (labor) supply shock, and a contractionary (fiscal) demand shock. Second, the adjustment to any macroeconomic shock should proceed gradually. Following the findings of standard empirical macroeconomic modeling (Sims, 1996), we expect the empirical dynamics to be more complicated than the theoretical dynamics. Third, the magnitude of costs for international capital transactions can be important for the degree to which shocks are transmitted across countries.

3 Data and Descriptive Statistics

The model suggests that foreign bank assets change in response to macroeconomic shocks. In the following section, we describe the data that we will use to model the impact of domestic and foreign macroeconomic developments on foreign bank assets empirically. We perform this analysis for the OECD countries because of data availability and because OECD countries account for almost 80 percent of the foreign bank assets in developed countries.[8] The respective share of the latter countries in international bank liabilities is 64 percent. Here, we describe some basic features of our data.

Our data on foreign bank assets are from the Bank for International Settlements' *Consolidated Banking Statistics*.[9] The advantage of this data source is that it gives information on foreign bank assets on a country-by-country basis. The disadvantage is that the data do not allow maturities and sectors to be distinguished from each other, i.e., the data include short-term and long-term claims of domestic banks on the foreign public sector, on the foreign non-bank private sector, and on the foreign banking sector. We also cannot distinguish foreign debt from equity claims on a country-by-country basis, but we know from aggregated data that that debt claims dominate.[10]

Foreign bank assets are consolidated foreign claims vis-à-vis individual countries by nationality of the reporting banks. Table 1 gives the means of foreign bank assets and foreign liabilities for the years 1999-2003. With regard to foreign bank assets, German banks dominate the sample with a share of almost 30 percent. Swiss, French, and British banks

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8 The countries we include are Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, Switzerland, and the UK.

9 The publications and the data are available online at http://www.bis.org/publ/r_hy0410.htm (November 3, 2004).

10 The BIS Consolidated Banking Statistics do not give a breakdown of foreign bank assets into debt and equity. However, only 16 percent of the claims on developed countries are not allocated to a specific maturity. This gives the upper bound for the share of equity finance.

follow with about 10 percent of total assets each. With regard to foreign liabilities i.e. liabilities vis-à-vis foreign banks, foreign firms, and foreign governments, the picture is somewhat the opposite, with banks, firms and governments in the United Kingdom account for almost 30 percent of the total, and Germany, France, and Italy following behind with shares of roughly 10 percent of the total.

The importance of foreign bank assets as a channel for the transmission of shocks across countries should be reflected by the volatility of foreign bank assets and by the importance of foreign bank assets relative to GDP.

Looking at the volatility of foreign bank assets first, Table 1 shows that, on average, the foreign bank assets and foreign liabilities have coefficients of variation of around 4.8. However, there is also a significant amount of heterogeneity across countries. Volatility is particularly high for countries such as Ireland, Canada, Finland, and Switzerland for foreign bank assets, and Austria for foreign liabilities.

Foreign bank assets are not only relatively volatile, bilateral foreign assets of banks are also quite important for some country pairs. This can be seen from Table 2, which shows stocks of bilateral assets of the BIS reporting banks relative to host and source country GDP. For the majority of countries, bilateral banking sector linkages are small (below 10 percent of GDP). Looking at Panel (a) first, which indicates the importance of bilateral claims relative to the GDP of the *source* country, we find that claims on the UK and on the US are important for some source countries (Belgium, France, Germany, Ireland, the Netherlands, Switzerland) but not for others.

Whereas Panel (a) of Table 2 addresses the question whether shocks originating in particular host countries have the potential to feed back into the source countries through changes in foreign bank assets, Panel (b) turns this question around by asking how important claims are relative to *host* country GDP. Here, we find that claims of German banks on several countries (Belgium, Denmark, Ireland, the Netherlands, Portugal, Switzerland, the

UK) are quite important. Moreover, there are some regional clusters such as claims of Dutch banks on Belgium, or of Spanish banks on Portugal.

In sum, the data show that the countries under study not only have relatively high cross-border assets and liabilities relative to GDP (as shown by the last row of Panel (a) and the last column of Panel (b)) but that some bilateral financial linkages are also quite tight. Bilateral financial linkages are thus a potentially powerful channel for the transmission of shocks across countries. Whether changes in foreign bank assets are driven by the macroeconomic variables stressed in our theoretical model is an issue to which we turn next.

4 The Empirical Model

The empirical analysis is conducted in three steps. First, in our baseline model, we analyze the effects of observable macroeconomic indicators on changes in foreign bank assets. Second, we check the robustness of the results obtained in step one. To this end, we replace the observable macroeconomic indicators by unobservable macroeconomic shocks which are derived from an estimated structural panel VAR model. Third, we check the robustness of our results by analyzing the importance of transaction costs for the transmission mechanism.

4.1 The Baseline Model

In our baseline model, we test whether changes in macroeconomic conditions have an impact on the changes in gross foreign bank assets.[11] We use a panel data set of assets that banks in country *i* hold in country *j* at time *t*. We take first differences of the logarithm of foreign bank

[11] Note that we cannot calculate net foreign bank assets because our data set comprises only the sum of bank assets given to foreign banks, firms, and governments, and we have no information of foreign bank liabilities. This asymmetry of information prevents us from calculating net foreign bank assets in an adequate way.

assets ($F_{i,j,t}$) measured in dollars, i.e., we look at percentage changes in foreign bank assets.[12] Our baseline regression has the following form:

$$\Delta f_{i,j,t} = \sum_{m=1}^{4} \alpha_m \Delta f_{i,j,t-m} + \sum_{m=0}^{4} x_{i,j,t-m} \beta_m + \sum_{m=0}^{4} w_{i,j,t-m} \kappa_m + z_{i,j,t} \delta + \varepsilon_{i,j,t} \qquad (2)$$

with $\varepsilon_{i,j,t} = \gamma_i + \gamma_j + \eta_{i,j,t}$, where γ_i and γ_j are country-specific fixed effects[13] and $\eta_{i,j,t}$ is a disturbance term. In close correspondence to the theoretical model, we estimate (2) under the symmetry restrictions, i.e., we include differences between home and foreign variables. Therefore, $x_{i,j,t}$ is a row vector of explanatory variables comprising π = inflation rate differential between countries *i* and *j*, *r* = nominal short-term interest rate differential between countries *i* and *j*, *y* = GDP growth rate differential between countries *i* and *j*.[14] $w_{i,j,t}$ is a row vector of explanatory variables comprising *e* = log of the bilateral exchange rate between countries *i* and *j*, and Δy^{US} = US GDP growth. The exchange rate is included to capture valuation effects, and US GDP growth is included to control for developments in the US, which may influence lending conditions around the world. For this reason and because of the special role of the US in world financial markets, we exclude the US as a host and source country of foreign bank assets. Since the full transmission of shocks is not instantaneous according to our model, we include four lags of the endogenous variable and of the explanatory variables, which is a natural choice for quarterly data.

Moreover, we add several control variables, $z_{i,j,t}$, such as the log of distance between two countries and a full set of dummy variables for each quarter and each year in order to capture

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[12] Results of the Levin, Lin, and Chu (2002) test as well as of the Im, Pesaran and Shin (2003) test indicate that the first difference of the logarithm of foreign bank assets is stationary.

[13] Hence, we allow for changes in foreign bank assets to have a country-specific component.

[14] More specifically, we define differences in the national variables as follows: the GDP growth differential is $\Delta\ln(GDP_{i,t}) - \Delta\ln(GDP_{j,t})$, interest rate differential is $r_{i,t} - r_{j,t}$, the inflation rate differential is $\Delta\ln(P_{i,t}) - \Delta\ln(P_{j,t})$.

seasonal and omitted business cycle effects.[15] Table A1 in the Appendix gives a detailed description of the variables used.

Econometric Specification

Equation (2) is estimated using the generalized method of moments (GMM) estimator proposed by Blundell and Bond (1998) and a finite sample correction proposed by Windmeijer (2005). This allows coefficients on time-invariant variables such as geographic distance to be estimated.[16] Estimation results are consistent if we use appropriate instruments for our lagged endogenous variable and if there is no second-order autocorrelation. Therefore, we performed tests on second-order serial correlations and on overidentifying restrictions to check the validity of our instruments (Blundell and Bond 1998). In all specifications, at least the first lag of the endogenous variable is highly significant. The test on overidentifying restrictions indicates validity of instruments, and there is no second-order autocorrelation.

Another issue that needs to be addressed in a macroeconomic setting is the potential endogeneity of our regressors. In our setting, endogeneity is not a serious concern because our LHS variable is the change in bilateral bank assets, whereas our RHS variables are aggregated data for the source and the host country. Given that bilateral bank assets are relatively small for most source and host countries (see Table 2), changes in the LHS variable are unlikely to affect general macroeconomic conditions. Moreover, the Sargan-Hansen test does not reject the assumption of exogenous instruments in any of our specifications and, hence, supports our approach.

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[15] Note that we use seasonally adjusted data only for GDP. Since quarter and year dummies are entered separately, we can assess the effects of variables – such as US GDP growth – which vary across time but not across cross-sections.

[16] We also used a fixed effects estimator that yields similar qualitative results except for the coefficient of the lagged endogenous variable. Because of the endogenous lagged variable included in the regression, our results based on the fixed effects model are biased (Nickell 1981, Kiviet 1995), and we do not report them here.

In order to capture the dynamics of changes in foreign bank assets, we follow a general-to-specific methodology and include up to four lags of each variable in the initial specification (Table 3, column 1). Subsequently, the model is restricted in a stepwise procedure that, in each step, drops the least significant variable and re-estimates the model until all insignificant variables are eliminated. Our main results are unaffected by dropping insignificant lags though, and they are also robust with regard to the choice of instruments. More specifically, including the full set of instruments (up to four lags of the explanatory variables) or a reduced set of instruments (only those explanatory variables that enter the model) does not affect our results (see columns 2 and 3 in Table 3). Therefore, we only discuss the results of the restricted model which uses all instruments (Table 3, column 3). Also, results are robust with regard to dropping individual source or host countries.

Response to Macroeconomic Developments at Home and Abroad

We expect banks to increase their assets abroad if foreign real interest rates increase relative to domestic real interest rates. As we include nominal interest rates and inflation in our regressions, we can decompose the response to real interest rates. We thus expect a negative coefficient on the interest rate differential and a positive coefficient on the inflation differential.

We indeed find that an increasing interest rate differential (home minus foreign interest rate) tends to lower foreign bank assets. The estimated coefficients of lags 3 and 4 are –0.05 and 0.04, respectively, while lags 0 to 2 are restricted to zero. The total effect, i.e., the sum of the partial effects, given that all other variables remain unchanged, is –0.01 and significantly below zero. This coefficient implies that a one percentage point increase in the interest rate in country *i* relative to country *j* reduces the growth rate of foreign bank assets from *i* to *j* by one percentage point (since the interest rate is expressed in percent).

The impact of inflation differentials on foreign bank assets is highly significant as well. The estimated total effect of 6.59 implies that a one percentage point increase in the inflation rate of country *i* vis-à-vis country *j* leads to a 6.59 percentage point stronger change in foreign bank assets from *i* to *j*.

Transitorily, foreign bank assets also respond to differences in the rates of economic growth. We expect to find a negative coefficient on domestic growth and a positive coefficient on foreign growth. Thus, a positive growth differential should lower foreign bank assets. Contrary to this, we find coefficients of 2.2 and –1.3 on lags 1 and 2 of the growth differential. In total, this implies a positive coefficient of 0.9, which, however, is insignificant, so that there is no persistent effect of the growth differential on foreign bank assets. A possible explanation for this finding is that we note that we have not yet distinguished between the different types of shocks that lead to changes in output. Our theoretical analysis above has shown that an increase in output coincides with a decrease in foreign bank assets if it is caused by expansionary supply or demand shocks. An increase in output should be associated with an increase in foreign bank assets if it is caused by an expansionary monetary shock. We will return to this issue below (Section 4.2).

Exchange Rate Effects

Recent literature has argued that changes in foreign bank assets are driven by valuation effects (Gourinchas and Rey 2005, Tille 2004). Valuation effects are likely to have an impact on our dependent variable as well. To see this, note that we do not have bilateral information on the currency structure of foreign bank assets. Hence, we cannot say whether the foreign assets of German banks vis-à-vis France, which are reported in dollars by the BIS, are originally denominated in euros, dollars, or in a third currency. Suppose they were denominated in dollars. Then, a depreciation of the euro vis-à-vis the dollar would lead to an increase in Germany's foreign bank assets in France even though the underlying volume of claims in euros would be unchanged. Since we cannot directly eliminate valuation effects, we include the difference between the dollar exchange rates of the currencies of the source and of the host countries, which is the (log of the) bilateral exchange rate between the source and the host country. Since exchange rates are given in quantity notation, i.e., dollar per national currency, an increase in the exchange rate corresponds to an appreciation of the domestic currency. Finding a negative coefficient on the bilateral exchange rate would be consistent with a valuation effect. We indeed find a negative effect of the second lag of the exchange rate differential, but this valuation effect is compensated by the positive coefficients on the remaining lags. Overall, exchange rate does not have a significant total impact on foreign bank assets.

Obviously, the valuation effect is absent within the euro area. To check whether pooling across countries in- and outside the euro area affects our results, we also ran our regressions for the group of non-euro area countries separately (results not reported). It turned out that the total exchange rate effect remained insignificant for this sample. Hence, this finding in the baseline model is not driven by including a subset of countries with the same currency.

Control Variables

Growth in the US enters strongly, with all lags being highly significant. The estimated total effect of –15 implies that a rise in US GDP growth by one percentage point reduces the change in foreign bank assets by 15 percentage points. This reflects a decline in bilateral foreign bank assets among non-US OECD countries if credit demand from the US increases.

Geographical distance has a significantly negative impact on foreign bank assets, but the significance of this variable is sensitive to the number of instruments included. We will return to the interpretation of this variable below when we address the role of transaction costs (Section 4.3).

Finally, we computed beta coefficients to assess the economic significance of the variables having significant long-run effects on changes in foreign bank assets. US GDP growth explains about one-third of the changes in foreign bank assets (beta factor of 27 percent), followed by the inflation differential (13 percent), and the interest rate differential (5 percent).

It is interesting to compare our results to recent work by Goldberg (2005), who studies the elasticities of lending of US banks in Europe and Latin America with respect to domestic and foreign GDP and interest rates. Our results are similar in the sense that we find that changes in key macroeconomic variables have relatively little power to explain changes in cross-border lending. In fixed effects regressions (not reported), we obtained very low adjusted R^2, similar to Goldberg's results. Our results also show that there is a significant amount of variability in the response of foreign bank assets to macroeconomic developments. Whereas the total responses that we find are in line with theory, short-run changes do not follow a predictable pattern.

4.2 The Model with Shocks Derived From a VAR

Our theoretical model predicts that a shock in country *i* relative to country *j* impacts on foreign bank assets. So far, our proxies for macroeconomic developments include both unexpected and expected components and different types of shocks. For example, it is not obvious whether a change in GDP growth is caused by a demand shock or a monetary policy shock. These are predicted by economic theory to have opposite effects on foreign bank assets. In order to align our empirical specification more with the theoretical framework, we now follow a two-step procedure. In the first step, we estimate a panel VAR model and identify macroeconomic shocks. In the second step, we use the shocks retrieved from this VAR model as explanatory variables in our empirical model.

We extract a relative demand shock, a relative supply shock, and a relative monetary policy shock from a panel VAR model using quarterly GDP growth, quarterly inflation, and the short-term interest rate of country *i* vis-à-vis country *j*. To be consistent with the baseline specification, we restrict ourselves to the period 1999Q1 to 2003Q4. Again, we follow the general-to-specific methodology, and we compute coefficients that capture the total effects of all lags.

Estimating VAR models with panel data was first proposed by Holtz-Eakin et al. (1988). In principle, we follow their approach to estimate each equation separately while assuming that all parameters are constant over time. Further, we use the GMM estimator put forward by Blundell and Bond (1998). To choose the lag order of the regressors and the instruments, we apply two of the model and moment selection criteria proposed by Andrews and Lu (2001), namely the MMSC-BIC and the MMSC-HQIC criteria. These are similar to the well-known BIC (Bayesian information criterion) and HQIC (Hannan-Quinn information criterion) but are based on the Hansen statistic instead of the residual variance. It turns out that the MMSC-BIC favors a regressor lag length of 1 and an instrument lag length of 10, while the MMSC-HQIC favors a regressor and instrument lag length of 4. Since a regressor lag length of 1 leads to overly simplistic dynamics, we prefer to use the MMSC-HQIC. Unfortunately, this choice gives rise to a maximum eigenvalue of the VAR slightly above one. This problem is solved when using a regressor and instrument lag length of 5, which is the second-best model according to the MMSC-HQIC. All results are based on this model. Unfortunately, both the Hansen and the AR(2) tests are rejected in all specifications, so that the results of the VAR model should be viewed cautiously.

The disturbances of the three-equation VAR model are transformed into structural shocks by means of a Choleski decomposition with the ordering inflation, GDP, and interest rate. The first structural shock can then be interpreted as a relative price (supply) shock, the second as a relative demand shock, and the third as a relative monetary policy shock. The ordering implies that inflation reacts only with a delay to demand and monetary policy shocks, which is justified by the typical empirical finding that inflation is sluggish. The impulse responses are reported in Figure 2. On impact, the (negative) supply shock leads to a rise in prices and a drop in output. The demand shock leads to a rise in output and prices that is counteracted by a rise in the interest rate. Finally, the monetary policy shock leads to a strong rise in the interest rate and a fall in output. There is slight evidence of a price puzzle which, however, disappears after some quarters. Hence, the impulse responses are in line with the theoretical considerations and typical findings reported in the literature.

In the next step, the structural shocks, instead of the macroeconomic variables used above in the baseline model, are included in the equation explaining changes in foreign bank assets:

$$\Delta f_{i,j,t} = \sum_{m=1}^{4} \alpha_m \Delta f_{i,j,t-m} + \sum_{m=0}^{4} \overline{x}_{i,j,t-m} \beta_m + \sum_{m=0}^{4} w_{i,j,t-m} \kappa_m + z_{i,j,t} \delta + \varepsilon_{i,j,t} \qquad (3)$$

where $\overline{x}_{i,j,t}$ is a row vector containing the relative supply shock, the relative demand shock, and the relative monetary policy shock of country *i* vis-à-vis country *j*. Otherwise, our specification is the same as before.

A demand shock is predicted by the theoretical model to lower foreign bank assets, so we expect a negative coefficient. Since, in our panel VAR model, the supply shock reduces output, the theoretical model predicts that it has a positive impact on foreign bank assets. Similarly, the monetary policy shock is expansionary in the theoretical model, while it is contractive in the VAR model. Hence, we expect a negative sign for our proxy of monetary shocks.

In Table 4, we report results both for an unrestricted model including up to four lags of all variables (column 1) and for two restricted models that are the outcome of the stepwise procedure explained above. Again, the specifications differ with respect to the handling of the instrumental variables. The model reported in column 2 has a reduced number of instruments (only those also included as regressors), while the model in column 3 retains all the instruments used in the initial specification. Since differences between the models are small, we discuss only the last model.

All three shocks impact significantly on foreign bank assets. The price (supply) shock works mainly through the fourth lag, hence transmission is quite sluggish. The estimated coefficient of 0.029 implies that a unit relative price shock leads to an increase in the growth rate of foreign bank assets of 2.9 percentage points. Since the price shock can be interpreted as a contractionary supply shock, this result is in line with the theoretical model. The demand shock affects foreign bank assets through lags one to four with alternating signs. The total effect is small and not significantly different from zero. This replicates the result obtained for the baseline model. Finally, the interest rate shock works through the third lag, hence transmission is again slow. The estimated coefficient of –0.021 implies that a unit relative monetary policy shock leads to a decrease in the growth rate of foreign bank assets of –2.1 percentage points. This is in line with our theoretical model.

The effect of US GDP growth remains strong and almost unchanged compared to the baseline model. In contrast, the effect of the exchange rate becomes more pronounced as indicated by the individual lag coefficients. Still, however, the total impact is insignificant, as positive and negative responses cancel out.

In sum, the results using VAR shocks are quite similar to the results obtained using the indicator variables in the baseline model. While the lag dynamics differ somewhat, the total effects are similar. One reason for this is the relatively high correlation between the indicator variables and the VAR shocks (correlation coefficients around 0.7), suggesting that most of the variation in inflation, GDP, and interest rate differentials is due to unexpected disturbances.

4.3 The Role of Transaction Costs

Our theoretical model suggests that the reaction of foreign bank assets to macroeconomic developments depends on the costs of cross-border financial transactions. Generally, transaction costs in financial markets can be proxied through de facto or de jure measures of financial openness, see Edison et al. (2002) for a survey of the evidence. De facto measures are usually dummy variables that capture the presence of capital controls, de jure measures are based on actual cross-border capital flows. We cannot directly follow this literature here. All the countries under study have dismantled controls on cross-border capital flows as they are members of the EU and/or the OECD. Also, we cannot use de facto measures of openness, since we aim at explaining the volume of cross-border capital flows. However, we can analyze indirect transaction costs arising from cultural and geographical proximity by including the geographic and cultural distance (common language and common law) between two countries. Moreover, we resort to an alternative and even more direct measure of financial transaction costs, which has been taken from the IMD World Competitiveness Yearbooks (various issues). This indicator is based on survey evidence on the ease of access to local capital markets and assumes a high value if foreign companies do not face restrictions in accessing the local capital market.

Our analysis of the role of transaction costs is conducted in two steps. In the first step, we re-estimate equation (2) including geographic and cultural distance between the two countries and the access to local capital markets for foreigners. Table 5 reports our estimation results. According to the results in column (1), geographical distance keeps the negative and significant coefficient it already had in our baseline specification (Table 3). Neither the dummy variable for the same law nor the dummy variable for the same language help in explaining changes in foreign bank assets. According to the results in column (2), the indicator of access to local capital markets for foreigners helps in explaining changes in foreign bank assets. The easier access to local capital markets, the higher the percentage changes in foreign bank assets are.

In the second step, we re-estimate equation (2) including interaction terms between macroeconomic developments and transaction costs. We include interaction terms because the theoretical model outlined in Section 2 shows that higher transaction costs lower the impact of domestic shocks on foreign bank assets. Now, our equation has the following form:

$$\Delta f_{i,j,t} = \sum_{m=1}^{4} \alpha_m \Delta f_{i,j,t-m} + \sum_{m=0}^{4} x_{i,j,t-m}\beta_m + \sum_{m=0}^{4} Dx_{i,j,t-m}\rho_m + \sum_{m=0}^{4} w_{i,j,t-m}\kappa_m + z_{i,j,t}\delta + \varepsilon_{i,j,t} \quad (4)$$

where D is a zero-one dummy variable. In column (3) of Table 5, the dummy variable D equals one if the distance between the two countries is above the sample mean. In column (4), the dummy variable D equals one if the distance between the two countries is above the 75 percentile. We rely here on the distance and not on the indicator of the access to local capital markets because the latter measures access to local capital markets for all foreigners and not only for investors from country *i*.

In Table 5, we report results of the (restricted) baseline specification with a full set of instruments. The effects of macroeconomic developments are now measured by two coefficients. The β coefficients alone capture the effect for those country pairs that are relatively close to each other. The sum of the β and ρ coefficients captures the effect for country pairs that are relatively far away from each other.

Regarding the β coefficients, we find that the magnitude of the responses to macroeconomic developments are similar to those in the baseline regression. Specifically, as in the baseline regression, the GDP growth differential, and the bilateral exchange rate are insignificant, while the US GDP growth has a significantly negative impact on foreign bank assets. The interest rate differential has a negative impact but its *t*-value is lower than in the baseline regression. As in the baseline regression, the inflation rate differential has a significantly positive impact on foreign bank assets.

Regarding the ρ coefficients, we find that distance does not determine how demand and monetary shocks are transmitted between countries. The results presented in columns (3) and (4) show that the coefficients of the interaction terms in the case of the GDP growth differential and the interest rate differential are insignificant. However, we find that distance seems to matter for the transmission of supply shocks. In column (3), we split the country pairs into those whose distance is below average and those whose distance is above average.

Here, we find weak evidence for a greater shock transmission in the case of those country pairs whose distance is below the sample average. Therefore, in column (4), we split the country pairs into those whose distance is below and those whose distance is above the 75 percentile. In this specification, the inflation rate differential has a significantly positive impact, while the interaction term of the inflation rate differential has a significantly negative impact. Thus, foreign bank assets tend to respond more to supply shocks if countries are not too far from each other. A test for joint significance indicates that supply shocks are not transmitted between country pairs whose distance is above the 75 percentile of our sample.

Note that we have experimented with a number of different specifications for this dummy variable, such as interaction terms between the market access measure and different cut-offs for the distance variable, but most of the results have been insignificant. Hence, the results reported in the last column of Table 5 are not very robust regarding the role of transaction costs for the transmission of macroeconomic shocks. Therefore, we cannot replicate the prediction of the theoretical model that transaction costs have a measurable effect on the transmission of macroeconomic shocks. This result can probably be explained by our country sample. Since we mostly include European OECD countries, there is not much variation in transaction costs that can help explain changes in foreign bank assets.

5 Summary of Results

In this paper, we have analyzed whether foreign assets of commercial banks react to macroeconomic shocks in a systematic way. We have based our empirical analysis on a new open economy macroeconomic model with incomplete financial integration. According to this model, consumers aim at smoothening consumption over time. International borrowing and lending is the main channel of adjustment in this model. Accordingly, foreign bank assets should expand following monetary shocks and contract following supply and expansionary demand (fiscal) shocks. The magnitude of the response depends on the transaction costs in international banking markets.

We have empirically tested these theoretical predictions using data on bilateral foreign bank assets for OECD countries. Our empirical results are largely in line with these predictions. Expansionary monetary shocks, measured as the relative decrease of the domestic vis-à-vis the foreign nominal interest rate, and contractionary supply shocks, measured as the relative increase of the domestic vis-à-vis the foreign inflation rate, lead to an increase in foreign bank assets. However, contractionary demand (fiscal) shocks, measured as the relative decrease of domestic vis-à-vis foreign GDP growth, do not exert a significant effect on foreign bank assets. Overall, our results are not inconsistent with the theoretical framework used.

These results are quite robust across different specifications, and they also hold if we extract proxies for macroeconomic shocks from a panel VAR model. Hence, our results suggest that changes in foreign bank assets play a role in the transmission of macroeconomic shocks across countries. However, transaction costs seem to be relatively unimportant for the transmission of macroeconomic shocks, which is probably a consequence of our relatively homogenous sample of mostly European OECD countries. Therefore, future work should try to assemble a larger country sample that also includes non-OECD countries.

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Figure 1: Responses of Foreign Bank Assets to Macroeconomic Shocks

This figure shows impulse response functions of foreign bank assets to domestic and foreign shocks. Parameters used are as in Sutherland (1996). A supply shock is modeled as an increase in the disutility of labor by 1 percent at home and a decrease in the disutility of labor by 1 percent abroad. A demand shock is modeled as a tax-financed increase in government expenditure by 1 percent at home and a decrease in expenditures by 1 percent abroad. A monetary shock is modeled as an increase in money supply by 1 percent at home and a decrease in money supply by 1 percent abroad.

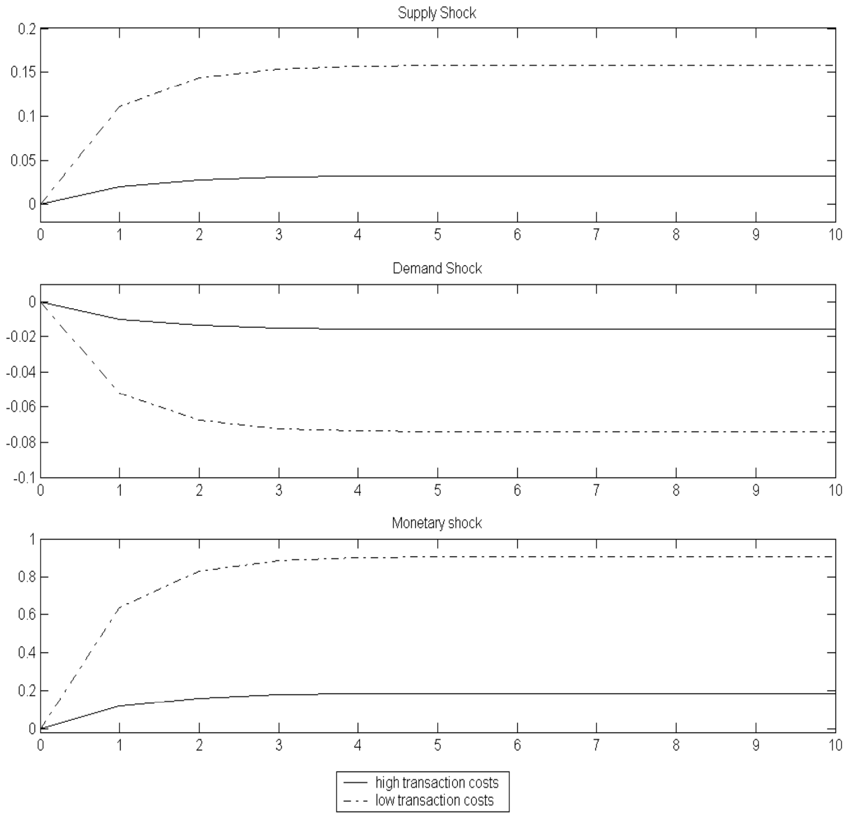

Figure 2: Impulse Response Functions

This figure contains the impulse response functions estimated from the panel VAR model. It shows the response of relative GDP growth, relative inflation and the relative short-term interest rate to a negative supply shock, an expansionary demand shock, and a contractive monetary policy shock. The VAR equations are specified with 5 lags of the endogenous variables and are estimated using as instruments 5 lags of the endogenous variables. This specification minimizes the panel Hannan-Quinn criterion proposed by Andrews and Lu (2001). The structural shocks are computed from a Choleski decomposition applied to the VAR residuals.

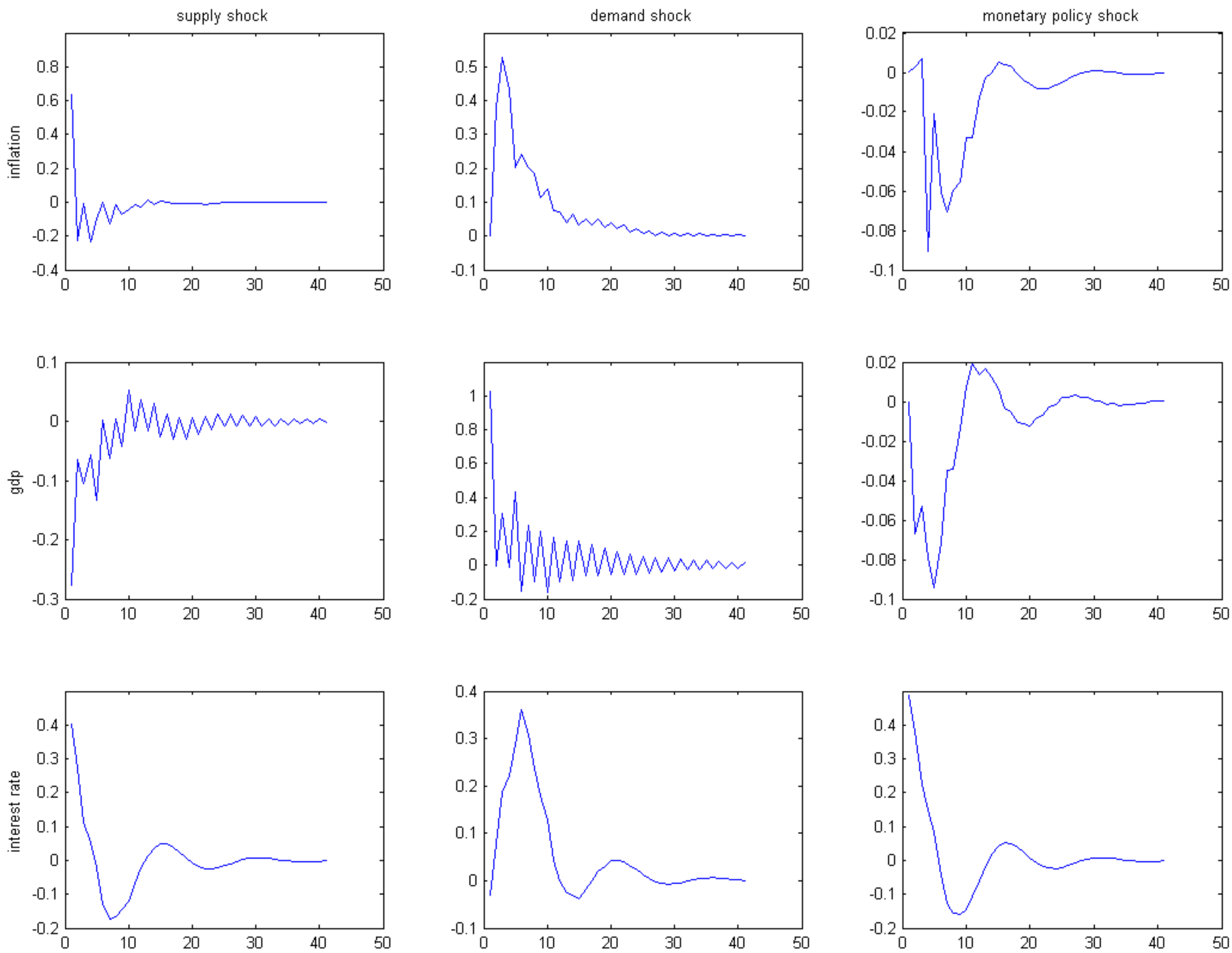

Table 1: Descriptive Statistics

This Table reports mean values of foreign asset holding of domestic banks and domestic assets of foreign banks. Moreover, the coefficients of variation, defined as the variance divided by mean squared, are reported. Data are taken from the BIS consolidated banking statistics for all source countries for the years 1999-2003.

	Foreign assets of domestic banks			Domestic assets of foreign banks		
	mean (million US$)	mean (% of total)	coefficient of variation	mean (million US$)	mean (% of total)	coefficient of variation
Austria	2924.3	7.4	1.8	8333.4	2.9	6.7
Belgium	21061.9	1.8	1.4	11768.4	4.1	1.7
Canada	5152.2	0.9	3.0	6662.0	2.3	1.8
Denmark	2537.5	0.7	2.6	4889.5	1.7	1.7
Finland	1890.4	12.6	3.3	2739.0	0.9	1.5
France	35706.6	27.8	1.1	26198.7	9.1	1.6
Germany	78641.7	3.2	1.6	35865.5	12.4	0.9
Ireland	9080.9	3.7	5.8	8998.8	3.1	1.6
Italy	10390.2	8.2	1.5	27120.1	9.4	1.6
Japan	23287.8	7.6	1.8	22343.8	7.7	2.2
Netherlands	21615.2	0.6	1.7	20188.4	7.0	1.8
Portugal	1648.4	3.0	1.7	5125.4	1.8	2.2
Spain	8620.6	2.2	1.4	11751.1	4.1	1.9
Sweden	6274.2	11.7	3.0	5720.3	2.0	1.0
Switzerland	33021.3	8.6	3.3	7803.6	2.7	2.5
UK	24348.3	7.4	0.8	83108.2	28.8	1.8
Total	18064.9		4.8	18064.9		4.8

Table 2: Bilateral Assets of Banks Relative to GDP (%, 2003)

This Table reports bilateral cross-border claims of BIS reporting banks relative to host and source countries' GDP. Cross-border assets are taken from the BIS' consolidated statistics and are as of 2003. Total GDP in 2003 has been taken from the World Developments Indicators database of the World Bank (April 2005).

a) Claims of source on host country over source country GDP (%)

Source / Host	AUT	BEL	CAN	DNK	FIN	FRA	GER	IRL	ITA	JAP	NET	PRT	ESP	SWE	SWI	UK	US
AUT		1.81	0.16	0.16	0.03	0.54	4.87	4.60	0.00	0.13	1.85	0.50	0.12	0.27	2.66	0.43	0.06
BEL	0.49		0.25	0.23	0.06	2.00	2.16	1.79	0.73	0.31	15.67	0.95	0.68	0.62	4.54	1.44	0.13
CAN	0.17	0.53		0.03	0.33	0.86	0.82	2.73	0.09	0.48	3.37	0.09	0.10	0.18	3.13	0.00	0.28
DNK	0.09	1.20	0.05		7.25	0.17	1.15	1.27	0.08	0.10	1.49	0.36	0.10	9.94	1.66	0.37	0.08
FIN	0.15	0.82	0.00	0.49		0.27	0.44	1.62	0.03	0.08	0.60	0.09	0.08	4.28	0.72	0.18	0.02
FRA	1.16	14.53	0.59	0.26	0.37		6.65	9.63	2.10	1.42	8.41	4.03	2.01	1.16	14.96	5.67	0.29
GER	7.30	14.93	1.06	4.36	1.96	6.73		84.68	2.05	2.34	30.93	4.28	4.07	17.18	24.82	3.63	0.62
IRL	1.27	8.26	0.77	0.97	0.17	1.00	2.33		0.61	0.25	3.90	1.75	0.60	0.27	3.87	2.79	0.07
ITA	1.62	17.31	0.25	0.10	0.32	6.62	5.64	17.32		0.71	11.66	1.16	2.95	0.37	14.46	3.24	0.22
JAP	0.26	1.32	0.82	0.05	0.08	8.49	3.66	18.24	0.28		5.36	0.07	0.06	0.23	25.43	2.96	0.57
NET	1.60	29.26	0.56	0.71	0.39	2.77	4.86	2.43	0.00	0.70		1.57	1.83	0.90	6.87	2.55	0.29
PRT	0.27	2.45	0.12	0.07	0.01	0.55	1.10	0.00	0.62	0.04	1.41		4.65	0.04	0.50	0.66	0.02
ESP	0.41	5.05	0.20	0.15	0.03	3.11	3.06	9.65	0.46	0.39	8.07	4.75		0.28	3.14	2.14	0.11
SWE	0.17	0.89	0.23	8.58	4.90	0.32	0.97	2.25	0.08	0.18	2.72	0.14	0.14		1.76	0.55	0.06
SWI	1.04	1.25	0.15	0.76	0.05	1.55	2.20	1.11	0.29	0.16	1.89	0.84	0.18	0.49		0.57	0.11
UK	4.18	27.82	5.39	8.96	1.72	10.14	22.24	48.29	3.48	2.04	32.21	7.37	2.97	8.11	93.54		1.25
US	1.65	24.95	23.13	1.36	2.39	14.44	19.32	8.25	1.86	11.03	65.45	4.30	3.42	8.28	199.44	31.22	
∑	**21.85**	**152.38**	**33.72**	**27.25**	**20.05**	**59.56**	**81.48**	**213.85**	**12.75**	**20.35**	**195.00**	**32.23**	**23.95**	**52.60**	**401.50**	**58.39**	**4.18**

b) Claims of source on host country over host country GDP (%)

Source / Host	AUT	BEL	CAN	DNK	FIN	FRA	GER	IRL	ITA	JAP	NET	PRT	ESP	SWE	SWI	UK	US	∑
AUT		2.16	0.55	0.14	0.02	3.74	46.21	2.79	0.00	2.16	3.75	0.29	0.40	0.32	3.37	3.04	2.61	**71.54**
BEL	0.41		0.70	0.16	0.03	11.65	17.18	0.91	3.55	4.37	26.54	0.47	1.88	0.62	4.82	8.56	4.69	**86.54**
CAN	0.05	0.19		0.01	0.06	1.76	2.30	0.49	0.16	2.41	2.01	0.01	0.10	0.06	1.17	0.00	3.53	**14.31**
DNK	0.11	1.72	0.20		5.54	1.40	13.08	0.92	0.52	2.10	3.60	0.25	0.39	14.15	2.50	3.10	4.23	**53.81**
FIN	0.23	1.53	0.00	0.65		2.97	6.47	1.54	0.24	2.19	1.88	0.08	0.43	7.97	1.43	1.97	1.22	**30.79**
FRA	0.17	2.49	0.29	0.03	0.03		9.09	0.84	1.75	3.47	2.45	0.34	0.96	0.20	2.73	5.79	1.78	**32.41**
GER	0.77	1.88	0.38	0.38	0.13	4.93		5.42	1.25	4.18	6.58	0.26	1.42	2.16	3.31	2.71	2.81	**38.57**
IRL	2.10	16.22	4.31	1.34	0.18	11.44	36.40		5.87	6.87	12.99	1.68	3.27	0.53	8.07	32.53	5.28	**149.10**
ITA	0.28	3.56	0.14	0.01	0.04	7.92	9.24	1.81		2.08	4.06	0.12	1.69	0.08	3.15	3.96	1.64	**39.77**
JAP	0.02	0.09	0.16	0.00	0.00	3.47	2.05	0.65	0.10		0.64	0.00	0.01	0.02	1.89	1.23	1.46	**11.79**
NET	0.79	17.27	0.94	0.30	0.12	9.50	22.86	0.73	0.00	5.86		0.45	3.00	0.53	4.30	8.96	6.15	**81.76**
PRT	0.46	5.00	0.70	0.10	0.01	6.58	17.88	0.00	6.15	1.03	4.89		26.34	0.09	1.09	8.05	1.40	**79.76**
ESP	0.12	1.82	0.21	0.04	0.00	6.51	8.77	1.77	0.80	1.99	4.92	0.84		0.10	1.20	4.59	1.48	**35.16**
SWE	0.15	0.89	0.64	6.03	2.63	1.88	7.75	1.15	0.38	2.57	4.62	0.07	0.40		1.87	3.25	2.09	**36.35**
SWI	0.82	1.18	0.41	0.50	0.02	8.51	16.55	0.53	1.33	2.18	3.02	0.39	0.48	0.46		3.18	3.80	**43.36**
UK	0.59	4.68	2.57	1.06	0.16	9.93	29.78	4.14	2.84	4.89	9.18	0.61	1.39	1.36	16.68		7.65	**97.51**
US	0.04	0.69	1.81	0.03	0.04	2.32	4.24	0.12	0.25	4.33	3.06	0.06	0.26	0.23	5.83	5.12		**28.41**

Table 3: Results of the Baseline Regressions

The dependent variable is the percentage change in foreign bank assets in country *i* on country *j*. Data are taken from the BIS consolidated banking statistics for all source countries for the years 1999-2003. Results are based on GMM estimations with Windmeijer's (2005) corrected *t*-statistics. In column (1) an unrestricted specification including four lags of all explanatory variables is reported. In columns (2) and (3), stepwise restricted specifications with restricted and full instrument sets, respectively, are reported. All estimations include quarter and year dummies. * significant at the 10%-, ** significant at 5%-,; *** significant at 1%-level. Absolute *t*-values are reported in brackets.

	(1) Unrestricted	(2) Restricted: instruments reduced	(3) Restricted: full instruments
L. percentage change in bank assets	-0.178***	-0.165***	-0.187***
	(3.47)	*(4.54)*	*(5.48)*
L2. percentage change in bank assets	-0.031		
	(0.58)		
L3. percentage change in bank assets	-0.091	-0.060*	-0.074**
	(1.56)	*(1.97)*	*(2.58)*
L4. percentage change in bank assets	-0.009		
	(0.16)		
GDP growth differential	-0.236		
	(0.29)		
L. GDP growth differential	2.634**	2.028*	2.219***
	(2.11)	*(1.76)*	*(2.68)*
L2. GDP growth differential	-1.667**	-1.436**	-1.303**
	(2.35)	*(2.10)*	*(2.37)*
L3. GDP growth differential	-0.312		
	(0.39)		
L4. GDP growth differential	-0.844	-0.952*	
	(1.07)	*(1.69)*	
Interest rate differential	-0.019		
	(0.97)		
L. Interest rate differential	-0.027		
	(0.97)		
L2. Interest rate differential	0.064*		
	(1.95)		
L3. Interest rate differential	-0.072**	-0.050**	-0.050***
	(2.34)	*(2.52)*	*(2.87)*
L4. Interest rate differential	0.036*	0.040**	0.041**
	(1.73)	*(2.16)*	*(2.43)*
Inflation rate differential	0.836		
	(0.65)		
L. Inflation rate differential	2.407*		2.019**
	(1.68)		*(2.21)*
L2. Inflation rate differential	1.031		
	(0.89)		
L3. Inflation rate differential	1.230	2.133**	
	(1.03)	*(2.07)*	

	(1)	(2)	(3)
L4. Inflation rate differential	4.168***	4.426***	4.574***
	(2.69)	*(3.59)*	*(3.82)*
US GDP growth	-10.110***	-10.303***	-11.387***
	(5.41)	*(5.64)*	*(6.45)*
L. US GDP growth	10.869***	13.164***	12.713***
	(3.30)	*(4.09)*	*(4.44)*
L2. US GDP growth	10.245***	8.980***	8.688***
	(4.23)	*(4.29)*	*(3.92)*
L3. US GDP growth	-7.536***	-9.340***	-9.396***
	(3.12)	*(3.97)*	*(4.58)*
L4. US GDP growth	-16.938***	-15.232***	-15.674***
	(6.27)	*(6.82)*	*(7.31)*
Bilateral exchange rate	0.051**	0.063***	0.065***
	(2.31)	*(3.21)*	*(3.42)*
L. bilateral exchange rate	0.033***	0.025**	0.026***
	(2.78)	*(2.41)*	*(2.61)*
L2. bilateral exchange rate	-0.121***	-0.115***	-0.119***
	(5.18)	*(5.34)*	*(5.69)*
L3. bilateral exchange rate	0.023**	0.027***	0.024***
	(2.38)	*(3.25)*	*(3.02)*
L4. bilateral exchange rate	0.011		
	(0.57)		
ln of distance	-0.011**	-0.004	-0.008**
	(2.03)	*(1.15)*	*(2.00)*
Constant	0.353***	0.310***	0.342***
	(6.91)	*(8.29)*	*(9.13)*
Observations	3058	3365	3282
Groups	240	240	240
Instruments	39	30	39
F test (*p*-value)	0.000	0.000	0.000
Sargan test	0.683	0.811	0.843
AR(1) test (*p*-value)	0.000	0.000	0.000
AR(2) test (*p*-value)	0.710	0.380	0.259
F test against unrestricted model (*p*-value)		0.54	0.64
Sum of coefficients			
percentage change in bank assets	-0.31	-0.23***	-0.26***
	(1.61)	*(4.14)*	*(5.26)*
GDP growth differential	-0.43	-0.36	0.92
	(0.30)	*(0.24)*	*(1.03)*
Interest rate differential	-0.02***	-0.01**	-0.01**
	(3.11)	*(2.32)*	*(2.32)*
Inflation rate differential	9.67***	6.56***	6.59***
	(3.44)	*(3.86)*	*(3.87)*
US GDP growth	-13.47***	-12.73***	-15.06***
	(3.47)	*(3.07)*	*(3.92)*
Bilateral exchange rate	-0.003	-0.000	-0.005
	(0.72)	*(0.12)*	*(1.63)*

Table 4: Macroeconomic Developments Proxied Through VAR Shocks

The dependent variable is the percentage change in foreign bank assets in country *i* on country *j*. Data are taken from the BIS consolidated banking statistics for all source countries for the years 1999-2003. Results are based on GMM estimations with Windmeijer's (2005) corrected *t*-statistics. The shocks are derived from a panel VAR model for the following three variables in country differences: quarterly GDP growth, quarterly inflation rate, and interest rate. The equations are specified with 5 lags of the endogenous variables and are estimated using as instruments 5 lags of the endogenous variables. This specification minimizes the panel Hannan-Quinn criterion proposed by Andrews and Lu (2001). The structural shocks are computed from a Choleski decomposition applied to the VAR residuals. In column (1), an unrestricted specification including four lags of all explanatory variables is reported. In columns (2) and (3), stepwise restricted specifications with restricted and full instrument sets, respectively, are reported. * significant at the 10%-, ** significant at the 5%-, *** significant at the 1%-level. Absolute *t*-values are reported in brackets.

	(1) Unrestricted	(2) Restricted: instruments reduced	(3) Restricted: full instruments
L. percentage change in bank assets	-0.214*** *(4.28)*	-0.204*** *(6.93)*	-0.176*** *(4.76)*
L2. percentage change in bank assets	-0.057 *(1.09)*		
L3. percentage change in bank assets	-0.113* *(1.95)*	-0.083*** *(3.03)*	-0.064** *(2.07)*
L4. percentage change in bank assets	-0.020 *(0.37)*		
Price Shock	0.007 *(0.61)*		
L. Price Shock	0.001 *(0.11)*		
L2. Price Shock	0.014 *(1.15)*		
L3. Price Shock	-0.010 *(0.90)*		
L4. Price Shock	0.028** *(2.16)*	0.023*** *(2.94)*	0.029*** *(3.00)*
Demand Shock	-0.004 *(0.48)*		
L. Demand Shock	0.032** *(2.16)*	0.020*** *(2.64)*	0.024* *(1.88)*
L2. Demand Shock	-0.019** *(2.15)*	-0.016** *(2.39)*	-0.016** *(2.18)*
L3. Demand Shock	0.015* *(1.95)*	0.013** *(2.03)*	0.015* *(1.96)*
L4. Demand Shock	-0.016* *(1.76)*		-0.014* *(1.69)*
Interest Rate Shock	-0.004 *(0.33)*		
L. Interest Rate Shock	-0.018 *(1.48)*	-0.010* *(1.67)*	
L2. Interest Rate Shock	0.005 *(0.44)*		
L3. Interest Rate Shock	-0.028** *(2.19)*	-0.013* *(1.92)*	-0.021*** *(2.64)*

	(1)	(2)	(3)
L4. Interest Rate Shock	-0.005		
	(0.36)		
US GDP growth	-10.594***	-11.729***	-10.978***
	(5.63)	*(7.25)*	*(5.75)*
L. US GDP growth	12.191***	11.746***	14.514***
	(3.41)	*(4.35)*	*(4.29)*
L2. US GDP growth	11.675***	9.089***	9.829***
	(4.37)	*(4.93)*	*(4.59)*
L3. US GDP growth	-8.001***	-8.612***	-10.268***
	(3.15)	*(4.50)*	*(4.07)*
L4. US GDP growth	-17.650***	-14.864***	-15.835***
	(6.14)	*(8.19)*	*(6.78)*
Bilateral exchange rate	0.383*	0.341**	0.335**
	(1.84)	*(2.17)*	*(2.06)*
L. Bilateral exchange rate	-0.594*	-0.341**	-0.436*
	(1.77)	*(2.17)*	*(1.86)*
L2. Bilateral exchange rate	-0.039		
	(0.15)		
L3. Bilateral exchange rate	0.829**	0.645***	0.942***
	(2.31)	*(2.77)*	*(2.72)*
L4. Bilateral exchange rate	-0.581**	-0.645***	-0.842***
	(1.97)	*(2.77)*	*(3.06)*
ln of distance	-0.013**	-0.008**	-0.006
	(2.10)	*(2.04)*	*(1.48)*
Constant	0.364***	0.334***	0.323***
	(6.81)	*(9.13)*	*(8.54)*
Observations	2993	3217	3300
Groups	239	239	239
Instruments	38	38	29
F test (*p*-value)	0.000	0.000	0.000
Sargan test	0.290	0.875	0.688
AR(1) test (*p*-value)	0.000	0.000	0.000
AR(2) test (*p*-value)	0.430	0.157	0.275
F test against unrestricted model (*p*-value)		0.65	0.53
Sum of coefficients			
percentage change in bank assets	-0.404**	-0.287***	-0.240***
	(2.14)	*(6.62)*	*(4.37)*
Demand shock	0.008	0.017*	0.009
	(0.55)	*(1.86)*	*(0.66)*
Interest rate shock	-0.049***	-0.023***	-0.021***
	(3.59)	*(3.27)*	*(2.64)*
Price shock	0.041**	0.023***	0.029***
	(2.11)	*(2.94)*	*(3.00)*
US GDP growth	-12.378***	-14.370***	-12.738***
	(3.14)	*(4.14)*	*(3.02)*
Bilateral exchange rate	-0.002	0	-0.001
	(0.51)	*(---)*	*(0.36)*

Table 5: Shock Transmission and Transaction Costs

The dependent variable is the log change in foreign bank assets in country *i* on country *j*. Data are taken from the BIS consolidated banking statistics for all source countries for the years 1999-2003. Results are based on GMM estimations with Windmeijer's (2005) corrected *t*-statistics. All estimations include quarter and year dummies. In column (3) the dummy variable *D* equals one if the distance between the two countries is above the sample mean. In column (4) the dummy variable *D* equals one if the distance between the two countries is above the 75 percentile. * significant at the 10%-, ** significant at the 5%-, *** significant at the 1%-level. Absolute *t*-values are reported in brackets. In all specifications, we include a full set of instruments of up to four lags.

	(1)	(2)	(3)	(4)
L. percentage change in ln of bank assets	-0.187***	-0.192***	-0.195***	-0.188***
	(5.48)	*(5.77)*	*(5.83)*	*(6.12)*
L3. percentage change in ln of bank assets	-0.074**	-0.075***	-0.071***	-0.072***
	(2.58)	*(2.62)*	*(2.72)*	*(2.76)*
L. GDP growth differential	2.223***	2.221***	1.835**	1.773**
	(2.68)	*(2.71)*	*(2.18)*	*(2.25)*
L2. GDP growth differential	-1.308**	-1.273**	-1.518***	-1.567***
	(2.38)	*(2.33)*	*(2.68)*	*(2.75)*
L3. Interest rate differential	-0.050***	-0.050***	-0.056***	-0.059***
	(2.86)	*(2.79)*	*(2.61)*	*(2.93)*
L4. Interest rate differential	0.041**	0.043**	0.048**	0.051***
	(2.42)	*(2.46)*	*(2.34)*	*(2.62)*
L. Inflation rate differential	2.006**	2.271**	2.258**	3.251***
	(2.19)	*(2.49)*	*(2.53)*	*(3.57)*
L4. Inflation rate differential	4.561***	4.740***	4.964***	5.136***
	(3.8)	*(3.99)*	*(3.67)*	*(4.13)*
US GDP growth	-11.407***	-11.563***	-10.978***	-11.513***
	(6.44)	*(6.65)*	*(6.29)*	*(7.08)*
L. US GDP growth	12.749***	12.879***	9.998***	10.659***
	(4.44)	*(4.61)*	*(3.47)*	*(3.95)*
L2. US GDP growth	8.710***	8.873***	7.905***	8.647***
	(3.92)	*(4.1)*	*(3.67)*	*(4.13)*
L3. US GDP growth	-9.411***	-9.670***	-7.696***	-8.028***
	(4.57)	*(4.8)*	*(3.69)*	*(4.32)*
L4. US GDP growth	-15.686***	-15.676***	-14.008***	-14.839***
	(7.29)	*(7.44)*	*(6.48)*	*(7.45)*
difference in exchange rate to US$	0.065***	0.060***	0.052**	0.062***
	(3.38)	*(3.46)*	*(2.56)*	*(3.26)*
L. difference in exchange rate to US$	0.027***	0.029***	0.024**	0.037***
	(2.61)	*(2.63)*	*(2.15)*	*(3.66)*
L2. difference in exchange rate to US$	-0.120***	-0.118***	-0.098***	-0.118***
	(5.67)	*(5.86)*	*(4.61)*	*(5.6)*
L3. difference in exchange rate to US$	0.024***	0.024***	0.019***	0.018***
	(3)	*(3.17)*	*(2.64)*	*(2.8)*
ln of distance	-0.008*		-0.008*	-0.009**
	(1.81)		*(1.91)*	*(2.44)*
Same law	0.012			
	(1.36)			

Same language	-0.012			
	(0.99)			
Access to local capital markets		0.020**		
		(2)		
D* L. GDP growth differential			-0.891	0.085
			(0.41)	*(0.04)*
D* L2. GDP growth differential			0.832	1.793
			(0.53)	*(1.29)*
D* L3. Interest rate differential			0.049	0.064*
			(1.33)	*(1.81)*
D* L4. Interest rate differential			-0.042	-0.054*
			(1.24)	*(1.66)*
D* L. Inflation rate differential			-2.346	-6.307***
			(0.93)	*(3.18)*
D* L4. Inflation rate differential			-3.536	-5.224**
			(1.4)	*(2.14)*
Constant	0.336***	0.109	0.325***	0.342***
	(8.74)	*(1.11)*	*(8.26)*	*(9.15)*
Observations	3282	3282	3282	3282
Groups	240	240	240	240
Instruments	41	39	54	54
F test (p-value)	0.000	0.000	0.000	0.000
Sargan test	0.833	0.892	0.529	0.973
AR(1) test (p-value)	0.000	0.000	0.000	0.000
AR(2) test (p-value)	0.258	0.25	0.277	0.329
Sum of coefficients				
percentage change in bank assets	-0.26***	-0.27***	-0.27***	-0.26***
	(5.26)	*(5.46)*	*(5.67)*	*(6.03)*
GDP growth differential	0.92	0.95	0.32	0.21
	(1.03)	*(1.08)*	*(0.31)*	*(0.21)*
Interest rate differential	-0.01**	-0.01**	-0.01	-0.01
	(2.32)	*(1.98)*	*(1.48)*	*(1.64)*
Inflation rate differential	6.57***	7.01***	7.22***	8.39***
	(3.85)	*(4.13)*	*(3.93)*	*(4.85)*
US GDP growth	-15.05***	-15.16***	-14.78***	-15.07***
	(3.91)	*(3.87)*	*(4.02)*	*(4.32)*
Bilateral exchange rate	-0.001	-0.005*	0.00	0.00
	(1.64)	*(1.67)*	*(0.98)*	*(0.13)*
D* GDP growth differential			-0.06	1.88
			(0.03)	*(0.89)*
D* Interest rate differential			0.01	0.01
			(0.80)	*(1.28)*
D* Inflation rate differential			-5.88	-11.53***
			(1.40)	*(3.12)*

Table A1: Data Definition and Sources

Variable	Definition	Source
Foreign bank assets	Consolidated statistics of the BIS: Worldwide consolidated international on-balance sheet assets of BIS reporting banks, covering international assets of banks' head offices in the source countries and all offices at home and abroad. Positions between offices of the same bank have been netted out, in million dollar.	BIS (2004)
GDP	Gross Domestic Product in constant USD for the year 1995. Seasonally adjusted.	Eurostat (2004) and Bureau for Economic Analysis (BEA)
GDP per capita	GDP per capita in constant USD for the year 1995.	Eurostat (2004)
Interest rate	Short-term interest rate (Finland, Ireland, Netherlands, Portugal), short-term t-bill rate (Belgium, Canada, UK), money market rate (Austria, Italy, Switzerland), call money rate (Denmark, France through 1998q4), Germany, Japan, Spain, Sweden through 2002q1), interbank (France after 1999q1, Sweden after 2002q1)	IMF (2004) and Datastream
Prices (P)	Consumer price index	IMF (2004)
Exchange rate (EX)	Exchange rate defined as USD to national currency	IMF (2004)
Same law	Dummy: 1 for countries with share the same law; 0 otherwise.	La Porta et al. (2000)
Same language	Dummy: 1 for countries with use the same language; 0 otherwise.	
Distance	Logarithms of geodesic distances are calculated following the great circle formula, which uses latitudes and longitudes of the most important cities/agglomerations (in terms of population) for the distance variable.	http://www.cepii.fr/
Access to local capital markets	Survey indicator: The higher the value of this indicator is, the easier the access to local capital markets for foreigners.	IMD (various issues)