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Cross-Border Banking and Channels of Transmission: Evidence from Bilateral Data

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Cross-Border Banking and Channels of Transmission: Evidence from Bilateral Data*

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Very preliminary, please do not quote!
Comments are welcome!

Abstract

We use bilateral data on banks' cross-border assets and liabilities to analyze two questions. First, we analyze the degree of heterogeneity in the response of banks' foreign assets and liabilities to macroeconomic developments, focusing in particular on a comparison between the Euro Area and the rest of the OECD. Second, we analyze the determinants of cross-border banking using gravity models and dynamic panel data models. Our data are quarterly for the years 1995-2005. They cover ten reporting countries and all OECD countries as recipients. We find a significant degree of heterogeneity in the patterns of banks' foreign activities across countries. Also, exchange rate valuation effects are important. In terms of the determinants of banks' foreign activities, we do reasonably well in terms of explaining the cross-country variation in the data but standard models perform worse in terms of explaining the variation across time.

Keywords: international banking, heterogeneity, transmission channels, Euro Area

JEL classification: F32, F42, F34

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1 Motivation

What are the determinants of bilateral financial linkages? How do cross-border assets and liabilities react to interest rate differentials? Do developments in the Euro Area differ from developments elsewhere? Answering these questions is key to an understanding of international macroeconomic adjustment processes. Yet, little empirical evidence to answer these questions is available, in particular with regard to the *bilateral* financial linkages between countries.

Answering the questions above plays a particularly prominent role in the current debate on the causes and implications of global imbalances. In contrast to earlier episodes of financial integration, gross assets and liabilities have increased significantly and have moved very much in parallel for most countries. To an increasing degree, the adjustment of balance of payments positions is driven not only by the adjustment of the current account but also of gross assets and liabilities.

While increased gross cross-border asset holdings allow for improved risk-sharing across borders, they also expose countries to the repercussion of international macroeconomic developments. Understanding the forces driving the adjustment of gross capital flows is therefore crucial to assess the benefits of financial integration. In this paper, we provide evidence on the adjustment of banks' cross-border assets and liabilities over the past decade, focusing on OECD countries and on developments inside and outside the Euro Area. We focus on OECD countries because gross foreign assets have increased in particular for these countries and because of data availability. We focus on international bank assets because international debt instruments (assets as well as liabilities) still account for about 200% of GDP for industrialized countries and about 100% of GDP for emerging markets and developing countries (Lane and Milesi-Ferretti 2006b). Equity investments are a little over

half as important. Also, comparable evidence at the bilateral dimension is not available for other capital flows.

In studying the determinants of bilateral cross-border bank assets and liabilities, we focus on the following questions:

First, does the response of cross-border banking activities to macroeconomic developments differ across countries? Since our data are available on a country-by-country basis, we shed light on the degree of heterogeneity in the adjustment patterns across countries. Earlier studies on international asset holdings, such as the recently updated dataset by Lane and Milesi-Ferretti (2006a), provide information on aggregated foreign assets and liabilities. Likewise, theoretical open economy macroeconomic models are typically concerned with explaining aggregated rather than bilateral asset holdings. However, by focusing on aggregated positions, heterogeneity in adjustment patterns across individual countries or groups of countries may be overlooked. In studying the impact of cross-country heterogeneity on international adjustment mechanisms, we focus in particular on differences between countries inside and outside the Euro Area. This is possible because we have data from reporting countries inside the Euro Area (Belgium, Germany, France, Netherlands) and outside the Euro Area (Switzerland, UK, USA, Japan). As recipient countries, we use information on all OECD countries. In terms of the time series dimension, our dataset covers the pre-Euro period (1994-1998) as well as the post-Euro period (1999-2004).

Second, what are the determinants of cross-border assets and liabilities? Previous literature has been fairly successful in terms of explaining stocks of cross-border asset holdings. Buch (2003), for instance, studies bilateral cross-border asset holdings of banks that report to the Bank for International Settlements (BIS). She finds that, apart from market size, regulations and information costs affect the patterns of cross-border asset holdings. The response of bilateral bank lending to cyclical factors has been studied less frequently and only for selected

countries and time periods. Buch, Carstensen, and Schertler (2005), for instance, use a dataset similar to ours but focus on a shorter time period (1999-2003). Goldberg (2005) uses bank-level data for US banks. These studies show that explaining cross-border capital flows is much more difficult than explaining stocks of foreign assets and liabilities.[1] Although standard proxies for business cycle developments such as interest rates and GDP growth rates do have a significant impact on banks' international activities, the impact of these variables is not very stable across time and across countries. Moreover, the explanatory power of these regressions is typically low. In this paper, we first provide evidence on the long-run determinants of cross-border banking activities. This part of the analysis is based on gravity equations for a cross-section of countries. In addition, we explore how cross-border assets and liabilities react to interest rate differentials, using Granger causality tests and dynamic panel data models.

The data that we use for this paper is richer than data used in earlier studies for four reasons. First, we use data for banks from ten BIS reporting countries. In contrast to Goldberg (2005), we can thus study the impact of business cycle developments on foreign assets and liabilities of banks from more than one source country. However, our data do not allow a disaggregation by the size of banks. Second, we use quarterly data for a 10-year period (1995-2005) to study the determinants of cross-border assets and liabilities of banks for the pre- and the post-Euro period. Third, we study the interaction between cross-border lending and borrowing instead of focusing on cross-border asset holdings only. And, fourth, in contrast to Lane and Milesi-Ferretti (2002) who study how interest rates respond to aggregate net foreign assets, we have information on bilateral financial linkages.

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[1] A related strand of the literature studies the transmission of shocks during financial crises through the international activities of banks. See, e.g., Weder and Van Rijckeghem (2003) or Peek and Rosengren (1997). Also, Jeanneau and Micu (2001) use BIS data to study the determinants of bank assets in emerging markets.

Since our paper is mainly descriptive in nature, we do not provide an extensive review of the relevant theoretical literature. In the theoretical literature, issues of international banking and the transmission of shocks across countries have in fact largely been covered separately. Traditionally, open economy macroeconomic models do not assign an explicit role to financial intermediation and to the composition of international investment portfolios.[2] Also, most of these models focus on the linkages between two countries rather than modeling bilateral linkages between a larger set of countries. Portfolio models of international banking such as the recent work by Galindo et al. (2005) do not consider different types of macroeconomic shocks. Hence current theoretical models are not very well suited to explain repercussions between gross foreign asset holdings and macroeconomic shocks (Obstfeld 2004).

In Part 2, we describe the data. In Part 3, we look at the degree of heterogeneity in the adjustment of banks' foreign assets and liabilities, focusing in particular on differences between the Euro Area and the rest of the OECD area. In Part 4, we provide evidence on the determinants of banks' foreign activities, using gravity-type equations to explain the cross-section variation in the data as well as dynamic panel models to explain the time series variation. Part 5 concludes and summarizes the main results. Overall, our paper provides evidence on a quite significant degree of cross-country heterogeneity in the patterns of banks' foreign assets and liabilities. Our empirical model performs quite well in terms of explaining the cross-sectional variation in the data, but explaining the time series variation remains difficult.

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[2] Recently, dynamic general equilibrium model of open economies have been set up to model international portfolio choices. Evans and Hnatkovska (2005) and Tille (2005), for instance, model international equity and bond holdings within the framework of an open economy macroeconomic model, but both contributions abstract from banks in their setup. Ghironi, Lee, and Rebucci (2006) assume that perfectly competitive financial intermediaries charge (exogenously given) fees on financial market transactions.

2 Data

In this section, we describe the data used in this paper. Details on the data specification are given in the Appendix.

2.1 Dependent Variables

Our aim in this paper is to analyze the determinants of cross-border assets and liabilities of commercial banks. Our data come from the Bank for International Settlements (BIS). We have quarterly data for the years 1995-2004 on the bilateral foreign assets and liabilities for ten BIS reporting countries (Belgium, Germany, France, Hong Kong, Italy, Japan, Netherlands, Switzerland, UK, US).[3] For all countries, except Belgium and the UK, we also have information on the currency composition of assets and liabilities. The data are aggregated across banks in each reporting country but they are disaggregated by the country of destination.

The BIS collects information from national central banks on the cross-border assets and liabilities of commercial banks. Whereas the reporting area has formerly been restricted mainly to OECD countries, the set of countries has recently been enlarged to include also large emerging markets and financial centers. Until recently, however, data on bilateral activities *among* the BIS reporting countries have not been published by the BIS. Hence we resort to unpublished data, which have kindly been made available by the BIS' Statistics Department. These data allow an analysis also of the assets and liabilities *among* the reporting countries for an extended time range.

The BIS publishes two sets of banking statistics. The locational statistics are based on the balance of payments principle, i.e. they include all assets and liabilities of residents vis-à-vis

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[3] For reasons of data confidentiality, we do not report descriptive statistics for Hong Kong and Italy but we use data for these countries in our regressions.

non-residents. These data are in principle available since the early 1970s on a bilateral basis. In addition to aggregated positions by country, the BIS also collects breakdowns into different types of borrowers (banks / non-banks) and, which is of particular importance for our present study, on the currency composition of foreign assets and liabilities. This information is important when calculating changes in cross-border assets and liabilities which are the result of exchange rate valuation changes. In addition to information on banks' total assets and liabilities, we have information on the amounts denominated in Euro, in Yen, in Pound Sterling, in Swiss Francs, and in other currencies. Each position is given in US-Dollars.

In contrast to the locational statistics, the second set of statistics, the BIS' consolidated statistics consolidate inter-office positions among banks and their foreign affiliates. (For evidence using these data see, e.g., Buch, Carstensen, and Schertler (2005).) Hence the consolidated statistics provide a more detailed picture of the exposure of banks from specific reporting countries to foreign countries. The consolidated statistics are also more detailed with regard to the sector coverage than the locational statistics. However, no break-down into different currencies is available. Since we want to control for exchange rate effects, we use the locational statistics.

Figure 1 gives the currency composition of foreign assets and liabilities. Overall, the share of assets and liabilities denominated in Euro has remained relatively stable for the reporting countries that we consider. Despite the relative stable patterns in the currency of denomination, valuation changes have, of course, a potential impact on the changes in cross-border assets and liabilities of banks. Like the BIS in its Quarterly Review (2006), we thus convert the original data into constant US-DOLLAR. Since our data are already given in US-DOLLAR, we first transform each series of assets and liabilities in its original currency for every period t, x_t^{NC}, and then adjust for valuation changes by applying the following formula:

$$X_t^c = \sum_{i=1}^{k} \frac{x_{t,i}^{NC}}{e_0^{NC/USD}}$$

where $e_0^{NC/USD}$ is the exchange rate of the national currency to the US-DOLLAR ($\frac{NC}{USD}$) at the beginning of the sample period, and *k* is the number of currencies. We compare this series to the original data.

Figure 2 shows sample means of banking assets and liabilities in current US-Dollar and in constant US-Dollar for France, Germany, Japan, Netherlands, and Switzerland.[4] For all countries, the mean of the adjusted series is significantly larger than the data at current US-Dollar. On average, the impact of changes of the exchange rate vis-à-vis the US-Dollar on the value of banks' foreign assets and liabilities is positive, except for Germany, where we observe only small positive effects for cross-border liabilities and even a small negative impact on assets over the entire sample period. This is what we expect since the depreciation of the US-Dollar versus most other currencies of industrialized countries since 2001 does not outweigh the preceding period of large appreciations until the mid 1990s.

2.2 Explanatory Variables

Our set of explanatory variables is relatively standard and follows the international finance literature. As our main explanatory variables, we include domestic and foreign real GDP, domestic and foreign interest rates, and domestic and foreign inflation. Our dependent variable is specified in real terms, i.e. we deflate nominal variables with the domestic consumer price index. We capture short-run dynamics in financial markets through short-term interest rates with a maturity of three months.

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[4] Naturally, data for the U. S. is omitted.

All of our explanatory variables are provided by Datastream. When available, we use seasonally adjusted GDP data. These time series are deflated by the consumer price index of the respective country. The data come from the OECD and from national sources and have been retrieved through Datastream.

In some specifications, we also include the most representative stock market index for each OECD country, e.g. the Dow Jones Industrial Average for the U.S., the FTSE for the U.K., or the DAX for Germany.

The exchange rate series are also obtained from Datastream. To avoid structural breaks, the exchange rate series for member countries of the Euro Area are denominated in local currency versus US dollar even after the adoption of the Euro, i.e. the exchange rate given in Euro in terms of the US dollar has been multiplied by the official conversion rate of the respective member country.

In the following, we will use these data to answer two main questions:

- How large is the degree of heterogeneity across countries with regard to changes in cross-border assets and liabilities? Do adjustment patterns within the Euro Area differ from those outside the Euro Area?
- What are the short- and the long-run determinants of cross-border assets and liabilities of banks?

3 Cross-Country Heterogeneity and the Euro Area

There is a general perception that the financial markets of the Euro Area countries have become more integrated over the past years. At the same time, the speed of integration has differed across financial market segments. Recent empirical evidence shows that, despite the on-going integration of financial markets and the deregulation of cross-border banking

activity, banking systems in the Euro Area are still shaped by national characteristics (see, e.g., Sørensen and Puigvert Gutiérrez 2006).

In this section, we first check whether the introduction of the Euro has led to a re-structuring of banks' portfolios towards (or away) from the Euro Area. Subsequently, we analyze the responses of banks' cross-border activities to macroeconomic developments.

Starting with the changing importance of the Euro Area for banks' foreign activities, we follow literature that has studied the impact of the Euro on international portfolio choices. One of the more recent studies uses the IMF's International Portfolio Investment Survey (DeSantis and Gérard 2006) to analyze whether the introduction of the Euro has reduced the home bias in investment portfolios. This is done by comparing the structure of international investment portfolios to a benchmark portfolio, using cross-section data for the years 1997 and 2001. One main finding of this study is that the adoption of the Euro has reduced the home bias on equity and bond markets inside the Euro Area by increasing the share of assets held inside the Euro Area.

The set up of this study differs from our approach because we use banking data, because we have time series evidence rather than a cross-section of countries only, and because we have only 10 instead of 30 reporting countries. Yet, it is instructive to look at our data in a similar way. Figure 3 plots the shares of assets and liabilities that the reporting countries hold vis-à-vis the Euro Area as a percentage of total cross-border assets and liabilities. For some reporting countries such as the United States, the United Kingdom, Japan, and the Netherlands, these shares have remained relatively stable over the reporting period. There are only two countries which show a clear trend for both assets and liabilities: For Switzerland, the Euro Area has become *less* attractive as a destination for foreign activities of banks. For Italian banks, it has become *more* attractive. For banks in Belgium and France, the Euro Area has gained in importance only for assets. For Germany, there is a one time shift of assets and

liabilities around 1999. Figure 3 also shows that there are significant differences in the importance of Euro Area assets and liabilities, which are correlated with the distance between markets as the United States have relatively small financial linkages with the Euro Area.

Overall, evidence provided in Figure 3 does not lend strong support to the hypothesis that the introduction of the Euro has led to a significant restructuring of banks' international portfolios towards the Euro Area.

We next check whether international activities of banks react differently to macroeconomic developments, splitting the data into the Euro Area and the non-Euro Area. Table 2 shows the correlations between gross and net foreign assets with regard to standard proxies for macroeconomic developments. For the variables in levels, there are a number of significant correlations:

- Correlations with domestic GDP are positive inside but negative or insignificant outside the Euro Area.
- Correlations with foreign GDP are positive throughout.
- Correlations with (domestic and foreign) inflation are negative inside the Euro Area. For countries outside the Euro Area, domestic inflation has a positive impact on gross assets and liabilities, and foreign inflation has a negative impact.
- Correlations with interest rates are typically negative but not always significant for the Euro Area.
- Finally, gross assets and liabilities outside the Euro Area are positively correlated with the US-Dollar exchange rate but correlations inside the Euro area are negative.
- Some of these patterns are similar for the data in first differences, but correlations are much smaller and less significant.

In sum, the simple correlations that are reported in Table 2 give a pretty fuzzy picture. They are not always in line with expectations, in particular as regards the return proxies, and they show differences between the Euro Area and other OECD countries. One interesting observation that we can take away from this Table is the relatively parallel development of foreign assets and liabilities, which suggests that the two are jointly determined.

We next turn to the question of how volatile banks' assets and liabilities are. Figure 4 has the coefficients of variation (calculated as the ratio of standard deviation to the mean) for seven reporting countries (Japan is excluded because of relatively large outliers). (See Goldberg (2005) for a similar specification of the volatility of banks' foreign activities.) The Figure shows the coefficients of variation for cross-border assets and liabilities for each of the reporting countries, pooling the observations over time. For each country, we compare the volatilities of assets and liabilities and, in addition, split the sample into countries inside and outside the Euro Area.

There are a couple of interesting patterns in the data:

- Overall, the volatility of assets is similar to the volatility of liabilities. This reconfirms our earlier finding that assets and liabilities move very much in parallel.
- There is a considerable degree of heterogeneity in changes in cross-border banking activities both across recipient and across reporting countries.
- Volatilities inside the Euro Area tend to be smaller than those outside the Euro Area. This can be the result of two factors. First, the Euro Area is more stable in terms of macroeconomic conditions than the Non-Euro Area. Hence the volatility of shocks may differ. Second, the response to shocks may differ in the more integrated Euro Area than in the rest of the OECD area.

4 Determinants of Cross-Border Banking

The volatility of banks' foreign assets and liabilities, and correlations between banks foreign activities and macroeconomic developments differ for the Euro Area and the rest of the OECD region. We now turn to a more systematic analysis of the determinants of banks' foreign assets and liabilities. We start with a work-horse of the international trade and – to an increasing degree – of the international finance literature: a gravity model. This model allows to analyze the cross-section variation in the stocks of foreign assets and liabilities but, because of its focus on time-invariant determinants, it is less well-suited for an analysis of the time series variation in the data. Hence we supplement the analysis with a dynamic panel data model.

4.1 Cross-Sectional Variation: Gravity Models

The descriptive statistics that have been presented above have pointed to some distinct cross-sectional patterns in the data. For instance, the distance between two markets seems to have an impact on the tightness of cross-country financial linkages. Also, the impact of the introduction of the Euro in 1999 seems to have had a rather weak impact on banks' international portfolio choices. However, since our analysis has been univariate so far, we have not controlled for other variables that might affect cross-border activities of banks.

To find the long-run determinants of the stocks' of banks foreign assets and liabilities, we run a set of simple gravity-type, cross-section regressions. The baseline regressions include (log) domestic and foreign GDP and (log) bilateral distance. We additionally augment these regressions by domestic and foreign interest rates and inflation. We also control for the fact whether two countries share the same language. Rather than using the official language, we use information on the share of the population speaking the same language as a proxy for cultural proximity. In addition, we include a full set of home and host country fixed effects.

The 'Euro Area' effect is tested by including two dummy variables. The first, 'both EU members' is set at one if two countries are members of the European Union and zero otherwise. The second, 'both Euro Area members', is set at one if both countries are members of the Euro Area. It is important to note that this variable equals one over the full observation period, i.e. already prior to 1999. The reason is that we want to see whether the Euro Area countries have differed from the rest of the sample before and after the introduction of the Euro. We run these baseline regressions for gross foreign assets, gross foreign liabilities, and net foreign assets separately.[5]

The main results are given in Table 3. Generally, results for the gravity-type variables are in line with expectations. For gross assets and liabilities, GDP has a positive and significant impact in all regressions, and distance enters with a negative sign. The common language dummy is positive but not always significant (it is significant in unreported regressions excluding country fixed effects).

The results for interest rates and inflation are less stable, in contrast. We would expect that foreign assets are greater, the higher the foreign and the lower the domestic interest rate. Yet, the impact of the domestic interest rate is positive in a number of specifications, and the impact of the foreign interest rate is often negative. We find a similar interest rate response for foreign liabilities. Likewise, the results for inflation are quite mixed. Essentially, the missing link between foreign assets and liabilities and real return measures reconfirms our results using simple univariate correlations (Table 2). In unreported regressions, we have thus checked whether this might be due to the fact that we have included only the return of domestic and foreign assets but not the risk. However, including a simple measure of the volatility of real and nominal rates of return does not change the main picture.

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[5] Ideally, we would also test the links between foreign assets and liabilities but we lack an appropriate instrument affecting only one of the two.

In terms of the EU-effect, we find an insignificant impact of the dummy for both countries being a member of the EU for all years except the last year in the sample (2004). In this year, the new accession states of Central and Eastern Europe Czech Republic, Hungary, Poland, and the Slovak Republic are captured by this dummy variable for the first time. Since there has been a significant amount of cross-border bank lending to these countries, this can explain the significant positive effect of the EU dummy.

In addition, we find a positive and significant 'Euro Area' effect for the years 1999-2003, which would reconfirm earlier studies arguing that the introduction of the Euro has strengthened financial linkages among the Euro Area countries. Note, however, that our results do not say anything about the home bias in banks' investment portfolios since we have not specified an optimal benchmark portfolio.

For net foreign assets, results depend on the relative strength of the impact of each variable on assets and liabilities. Consequently, the coefficients are not very stable across the years.

Overall, results presented in Table 3 confirm the success of gravity-type regressions to explain the levels of cross-border banking activities. Our simple model explains about two-thirds of the cross-country variation in foreign assets and liabilities if no country fixed effects are included and an even higher share of around 85% of the variation if country fixed effects are included. The model performs decidedly worse in (unreported) regressions where we use the change in cross-border banking activity rather than the level as the dependent variable.

4.2 Time Series Variation: Dynamic Panel Models

Results of the gravity equations presented above may seem to suggest that standard empirical models do a fairly good job in terms of explaining the variation in banks' foreign assets and liabilities. However, results of the descriptive statistics, in particular the correlations and volatilities of foreign banking activities, have also shown the significant degree of

heterogeneity of changes in cross-border banking over time. Here, we turn to a more systematic analysis of the time series dimension in our data which eventually allow to study the transmission of macroeconomic shocks across countries.

One of the key variables in this context is the response of banks' activities to (real) interest rate differentials. In integrated financial markets, we would expect banks to arbitrage between different locations, taking into account differences in real rates of return. They should increase their (gross) foreign assets and lower their foreign liabilities if the foreign real interest rate exceeds the domestic real interest rate.

One approach that has been used in the literature was to regress changes in foreign assets and liabilities on (changes in) domestic and foreign interest rates (see, e.g., Buch, Carstensen, and Schertler (2005) and Goldberg (2005)). Results have been somewhat disappointing though. There seems to be a significant amount of 'noise' in the data, and the results are not very stable across time and different samples.

One reason why regressions of cross-border assets and liabilities on interest rate differentials yield unsatisfactory results could be that the two variables are jointly determined. Hence an alternative empirical approach has been to regress interest rate differentials on aggregated (net) foreign assets (Lane and Milesi-Ferretti 2002).

Instead of taking a stance on the direction of causality between foreign assets and liabilities and real interest rate differentials, we here use Granger tests for non-causality to analyze the link between cross-border banking activities and real interest rates. We have no priors on the direction of causality between the two. In fact, we may even find an insignificant link between capital flows and interest rates in unconditional regressions that do not control for the sources of the underlying shocks.

As in time series applications, panel tests for Granger non-causality investigate whether a series *x* Granger-causes a series *y*. This is the case if the knowledge of *x* up to *t*-1 helps to

predict the value of *y* in *t*. The idea of Granger-non-causality in panels traces back to Holtz-Eakin, Newey, and Rosen (1988). These authors introduce the concept of panel-vector-autoregressions and consider models of the form:

$$(1) \qquad y_{t,i} = \alpha_0 + \sum_{j=1}^{m} \alpha_j y_{i,t-1} + \sum_{j=1}^{m} \delta_j x_{i,t-1} + f_i + u_{it}$$

where $i = 1,\ldots,N$ denotes the number of cross-sections of the panel. By calculating first differences of the data, fixed effects can be eliminated:

$$(2) \qquad y_{i,t} - y_{i,t-1} = \sum_{j=1}^{m} \alpha_j (y_{i,t-1} - y_{i,t-j-1}) + \sum_{j=1}^{m} \delta_j (x_{i,t-1} - x_{i,t-j-1}) + (u_{it} - u_{i,t-1})$$

Within this model, *x* Granger-causes *y* if the joint hypothesis $\sum_{j=1}^{m} \delta_j = 0$ cannot be rejected. This assumes that the coefficients are equal across all cross-sections, i.e. that a stable causality pattern exists for the entire panel.

We use a panel data set of assets and liabilities that banks in country *i* hold in country *j* at time *t*. Time fixed effects are included to capture developments – such as changes in international interest rates and changes in the demand for capital worldwide – that affect banks in all countries alike. We also include a full set of quarterly dummies to pick up seasonal variation in our data.

Overall, our panel comprises ten reporting countries ($i = 10$), 30 recipient countries ($j = 30$)[6] ($N = 300$), and 35 time periods (1995:Q4 – 2004:Q2) ($t = 35$). The total number of observations is thus 10,500. Unlike in similar bilateral datasets,[7] we have very few missing entries. Only 72 of all observations for total assets and 90 observations for total liabilities are

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6 We exclude Turkey because of its high inflation and interest rate environment.

7 In the full matrix of bilateral international trade relationships, for instance, about one half of the observations are missing or zero entries.

zero, and the number of missing entries is 54. The reason for having such a relatively complete bilateral panel dataset is that we look at a set of developed countries, in particular with regard to the reporting countries, which maintain a close network of bilateral financial linkages.

Since we are using quarterly data over a relatively long time period of 10 years, the potential non-stationarity of the dependent variable is an issue. Results of unit root tests show, perhaps surprisingly, that our main dependent variables, the logs of bilateral assets and liabilities, are stationary (Table 4). The same holds for the explanatory variables except GDP.

Moreover, there are estimation problems since the residuals are by definition correlated with the endogenous variables. Hence an instrumental variable estimator is warranted. We proceed by estimating equation (2) using the generalized method of moments (GMM) estimator proposed by Blundell and Bond (1998) and a finite sample correction proposed by Windmeijer (2005). Estimation results are consistent if we use appropriate instruments for our lagged endogenous variable and if there is no higher-order autocorrelation. We perform tests on up to the order four serial correlations and on over-identifying restrictions to check the validity of our instruments. In most specifications, the first lag of the endogenous variable is highly significant. The test on over-identifying restrictions indicates validity of instruments, and there is no higher-order autocorrelation.

Results are reported in Table 5. In panel (a), changes in log gross and net foreign assets and liabilities are the dependent variables, in panel (b), changes in real interest rate differentials are the dependent variables. For each of the volume measures, we include a specification using data corrected for exchange rate changes and a specification for the uncorrected data. Results are fairly similar. In addition to tests for the validity of the instruments and for residual autocorrelation, we also include results of a test on the sum of lagged coefficients to

be zero. We include eight lags (corresponding to two years of observations) for each variable. Results are similar using four lags only.

Overall, results provide little evidence on causal linkages between changes in banks' cross border activities and real interest rate differentials. While the own lags are typically highly significant, the lagged interest rate differentials are insignificant for banks' foreign assets and liabilities. Similarly, changes in foreign liabilities and in net foreign assets have no impact on changes in the interest rate differential.

4.3 Robustness Tests

Our results suggest that real interest rate differentials and banks' foreign assets and liabilities are hardly linked. Given that arbitrage conditions on financial markets state that quantities should move in response to differences in the rates of return, this results is surprising. There are a couple of possible explanations for the 'missing link' between prices and quantities, and we check the relevance of some of these in this section. Results for the respective tests for Granger non-causality are not reported but are available upon request.[8]

First, the short-term interest rate that we have used so far might not be the appropriate proxy for rates of return that banks are facing. Moreover, by using the return differential, we have restricted the coefficients on domestic and foreign interest rates to be the same. Hence we have additionally split up the interest rate differential into the foreign and the domestic interest rate, and we have used domestic and foreign GDP growth as well as growth in the stock index as additional return proxies.

Results using GDP growth generally yield insignificant results. There are only two effects which are significant at the conventional levels. Higher net foreign assets have a negative

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[8] In (unreported) static regressions, we have also included proxies for the volatility of interest rates and inflation. These do not give a clear picture that would be in support of portfolio theories though.

impact of GDP growth in country *i*, and higher gross foreign assets have a negative impact on GDP growth in country *j*. Both of these effects are difficult to interpret and should in any case be interpreted with caution because the Hansen test is significant. In any event, they show that using an alternative return proxy does not change our main result of a 'missing link' between quantities and prices. Using the domestic and the foreign stock index gives similar results with the exception of a positive impact of gross and net foreign assets on the foreign stock index. Also, the only significant impact that we find when splitting up the interest rate differential is a negative impact of the foreign interest rate on foreign liabilities.

Second, we have split the sample into the Euro Area and the non-Euro Area. Results are similar – there is no significant impact of real interest rate differentials on cross-border assets and liabilities. When splitting the sample according to the distance between the reporting and the recipient country, we do find some differences though. In country pairs with a distance below the median distance of 2,196 km, we find a statistically significant negative impact of the real interest rate differential on foreign assets and a positive impact on foreign liabilities.

Finally, the size of the country could matter as it affects the ability of countries to affect the foreign interest rate. Hence we have estimated the response of banks' net foreign assets on real interest rate differentials dropping each of the reporting countries successively. The aim of this exercise is to test whether the presence of a particular reporting country affects the results. This is not the case.

5 Summary and Outlook

Using new data on bilateral assets and liabilities of banks of ten BIS reporting countries vis-à-vis the OECD area, this paper has focused on two questions. First, we have studied the heterogeneity of changes in cross-border assets and liabilities across countries, focusing in

particular on developments in the Euro Area. Second, we have explained the variation of banks' foreign activities both across time and across countries.

With regard to the first question of interest, we find that the share of the Euro Area countries in total foreign assets and liabilities has been fairly stable. The geographic and cultural distance between markets continues to shape investment positions to a significant degree. At the same time, there is evidence that foreign assets and liabilities *among* the Euro Area members have been above-average after the introduction of the Euro.

Our data also reveal a significant degree of heterogeneity across countries. In terms of the correlations with macroeconomic variables, we find similar patterns for banks' assets and liabilities as well as differences between countries inside and outside the Euro Area. Assets and liabilities held inside the Euro Area are also less volatile than those held outside.

As regards our ability to explain patterns of banks' foreign activities across countries and across time, we are clearly more successful in terms of the cross-country variation in the data. Even the relatively simple gravity-type model that we have used here, and which could certainly be augmented with additional explanatory variables, explains about two-thirds of the cross-country variation of banks' foreign assets and liabilities. Granger non-causality tests using dynamic panel models show that explaining the time series variation in banks' foreign activities is decidedly more difficult. At first sight, it seems surprising that changes in banks' foreign assets and liabilities and real interest rate differential are unrelated. There are a couple potential reasons for this.

First, we have ignored portfolio considerations in banks' investment choices. The dynamic panel models that we have estimated take into account domestic and foreign developments but – apart from including time fixed effects – ignore developments in third countries. If, however, banks optimize the international assets and liabilities using portfolio considerations, this empirical modeling strategy might be inadequate.

Second, our results suggest that banks determine their assets and liabilities simultaneously. At the same time, we expect changes in interest rates to have different effects on the borrowing and lending decisions of banks. A related issue is that our current empirical specification does not control for the underlying shock driving interest rates and that we have not disentangled changes in the demand and in the supply of foreign assets. Hence the inability of our present framework to disentangle the impact of asset and liability choices might be responsible for the missing link between quantities and prices. Taking portfolio considerations and modeling links between bank behavior and the macro-economy into account in more detail thus seems a promising route for future research.

Finally, our results show some stylized facts that models of international portfolio choices should match. Among these are the parallel movements of assets and liabilities and the differences in volatilities and in correlations with macroeconomic developments. Also, it would be interesting to explore whether our results for international bank assets match the stylized facts for other types of capital flows.

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7 Data Appendix

Cross-border assets and liabilities: Locational statistics of the BIS: Worldwide international on-balance sheet assets and liabilities of BIS reporting banks, covering international positions of banks' head offices in the source countries and all offices at home and abroad, in million U.S. dollar. The data are defined as in Tables 2A, 2B, 3A, 3B and 5A of the BIS Quarterly Review. Unpublished bilateral data have kindly been provided by the Statistics Department of the BIS.

Gross domestic product (GDP): Seasonally adjusted data as provided by the OECD, in million US dollar. Due to lack of availability or short length of the time-series, seasonally unadjusted data were used for Iceland, Luxemburg, Mexico, Poland, Sweden, Turkey, and Hong Kong, with this last GDP taken from national sources as reported by Datastream. These series are adjusted using quarterly dummies. Data for the Netherlands were taken from the International Financial Statistics (IMF 2006).

Prices: Represented by each country's consumer price index taken from Datastream, not seasonally adjusted.

Exchange rates: National currency against the US-Dollar, provided by Datastream. Exchange rates of members of the European Monetary Union are expressed in the former national currency versus the U.S. dollar by multiplying the exchange rate of the Euro versus the US-Dollar by the official conversion rate of the respective EMU member country.

Interest rates: For most countries, we use a monthly average of the three month interbank offered rate as reported by Datastream. We take 90-day certificates of deposits for Japan, Korea, and the U.S. and treasury bills with the same maturity for Australia, Canada, Hungary, Iceland, New Zealand, and, Sweden. The interest rate series for Luxemberg was taken from Belgium.

Stock Indices: Provided by Datastream. We take the following indices: All Ordinaries (Australia), ATX (Austria), BEL (Belgium), TSX (Canada), PX-50 (Czech Republic), KFX (Denmark), HEX (Finland), SBF (France), DAX (Germany), ATG (Greece), BUX (Hungary), ICEX (Iceland), Price Index of Ordinary Stocks & Shares (Ireland), MIB (Italy), TOPIX (Japan), KOSPI (Korea), IPC (Mexico), Amsterdam SE All Share (Netherlands), OSEBX (Norway), WIG (Poland), PSI (Portugal), SAX (Slovak Republic), Madrid General Index (Spain), Affarsvarlden Index (Sweden), ISE National (Turkey), FTSE All Share (U.K.), Dow Jones Industrial Average (U.S.), and Hang Seng (Hong Kong); due to limited data availability, we assigned Belgium and Australian stock market data to Luxemburg and New Zealand, respectively.

Table 1: Descriptive Statistics

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Log foreign assets	10,023	8.04	2.29	-0.08	13.03
Log foreign liabilities	10,006	7.49	2.52	-0.22	12.79
Log net foreign assets	10,017	2.94	7.07	-11.27	12.87
Log foreign assets (constant USD)	8,017	7.99	2.35	-0.07	13.04
Log foreign liabilities (constant USD)	8,000	7.43	2.56	-0.21	12.79
Log net foreign assets (constant USD)	8,023	2.82	7.15	-11.43	12.88
Domestic interest rate	10150	3.44	2.03	0.03	10.69
Foreign interest rate	10,150	6.06	5.40	0.03	48.01
Domestic inflation	8,990	1.43	1.62	-4.98	6.07
Foreign inflation	8,990	3.15	3.59	-4.98	28.13
Log domestic GDP	10,150	12.61	1.59	10.43	15.63
Log foreign GDP	10,050	11.08	1.90	6.75	15.63
Log distance	10,150	7.90	1.25	5.15	9.86

Table 2: Correlation Matrix

This Table reports correlations of gross foreign assets, gross foreign liabilities and net foreign assets with our explanatory variables. The total number of observations is about 5,000. ***, **, * = significant at the 1%, 5%, 10%-level.

(a) Levels

	Gross foreign assets	Gross foreign liabilities	Net foreign assets
		Non Euro Area	
Domestic GDP	-0.0227	-0.0474***	0.0143
Foreign GDP	0.5371***	0.4686***	0.3853***
Domestic Inflation	0.0336**	0.1242***	-0.0791***
Foreign Inflation	-0.1418***	-0.1752***	-0.0454***
Domestic Interest Rates	-0.0693***	-0.0456***	-0.0658***
Foreign Interest Rates	-0.1114***	-0.1087***	-0.0672***
Exchange rate versus US$	0.0891***	-0.0174	0.1698***
		Euro Area	
Domestic GDP	0.2272***	0.1751***	0.1430***
Foreign GDP	0.2371***	0.1843***	0.1461***
Domestic Inflation	-0.1451***	-0.1091***	-0.0985***
Foreign Inflation	-0.1376***	-0.1460***	-0.0076
Domestic Interest Rates	-0.007	0.0139	-0.0434***
Foreign Interest Rates	-0.1662***	-0.1253***	-0.1121***
Exchange rate versus US$	-0.1652***	-0.1119***	-0.1349***

(b) First Differences

	Gross foreign assets	Gross foreign liabilities	Net foreign assets
		Non Euro Area	
Domestic GDP	0.0645***	0.0192	0.0225
Foreign GDP	0.0232	0.03**	0.011
Domestic Inflation	-0.0135	0.0462***	-0.0397***
Foreign Inflation	-0.0104	0.0065*	-0.0312**
Domestic Interest Rates	0.0073	-0.0549**	0.0282*
Foreign Interest Rates	0.009	0.0332**	0.0113
Exchange rate versus US$	-0.0487***	-0.0164	-0.0175
		Euro Area	
Domestic GDP	0.0952***	0.0311*	0.0133
Foreign GDP	0.0701***	0.0183	0.0118
Domestic Inflation	-0.0611***	-0.0470*	0.0035
Foreign Inflation	-0.0107	-0.0319*	0.021
Domestic Interest Rates	0.024	0.0144	-0.0019
Foreign Interest Rates	-0.001	-0.0078	-0.0013
Exchange rate versus US$	-0.1031***	-0.0471***	-0.0097

Table 3: Results of Cross-Section Regressions

This Table reports results of cross-section regressions for the log of cross-border assets and liabilities of banks. The data are pooled across reporting countries. A full set of source and host country dummies is included in all regressions. Robust t-values in brackets. ***, **, * = significant at the 1%, 5%, 10%-level.

(a) Cross-border assets

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Domestic GDP	0.395***	0.349***	0.192***	0.323***	0.358***	0.264***	0.586***	0.481***	0.299***
	[5.84]	[9.39]	[3.76]	[6.77]	[7.34]	[3.88]	[9.66]	[9.08]	[4.49]
Foreign GDP	0.522***	0.451***	0.371***	0.427***	0.771***	1.080***	0.635***	0.832***	0.716***
	[12.99]	[7.83]	[4.45]	[7.34]	[16.43]	[20.27]	[9.36]	[15.86]	[17.17]
Domestic interest rate	-0.285***	-0.099*	-0.307***	-0.086*	-0.050	-0.116	0.665***	0.705***	0.398***
	[5.19]	[1.72]	[4.12]	[1.90]	[0.91]	[0.83]	[9.11]	[6.78]	[3.31]
Foreign interest rate	-0.644***	-0.273***	-0.135***	-0.039	0.179***	-0.065	-0.400***	0.236***	0.088***
	[10.59]	[7.61]	[5.37]	[0.59]	[7.90]	[1.06]	[5.60]	[5.87]	[2.89]
Domestic inflation	0.466***	0.165	1.185***	-0.038	-0.059	-0.009	-0.064	-0.188	-0.374*
	[2.77]	[1.54]	[7.79]	[0.54]	[0.81]	[0.10]	[0.64]	[1.57]	[1.96]
Foreign inflation	0.969***	0.194***	0.092***	0.006	-0.256***	0.107	0.398***	-0.430***	-0.585***
	[10.46]	[7.09]	[4.23]	[0.09]	[8.13]	[1.44]	[5.24]	[7.51]	[7.50]
Distance	-0.695***	-0.729***	-0.742***	-0.759***	-0.760***	-0.756***	-0.717***	-0.701***	-0.461***
	[6.69]	[6.81]	[6.89]	[6.69]	[6.55]	[6.82]	[6.49]	[6.93]	[5.19]
Common language	0.369**	0.194	0.206	0.200	0.206	0.188	0.189	0.169	0.345**
	[2.23]	[1.20]	[1.23]	[1.13]	[1.09]	[0.98]	[0.98]	[0.93]	[1.98]
Both EU members	0.022	-0.283	-0.399	-0.560**	-0.756**	-0.928***	-0.848***	-0.639**	1.177***
	[0.09]	[1.17]	[1.60]	[2.06]	[2.49]	[3.05]	[2.79]	[2.28]	[4.08]
Both Euro Area members	-0.012	0.251	0.322	0.539**	0.678***	0.911***	0.874***	0.876***	0.016
	[0.06]	[1.21]	[1.51]	[2.42]	[2.89]	[3.94]	[3.91]	[4.11]	[0.07]
Constant	3.865***	5.491***	8.378***	6.130***	-0.903	-4.578***	-2.492**	-3.541***	0.616
	[3.44]	[5.25]	[6.99]	[5.41]	[0.78]	[3.19]	[2.14]	[3.33]	[0.37]
Observations	275	296	296	298	298	299	299	297	297
R-squared	0.88	0.89	0.89	0.87	0.85	0.85	0.83	0.84	0.86

(b) Cross-border liabilities

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Domestic GDP	0.223**	0.299***	0.118*	0.399***	0.387***	0.546***	0.138**	0.022	0.254***
	[2.24]	[5.73]	[1.78]	[7.01]	[7.62]	[9.12]	[2.02]	[0.30]	[3.28]
Foreign GDP	0.517***	0.354***	0.213**	0.393***	0.686***	1.025***	0.812***	0.795***	0.632***
	[16.15]	[6.13]	[2.22]	[7.50]	[17.12]	[17.96]	[15.08]	[18.49]	[14.66]
Domestic interest rate	-0.168**	0.147**	0.206**	0.201***	0.167***	0.466***	0.336***	0.152	0.206
	[2.43]	[2.28]	[2.21]	[3.63]	[3.01]	[3.47]	[4.19]	[1.26]	[1.62]
Foreign interest rate	-0.563***	-0.304***	-0.214***	0.043	0.238***	-0.011	-0.209***	0.305***	0.080**
	[10.61]	[10.13]	[4.65]	[0.62]	[8.66]	[0.21]	[2.86]	[7.07]	[2.55]
Domestic inflation	0.152	-0.204	0.173	0.118	0.069	-0.083	0.371***	0.555***	0.678***
	[0.65]	[1.49]	[0.98]	[1.36]	[1.01]	[0.89]	[3.57]	[4.02]	[3.46]
Foreign inflation	0.835***	0.205***	0.147***	-0.107	-0.373***	0.017	0.194**	-0.617***	-0.873***
	[10.53]	[8.61]	[3.54]	[1.48]	[10.13]	[0.26]	[2.48]	[9.54]	[10.10]
Distance	-0.683***	-0.638***	-0.725***	-0.788***	-0.757***	-0.737***	-0.734***	-0.654***	-0.458***
	[4.99]	[4.68]	[5.02]	[5.56]	[6.22]	[6.55]	[6.26]	[5.53]	[3.54]
Common language	0.366*	0.326*	0.222	0.169	0.162	0.208	0.196	0.232	0.372**
	[1.89]	[1.77]	[1.16]	[0.89]	[0.97]	[1.27]	[1.19]	[1.39]	[2.12]
Both EU members	-0.314	-0.240	-0.258	-0.338	-0.397	-0.151	0.233	0.196	1.243***
	[0.97]	[0.80]	[0.76]	[0.96]	[1.40]	[0.55]	[0.84]	[0.70]	[4.38]
Both Euro Area members	0.019	0.202	0.394	0.565**	0.885***	0.786***	0.529**	0.595**	0.218
	[0.07]	[0.82]	[1.47]	[2.00]	[3.72]	[3.36]	[2.18]	[2.47]	[0.94]
Constant	5.885***	7.223***	11.152***	4.201***	-1.224	-9.757***	1.166	3.410***	2.060
	[4.41]	[7.28]	[9.24]	[4.46]	[1.17]	[7.16]	[1.05]	[2.67]	[0.94]
Observations	275	296	295	298	298	299	298	297	297
R-squared	0.85	0.86	0.85	0.86	0.88	0.88	0.88	0.88	0.88

(c) Net Foreign Assets

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Domestic GDP	0.790	0.327	0.027	-0.283	-0.084	-1.037**	1.565***	1.580***	0.292
	[1.38]	[1.13]	[0.07]	[0.81]	[0.26]	[2.45]	[3.91]	[4.44]	[1.26]
Foreign GDP	0.442	1.364***	1.887***	0.959*	1.218***	0.130	-0.094	1.271***	1.759***
	[0.79]	[2.61]	[3.03]	[1.71]	[2.69]	[0.27]	[0.18]	[3.17]	[3.48]
Domestic interest rate	-0.767***	-1.640***	-2.657***	-1.157***	-0.742***	-1.739***	1.711***	2.283***	1.836**
	[3.27]	[4.74]	[4.64]	[4.09]	[2.85]	[2.63]	[3.10]	[3.03]	[2.56]
Foreign interest rate	-0.696*	0.598***	-0.030	-0.567	-0.447***	-0.319	-1.017***	-0.577***	0.142
	[1.80]	[3.11]	[0.20]	[1.07]	[2.85]	[1.24]	[3.24]	[2.87]	[1.05]
Domestic inflation	1.378	2.062***	6.102***	-0.751**	-0.563**	0.135	-1.478***	-2.511***	-4.823***
	[1.55]	[3.49]	[4.75]	[2.56]	[2.20]	[0.36]	[3.31]	[4.18]	[4.73]
Foreign inflation	1.041*	-0.380***	0.082	0.727	0.769***	0.482	1.094***	1.311***	1.380***
	[1.79]	[2.78]	[0.68]	[1.32]	[3.36]	[1.60]	[3.43]	[3.97]	[3.00]
Distance	-0.951	-1.386***	-0.986	-0.045	0.375	0.559	0.439	0.010	0.551
	[1.48]	[2.61]	[1.51]	[0.06]	[0.51]	[0.84]	[0.67]	[0.02]	[0.74]
Common language	1.782	1.157	0.837	1.593	1.003	0.527	0.781	-0.944	-0.902
	[1.23]	[0.88]	[0.59]	[1.12]	[0.70]	[0.37]	[0.59]	[0.71]	[0.70]
Both EU members	1.395	0.331	1.095	-1.040	0.433	-0.077	0.251	-0.283	2.388
	[0.70]	[0.18]	[0.55]	[0.53]	[0.22]	[0.04]	[0.13]	[0.14]	[1.26]
Both Euro Area members	0.802	1.349	0.223	1.994	0.432	1.647	0.400	0.946	-0.368
	[0.38]	[0.71]	[0.12]	[1.11]	[0.23]	[0.86]	[0.23]	[0.49]	[0.22]
Constant	-3.410	-16.895*	-14.143	-2.759	-14.404*	14.169	-22.338**	-42.192***	-33.505***
	[0.28]	[1.66]	[1.24]	[0.30]	[1.73]	[1.51]	[2.46]	[5.50]	[3.02]
Observations	275	296	296	297	298	299	299	297	297
R-squared	0.50	0.49	0.39	0.45	0.44	0.47	0.47	0.47	0.42

Table 4: Panel Unit Root Tests

This Table reports the test statistics of panel unit root tests based on Levin, Lin, and Chu (2002), Breitung (2002), and Im, Pesaran, and Shin (2003). The Null-Hypothesis is that the series contain a unit root. The maximum lag length was set at 8 quarters, basing the automatic lag selection on the SIC criterion. Newey-West bandwidth selection uses a Bartlett kernel. Foreign assets (FA) and liabilities (FL) are not corrected for exchange rate changes. NFA = net foreign assets. Interest rates = short-term interest rates. Foreign assets, foreign liabilities, and GDP are in logs. *** = significant at the 1%-level.

(a) Levels

Variable	Observations	Cross sections	Levin, Lin, Chu	Breitung	Im, Pesaran, Shin
Foreign assets	9,932	299	-169.21***	-3.32***	-25.61***
Foreign liabilities	9,891	298	-15.38***	-4.62***	-15.34***
Net foreign assets	9,761	298	-14.21***	-4.93***	-18.34***
Domestic GDP	9,840	300	4.18	14.62	6.28
Foreign GDP	9,802	300	6.08	15.25	14.70
Domestic interest rate	9,930	300	-3.19***	-7.25***	-3.67
Foreign interest rates	9,809	300	-2.59***	-7.76***	-9.11***
Domestic inflation	8,580	300	-1.21	-9.47***	-8.65***
Foreign inflation	8,534	300	4.05	-1.64*	-5.93***
Real interest rate differential	8,703	300	-4.64***	-2.76*	-12.59***

(b) First Differences

Variable	Observations	Cross sections	Levin, Lin, Chu	Breitung	Im, Pesaran, Shin
Foreign assets	9,614	299	-117.17***	-45.27***	-92.63***
Foreign liabilities	9,572	298	-93.34***	-50.10***	-99.99***
Net foreign assets	9,385	298	-78.91***	-32.31***	-91.67***
Domestic GDP	9,690	300	-64.77***	-13.15***	-73.50***
Foreign GDP	9,697	300	-85.35***	-18.01***	-89.74***
Domestic interest rate	9,870	300	-37.51***	-30.63***	-47.68***
Foreign interest rates	9,781	300	-32.05***	-27.21***	-45.63***
Domestic inflation	8,490	300	-31.09***	-20.95***	-51.54***
Foreign inflation	8,277	300	-20.38***	-31.69***	-48.17***

Table 5: Tests for Granger Non-Causality

The dependent variable are log foreign assets (FA), foreign liabilities (FL), and net foreign asset holdings (NFA) of country *i* in country *j* in Panel (a) and the real interest differential between country *i* and country *j* in Panel (b). The real interest rate differential (domestic – foreign real interest rate) has been calculated using the short-term interest rate minus the contemporaneous inflation rate in country *i* and *j*, respectively. Data are from the BIS locational banking statistics for all source countries for the years 1995-2004. Results are based on GMM estimations with Windmeijer's (2005) corrected t-statistics. * significant at the 10%-, ** significant at the 5%-, *** significant at the 1%-level. Absolute t-values are reported in brackets.

a) Dependent Variables: Gross and Net Foreign Assets and Liabilities

	FA adjusted	FA not adjusted	FL adjusted	FL not adjusted	NFA adjusted	NFA not adjusted
$\Delta Y_{ij,t-1}$	-0.226***	-0.208***	-0.444***	-0.437***	-0.352***	-0.401***
	[5.53]	[6.32]	[12.86]	[13.33]	[9.19]	[12.85]
$\Delta Y_{ij,t-2}$	-0.014	-0.032	-0.178***	-0.176***	-0.152***	-0.178***
	[0.45]	[1.31]	[5.37]	[5.88]	[4.23]	[5.45]
$\Delta Y_{ij,t-3}$	-0.022	-0.030	-0.096***	-0.103***	-0.045	-0.059**
	[0.77]	[1.29]	[2.71]	[2.91]	[1.54]	[2.25]
$\Delta Y_{ij,t-4}$	0.057*	0.064**	-0.026	-0.007	-0.051*	-0.001
	[1.89]	[2.43]	[0.92]	[0.26]	[1.83]	[0.05]
$\Delta Y_{ij,t-5}$	0.041	0.016	-0.020	-0.017	0.000	0.007
	[1.23]	[0.62]	[0.79]	[0.68]	[0.01]	[0.27]
$\Delta Y_{ij,t-6}$	0.035	0.022	-0.040	-0.045*	0.002	0.018
	[1.13]	[0.83]	[1.50]	[1.88]	[0.07]	[0.81]
$\Delta Y_{ij,t-7}$	0.013	0.007	-0.056*	-0.049*	-0.005	-0.005
	[0.43]	[0.30]	[1.75]	[1.74]	[0.23]	[0.26]
$\Delta Y_{ij,t-8}$	0.069**	0.044*	-0.016	-0.014	-0.018	0.004
	[2.26]	[1.79]	[0.50]	[0.48]	[0.86]	[0.19]
$\Delta (r_{i,t-1}-r_{j,t-1})$	-0.006	-0.005	-0.000	-0.002	-0.007	-0.005
	[1.37]	[1.35]	[0.06]	[0.32]	[0.23]	[0.20]
$\Delta (r_{i,t-2}-r_{j,t-2})$	-0.000	-0.002	0.007*	0.008**	0.001	-0.003
	[0.04]	[1.19]	[1.92]	[2.16]	[0.07]	[0.21]
$\Delta (r_{i,t-3}-r_{j,t-3})$	0.001	-0.000	0.008*	0.007*	-0.008	-0.009
	[0.29]	[0.07]	[1.90]	[1.77]	[0.44]	[0.53]
$\Delta (r_{i,t-4}-r_{j,t-4})$	-0.001	-0.003	-0.003	-0.003	-0.002	-0.006
	[0.51]	[1.60]	[0.77]	[0.95]	[0.14]	[0.33]
$\Delta (r_{i,t-5}-r_{j,t-5})$	0.004	0.001	-0.004	-0.002	0.020	0.020
	[1.46]	[0.51]	[1.11]	[0.58]	[1.13]	[1.13]
$\Delta (r_{i,t-6}-r_{j,t-6})$	-0.000	-0.002	0.000	0.003	0.031*	0.028
	[0.03]	[0.80]	[0.09]	[0.69]	[1.65]	[1.33]
$\Delta (r_{i,t-7}-r_{j,t-7})$	-0.000	0.001	0.002	0.003	0.005	-0.002
	[0.20]	[0.65]	[0.42]	[0.90]	[0.29]	[0.15]
$\Delta (r_{i,t-8}-r_{j,t-8})$	-0.003	-0.004**	0.002	-0.000	0.004	0.011
	[1.18]	[2.14]	[0.53]	[0.09]	[0.27]	[0.78]
Euroland	0.010	0.016***	0.018	0.014	0.100	0.095
	[1.47]	[2.72]	[1.60]	[1.44]	[1.04]	[1.25]

Table 5a continues …

Table 5a continued:

Sum of coefficients:						
$\sum_{m=1}^{8}\beta_m \Delta Y_{ij,t-m}$	-0.47	-0.11	-0.87***	-0.84***	-0.62***	-0.61***
	[0.35]	[1.12]	[6.81]	[6.51]	[4.78]	[5.42]
$\sum_{m=1}^{8}\beta_m \Delta\left(r_{i,t-m} - r_{j,t-m}\right)$	-0.005	-0.13	0.01	0.01	0.04	0.03
	[0.44]	[1.23]	[0.65]	[0.83]	[0.49]	[0.39]
Constant	0.015	-0.001	0.007	-0.014	0.114	-0.047
	[0.92]	[0.15]	[0.33]	[0.83]	[0.75]	[0.41]
Number of observations	4.994	6.260	4.986	6.252	5.014	6.215
Number of groups	231	289	230	288	231	289
Number of instruments	64	64	64	64	64	64
Hansen	0.11	0.21	0.11	0.04	0.21	0.18
AR(1)	0.00	0.00	0.00	0.00	0.00	0.00
AR(2)	0.45	0.32	0.45	0.53	0.40	0.51
AR(3)	0.88	0.61	0.98	0.78	0.61	0.63
AR(4)	0.87	0.35	0.56	0.42	0.66	0.52

b) Dependent Variables: Real Interest Rate Differential

	FA adjusted	FA not adjusted	FL adjusted	FL not adjusted	NFA adjusted	NFA not adjusted
$\Delta Y_{ij,t-1}$	-0.448	-0.736	0.11	-0.353	0.03	0.099
	[0.52]	[0.77]	[0.34]	[0.75]	[0.40]	[1.24]
$\Delta Y_{ij,t-2}$	-0.766	-1.276	0.227	0.29	0.028	0.004
	[0.84]	[1.30]	[0.38]	[0.48]	[0.38]	[0.05]
$\Delta Y_{ij,t-3}$	-0.55	-1.683	-0.506	0.088	-0.026	0.051
	[0.62]	[1.22]	[0.78]	[0.15]	[0.34]	[0.54]
$\Delta Y_{ij,t-4}$	-0.917	-0.928	-1.456***	-1.137*	-0.013	0.093
	[1.28]	[0.80]	[3.06]	[1.83]	[0.21]	[1.01]
$\Delta Y_{ij,t-5}$	0.845	0.302	-0.83	-0.837	0.009	0.009
	[0.85]	[0.27]	[1.60]	[0.98]	[0.11]	[0.14]
$\Delta Y_{ij,t-6}$	-0.437	-0.202	-0.875*	-0.612	0.016	0.052
	[0.57]	[0.24]	[1.70]	[0.72]	[0.18]	[0.60]
$\Delta Y_{ij,t-7}$	-0.026	-0.26	-0.851**	-0.597	-0.006	0.017
	[0.03]	[0.30]	[2.02]	[1.09]	[0.07]	[0.11]
$\Delta Y_{ij,t-8}$	-0.089	-0.262	-0.01	-0.199	-0.002	0.012
	[0.15]	[0.56]	[0.04]	[1.03]	[0.11]	[0.62]
$\Delta (r_{i,t-1}-r_{j,t-1})$	-0.177	-0.23	-0.326**	-0.252	-0.194	-0.171
	[0.70]	[0.84]	[2.28]	[1.14]	[1.45]	[0.97]
$\Delta (r_{i,t-2}-r_{j,t-2})$	-0.268	-0.357*	0.003	0.057	0.099	0.146
	[1.61]	[1.88]	[0.01]	[0.30]	[0.44]	[1.01]
$\Delta (r_{i,t-3}-r_{j,t-3})$	-0.209	-0.405**	-0.361**	-0.413**	-0.2	-0.236*
	[1.09]	[2.03]	[2.38]	[2.16]	[1.09]	[1.80]
$\Delta (r_{i,t-4}-r_{j,t-4})$	-0.158	-0.172	-0.208*	-0.179	-0.119	-0.105
	[1.04]	[0.77]	[1.80]	[1.24]	[0.67]	[0.93]
$\Delta (r_{i,t-5}-r_{j,t-5})$	-0.027	-0.022	0.112	0.099	0.068	0.102
	[0.29]	[0.26]	[1.01]	[1.29]	[0.58]	[1.19]
$\Delta (r_{i,t-6}-r_{j,t-6})$	0.097	-0.028	0.025	-0.044	0.083	0.046
	[0.50]	[0.19]	[0.29]	[0.43]	[0.50]	[0.37]
$\Delta (r_{i,t-7}-r_{j,t-7})$	0.278**	0.340***	0.144*	0.168*	0.220*	0.232**
	[2.17]	[3.32]	[1.84]	[1.75]	[1.86]	[2.48]
$\Delta (r_{i,t-8}-r_{j,t-8})$	0.002	0.089	-0.015	0.082	-0.033	0.029
	[0.01]	[0.79]	[0.17]	[1.17]	[0.33]	[0.30]
Euroland	0.03	0.054	0.056	0	-0.048	-0.084
	[0.32]	[0.65]	[0.82]	[0.01]	[1.30]	[1.49]
Sum of coefficients:						
$\sum_{m=1}^{8}\beta_m \Delta Y_{ij,t-m}$	-2.39	-5.04	0.09	-3.35	0.03	0.34
	[0.60]	[1.21]	[0.04]	[1.25]	[0.12]	[0.86]
$\sum_{m=1}^{8}\beta_m \Delta\left(r_{i,t-m}-r_{j,t-m}\right)$	-0.46	-0.78	-0.62	-0.48	-0.07	0.04
	[0.56]	[0.90]	[1.12]	[0.57]	[0.07]	[0.07]
Constant	0.057	0.226	0.317**	0.107	0.001	0.095
	[0.37]	[0.98]	[2.50]	[0.70]	[0.01]	[0.76]
Number of instruments	48	48	48	48	48	48
Number of observations	4,999	6,265	4,990	6,256	5,018	6,222
Number of groups	231	289	230	288	231	289
Hansen test	0.04	0.05	0.09	0.01	0.00	0.00
AR(1)	0.12	0.22	0.04	0.11	0.01	0.07
AR(2)	0.61	0.84	0.17	0.10	0.13	0.42
AR(3)	0.74	0.08	0.06	0.01	0.05	0.06
AR(4)	0.17	0.08	0.08	0.08	0.12	0.02

Figure 1: Currency Decomposition of Cross-Border Assets and Liabilities

Percentage share of assets (top panel) and liabilities (bottom panel) held in Euro and the US-Dollar of total assets and liabilities of reporting countries. Other currencies are combined. CHE = Switzerland, DEU = Germany, FRA = France, JPN = Japan, NLD = Netherlands, USA = United States.

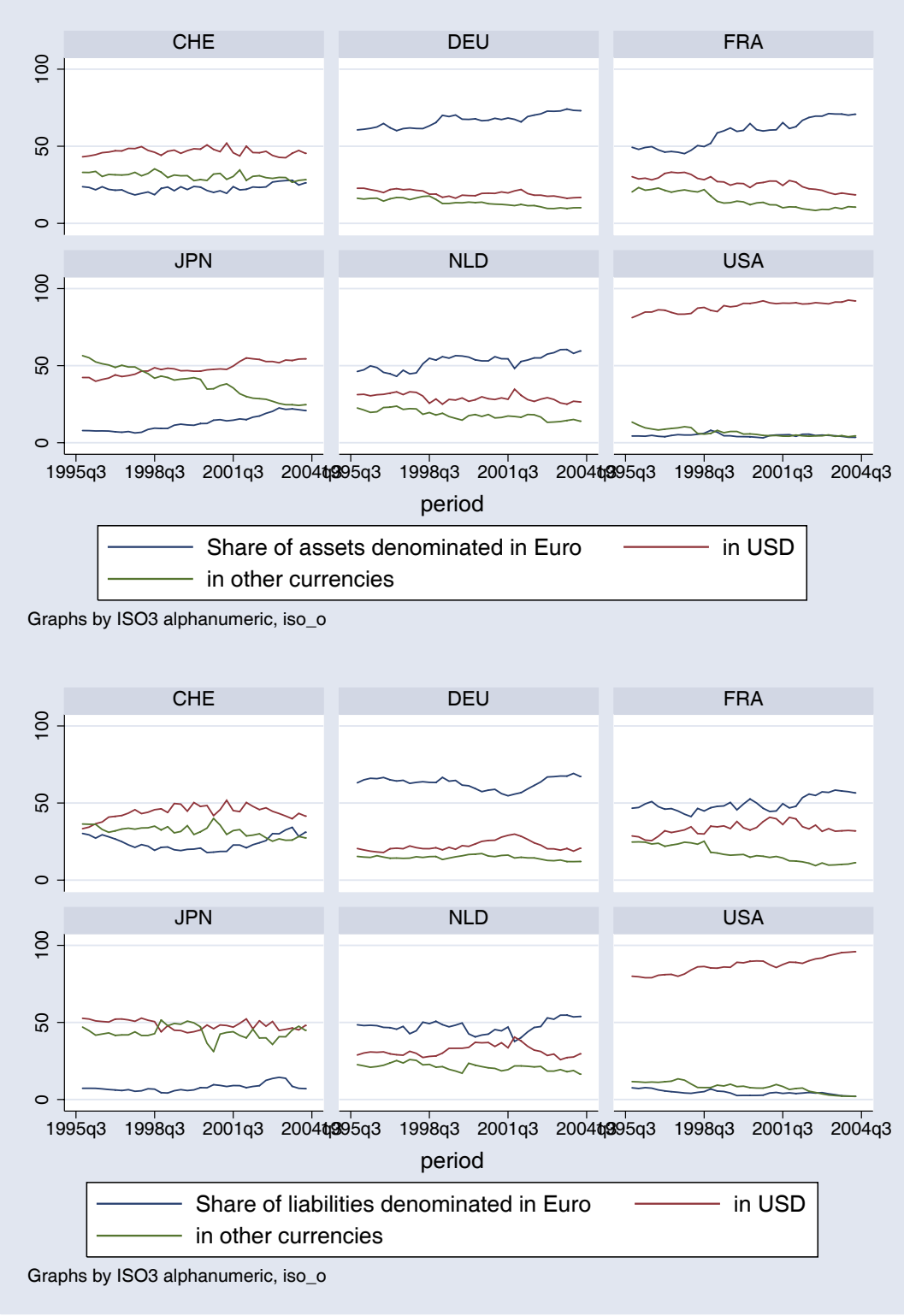

Figure 2: Valuation Effects

Comparison of assets (top panel) and liabilities (bottom panel) of reporting countries and a constructed series adjusted for valuation changes due to movements of the US-Dollar with other currencies (see main text for more details). Both series are means over the entire sample period for each country. CHE = Switzerland, DEU = Germany, FRA = France, JPN = Japan, NLD = Netherlands.

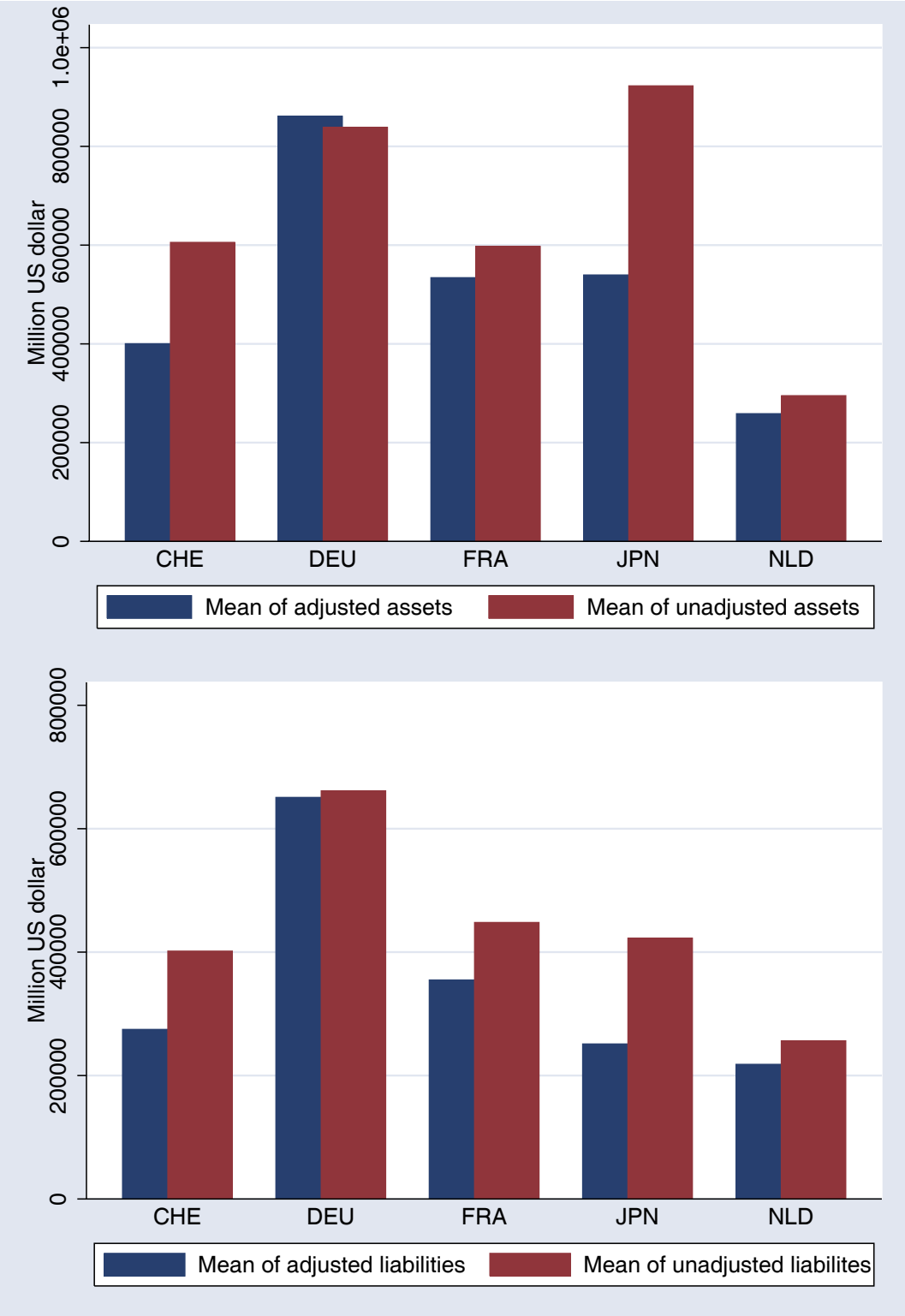

Figure 3: Share of Cross-Border Assets and Liabilities Held in the Euro Area

Percentage share of assets and liabilities held in the Euro Area in percent of total assets and liabilities of each reporting country. CHE = Switzerland, DEU = Germany, FRA = France, GBR = United Kingdom, JPN = Japan, NLD = Netherlands, USA = United States.

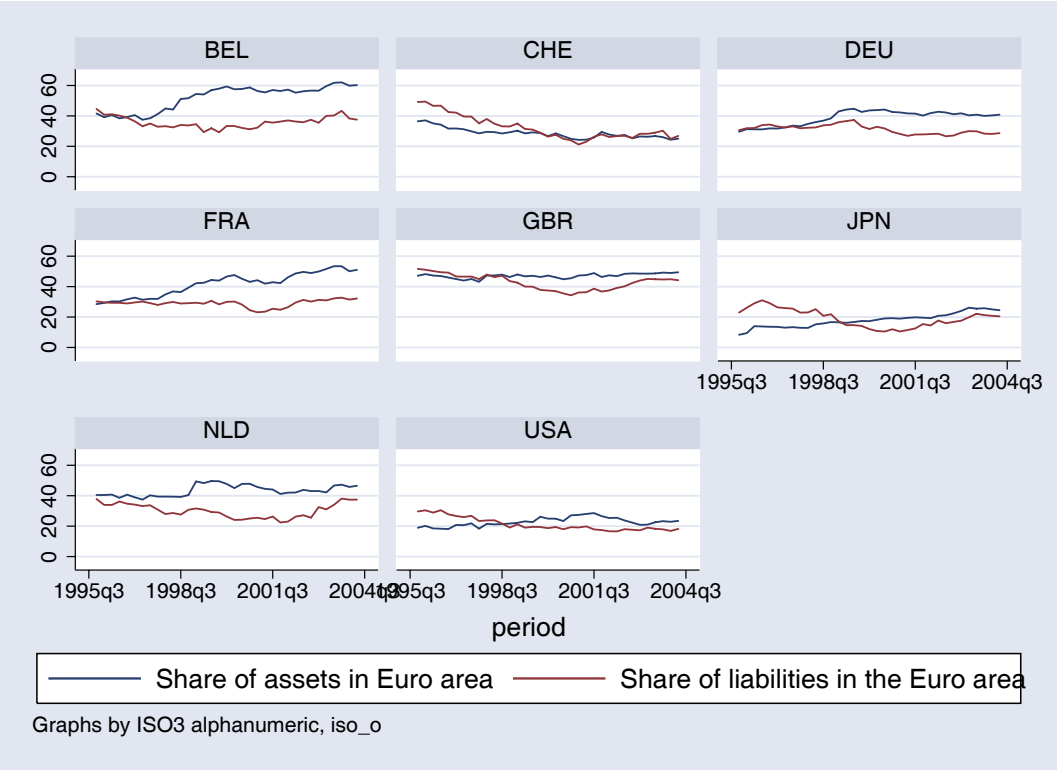

Figure 4: Coefficients of Variation

Coefficients of variation calculated as the ratio of the standard deviation to the mean of bilateral holdings of assets and liabilities for each reporting country vis-à-vis member countries of Euro Area (top panel) and vis-à-vis non Euro Area countries (bottom panel). CHE = Switzerland, DEU = Germany, FRA = France, GBR = United Kingdom, JPN = Japan, NLD = Netherlands, USA = United States.