Preliminary Draft

Long-Term Capital Movements*

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Abstract

International financial integration allows countries to become net creditors or net debtors with respect to the rest of the world. In this paper, we show that a small set of fundamentals--shifts in relative output levels, the stock of public debt and demographic factors--can do much to explain the evolution of net foreign asset positions. In addition, we highlight that "external wealth" plays a critical role in determining the behavior of the trade balance, both through shifts in the desired net foreign asset position and the investment returns generated on the outstanding stock of net foreign assets. Finally, we provide some evidence that a "portfolio balance" effect exists: real interest rate differentials are inversely related to net foreign asset positions.

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1. Introduction

The global integration of capital markets has been one of the biggest stories in the world economy in recent decades. International asset trade offers several potential benefits. Countries can share risks via international portfolio diversification; the efficient allocation of capital to the most productive locations is promoted; and consumption can be smoothed across time periods in response to cyclical and persistent shifts in macroeconomic fundamentals. While risk-sharing may be largely accomplished through gross international asset trade, net trade will typically be required for the latter two functions.

With respect to net asset trade, much of the empirical literature to date has focused (explicitly or implicitly) on the behavior of short-term net capital flows. This work has addressed the magnitude of net capital flows, as in the literature that followed the original Feldstein and Horioka (1980) article on the correlation between domestic saving and domestic investment. It has also investigated whether short-term net capital flows respond to cyclical macroeconomic shocks according to theory, most prominently in the literature that has tested "present value" models of the current account.[1]

In this paper, we shift the emphasis away from short-term net capital flows. We argue that much can be learned by studying the accumulated stocks of foreign assets and liabilities held by different countries. Our argument is based on a number of considerations. First, international macroeconomic theory suggests that a host of long-term fundamentals can lead to countries becoming persistent international net creditors or international net debtors. Such long-term factors can be missed if emphasis is exclusively placed on current account imbalances, even using long spans of data: for instance, a country may run persistent current account deficits but still be reducing its external liabilities relative to GDP. Second, if long-term factors are important in determining net foreign asset positions, short-term flows cannot be properly understood unless the constraints imposed by long-run equilibrium conditions are explicitly taken into account. If one observes a country running a current account deficit, the interpretation of this situation crucially depends on whether the current account deficit is moving the country towards or away from its desired long-run net foreign asset position.

Third, economic theory typically makes stronger predictions about long-run equilibrium relationships than about short-run dynamics (Pesaran 1997). For instance, as will be explored further below, there is a well-grounded hypothesis that the stock of net foreign assets, all else equal, is inversely related to the stock of government debt. However, the relation between the current account and the government deficit is more fragile, depending on the exact nature of shocks hitting the external and government accounts in a given period. In terms of research strategy, it may be more fruitful to first uncover the long-run relations in the data than to just examine short-run correlations.

[1] See Obstfeld and Rogoff (1996) and Bergin (2000).

Why then has little attention been devoted to studying such longer-run issues? Paucity of data on foreign asset and liability stocks has been a traditional barrier to research on net foreign asset positions. Only a few countries published reliable estimates of accumulated stocks, whereas current account data have been much more widely available. In recent years, the availability of stock data has been much improved. Since April 1998, the International Monetary Fund's *International Financial Statistics* (IFS) and *Balance of Payments Statistics* (BOPS) have reported data on international investment positions for a broader range of countries. However, only a few developing countries are represented and the data do not extend back very far for most countries. In addition, these data are based on national sources that employ a variety of different methodologies in calculating the value of foreign asset and liability stocks. In Lane and Milesi-Ferretti (1999), we have employed a uniform methodology to generate estimates of foreign asset and liability positions for a large number of industrial and developing countries and it is this data set that enables us to analyze the behavior of net foreign asset positions in a more comprehensive manner than in the efforts of previous researchers.

In this paper, we address three questions about net foreign asset positions. First, we try to explain their behavior, across countries and over time: what determines why some countries are net creditors and others net debtors? And why some creditor countries turn into debtors, such as the United States, and vice-versa, like Singapore? Identifying the macroeconomic forces underlying the endogenous determination of net foreign asset positions provides insight into the role played by international financial integration in allowing countries to de-link national production and consumption.

Second, we identify two mechanisms that link trade balances to net foreign asset positions. One key channel is that changes in the desired long-run net foreign asset position are an important force driving the current account. The other is that the trade imbalance required to achieve a given change in the net foreign asset position depends on the total investment returns earned and paid out on the outstanding stocks of foreign assets and liabilities. For a given desired net foreign asset position, a country that enjoys high returns on its foreign assets and pays out low returns on its foreign liabilities can afford to run a smaller trade surplus (or larger trade deficit). In this way, we highlight the role of a state variable (the net foreign asset position) in driving new capital flows (the trade balance). The corollary is that one cannot properly understand short-term capital flows in the absence of a model of the determination of long-run net foreign asset positions and an appreciation of the role played by investment income and capital gains/losses in determining the dynamics of the trade balance.

Third, we explore the relation between net foreign asset positions and the real interest rate differential. This is an old question in the "portfolio balance" literature: do debtor countries pay a risk premium? The traditional literature attempted to link currency return differentials to outstanding relative stocks of national monies but much less research has been directed at linking differences in real interest rates across countries to long-run net foreign asset positions (Dooley and Isard 1991, Frankel and Rose 1995).

In addressing these questions, our goal is to empirically highlight the central role played by accumulated and desired net foreign asset positions in driving international capital movements and international asset prices. Given the space limitations, there are many interesting questions concerning foreign asset and liability positions that we cannot address in this paper. In other work, we have shown that net foreign asset positions exert an important influence on the long-run behavior of real exchange rates (Lane and Milesi-Ferretti 2000a) and made an initial exploration of the determinants of the structure of the "international balance sheet" between debt, portfolio equity and foreign direct investment (Lane and Milesi-Ferretti 2000b). An important issue that we must defer to future research is the role played by the level and composition of the external balance sheet in determining the probability of a national financial crisis and the effects of such a crisis on the local and international economies (Frankel and Rose 1996, Milesi-Ferretti and Razin 2000). This is a question that is relevant not just for emerging market economies but also for the major industrial countries that play a central role in global financial markets (Smithers 1999, Senior and Westwood 2000).

The structure of the rest of the paper is as follows. In section 2, we briefly discuss the broad properties of our data set of foreign assets and liabilities. The determination of long-run net foreign asset positions is investigated in section 3. Section 4 models the short-run dynamics of the net foreign asset position and the behavior of the trade balance. We turn in section 5 to the impact of the net foreign asset position on the real interest rate differential. Conclusions and directions for future research are offered in section 6.

2. International Balance Sheets: Stylized Facts

A country's net external position is the sum of net claims of domestic residents on non-residents. In line with the way in which such transactions are recorded in balance of payments statistics, we classify external assets and liabilities into three main categories: foreign direct investment (FDI), portfolio equity (EQ), and debt instruments (DEBT). Foreign exchange reserves (FX) belong in this last category, although we keep them separate in the overall accounting. Hence we define net foreign assets (NFA) as follows:

$$NFA = FDIA + EQA + DEBTA + FX - FDIL - EQL - DEBTL \qquad (1)$$

where the letter *A* indicates assets and the letter *L* liabilities. The FDI category reflects a "lasting interest" of an entity resident in one economy in an enterprise resident in another economy (IMF, 1993). This includes greenfield investment as well as equity participation giving a controlling stake (typically set at above 10%), while remaining equity purchases are classified under portfolio equity investment.[2] The debt category includes primarily trade credits, bank loans and portfolio bond instruments.

For most industrial countries, estimates of stocks of external assets and liabilities are published by national authorities and collected by the IMF and the OECD, but coverage starts for most countries only in the early eighties. The corresponding measure of net

[2] This implies that in certain cases the distinction between these two categories can de facto be blurred, but the issue cannot be clarified further in the absence of detailed disaggregated data.

foreign assets is called the International Investment Position (*IIP*). For developing countries, however, comprehensive stock data are generally available only for external debt and foreign exchange reserves; *IIP* availability is limited, especially along the time series dimension. In addition, the methodologies used to estimate the various stocks of equation (1) often differ across countries (for example, book or market value for equity and FDI) making cross-country comparisons more difficult.

In order to obviate to the limitations in existing data, we have constructed data on external assets and liabilities for 66 industrial and developing countries, covering the period 1970-1998. In Lane and Milesi-Ferretti (1999) we discuss in detail the methodology we use for estimating net external positions. Broadly speaking, we rely on stock data, when available, supplemented by cumulative flows data, with appropriate valuation adjustments. The latter are particularly important given the increased role played by portfolio equity and FDI flows during the past decade.

The use of flow data can be better understood by considering the fundamental balance of payments identity, which states that the current account, net financial flows and changes in foreign exchange reserves sum to zero, with a term capturing “net errors and omissions” acting as the balancing item.[3] Financial flows can be divided between FDI, portfolio equity and debt flows, plus a term capturing capital account transfers, which include debt forgiveness operations and other transactions that do not give rise to a corresponding asset or liability. The evolution of net claims on the rest of the world is dictated by the flows of new net claims—which equal the current account balance net of capital transfers *KA*—and by capital gains and losses *KG* on existing claims:

$$\Delta NFA_t = CA_t + KA_t + KG_t \tag{2}$$

Our first measure of net foreign assets, *CUMCA*, available for all countries, is obtained by cumulating current account balances, net of capital transfers, with appropriate adjustments designed to take into account valuation effects, debt reduction and debt forgiveness and other terms subsumed in *KG*. For example, we adjust the outstanding stock of equity assets and liabilities so as to reflect variations in the US$ value of stock market indices, and the stocks of inward and outward FDI to reflect changes in the cross-country prices of capital goods. A comparison with existing data on stocks of external assets and liabilities provides a satisfactory robustness check on our methodology.

We also construct a second measure, *CUMFL* (available only for developing countries), which is obtained as the sum of stocks of the various external assets and liabilities, calculated as adjusted cumulative capital flows or, as is the case for external debt and foreign exchange reserves, as direct stock measures. As explained in detail in Lane and Milesi-Ferretti (1999) our *CUMCA* measure implicitly considers estimates of cumulative unrecorded capital flows as assets held by the country residents abroad. Instead, *CUMFL* includes unrecorded capital outflows only to the degree that they are reflected in net

[3] We assume that errors and omissions reflect changes in the debt assets held by country residents abroad, in line with the capital flight literature. See Lane and Milesi-Ferretti (1999) for a discussion of this issue.

errors and omissions, and hence a lower fraction of unrecorded external capital holdings than *CUMCA*. [4] We use these measures to supplement the existing *IIP* data.

Net external assets: broad trends

The distribution of countries between large and small creditors and debtors in 1975, 1986 and 1997 is depicted in Figure 1. In industrial countries as a whole the dispersion of net external positions has increased during the past 25 years, with an increase in the number of relatively large debtors, especially between 1975 and 1986, and in the number of creditors with assets above 10 percent of GDP. For developing countries, there is a large increase in the number of countries with "large" external liabilities (over 40 percent of GDP) between the 1970s and the 1980s, in the aftermath of the debt crisis. More generally, a pattern of increased dispersion in net external positions is also visible, and is especially strong between the 1970s and the 1980s.

Figure 2 plots different net foreign asset measures as ratio of GDP for a selection of industrial countries for the period 1970-1998, where we have grouped together the countries belonging to the Euro area. We graph both our estimated *CUMCA* position and the direct estimate of net foreign assets (*IIP*) when available.[5] Relatively few countries have remained international creditors throughout the past three decades (Germany, Japan, Netherlands and Switzerland); the rest of the group is almost evenly split between persistent debtors and 'switchers.' Among the latter, the most well known case is the United States.

Figure 3 plots net foreign asset measures for some of the developing nations in our sample, highlighting a number of interesting facts. First, the dynamics of net foreign assets in the countries most affected by the debt crisis is very similar, with a sharp worsening during the early 1980s and an improvement starting in the late 1980s. Second, net external liabilities measured with *CUMFL* are significantly larger than *CUMCA* in several countries (Argentina, Brazil, Mexico and Indonesia in Figure 3), reflecting unrecorded capital outflows. The third is the effect of the currency collapse following the Asian crisis on the burden of external liabilities in Indonesia and to a lesser degree in Thailand. Finally, a fourth fact is the remarkable improvement of Singapore's net external position over time.[6]

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[4] Consider, for example, the case of a country with a trade deficit entirely financed by a flow of new debt liaiblities (and errors and omissions equal to zero). Assume, as has often been the case in developing countries during periods of capital flight, that the change in the stock of external debt (measured by World Bank data) exceeds the recorded debt inflow in the balance of payments. Cumulating the current account implies that the change in the net external position is equal to the recorded flow of new debt, and thus implicitly assumes that the difference between the change in the stock of debt and the flow is offset by an accumulation of debt assets of the country abroad (a residual category in the calculation). If debt assets are instead estimated directly as cumulative flows (as is the case for CUMFL) the change in the net external position corresponds to the increase in the stock of external debt.

[5] The reader is referred to Lane and Milesi-Ferretti (1999) for an explanation of the most important differences between these two measures.

[6] Taiwan shows a similar, albeit less dramatic trend among the economies in our sample.

The composition of external assets and liabilities

The past decade has seen a remarkable growth in capital flows taking the form of portfolio equity and FDI.[7] This, together with the increase in value of equity market positions, has led to a rapid increase of the underlying stocks, not only in real terms but also as a fraction of GDP. Figure 4 documents this increased diversification in industrial countries' equity capital portfolio; the fact that portfolio equity is estimated at market value while foreign direct investment at book value tends to understate the overall importance of the latter. Figure 5 shows the aggregate dynamics of FDI, equity and debt liabilities for our sample of less developed countries.[8] While external debt remains the main source of external financing, the increased role played in the 1990s by foreign direct investment and, to a lesser extent, by portfolio equity investment is quite apparent from the graph.[9]

For the purposes of this paper, the composition of the international balance sheet matters if the level and volatility of returns differs across asset classes, since investment returns on existing foreign assets and liabilities are important in driving the dynamics of the net foreign asset position.

3. The Determinants of Net Foreign Asset Positions

We propose that a parsimonious model of the net foreign asset position can be represented as

$$\begin{aligned} b_{it} &= \sigma' Z_{it} + \varepsilon_{it} \\ Z_{it} &= [YC_{it}, GDEBT_{it}, DEM_{it}] \end{aligned} \tag{3}$$

where b_{it} is country i's ratio of net foreign assets to GDP in year t, YC_{it} is its output per capita, $GDEBT_{it}$ is its level of public debt and DEM_{it} is a set of demographic variables. As the discussion in the next subsection makes clear, we have followed the main themes developed in the theoretical literature in selecting these variables as the primary determinants of net foreign asset positions.[10] It is important to take note that all variables should be interpreted as measured relative to global values, since common movements in output per capita, demographic trends and government debt should not affect net foreign asset positions but rather will operate via global variables such as the world real interest

[7] See Lane and Milesi-Ferretti (2000b) for a discussion of the determinants of "external capital structure."

[8] Direct investment and portfolio equity assets of developing countries are much smaller in magnitude, but also display similar trends.

[9] It should also be noted that the structure of external debt flows has also changed substantially: portfolio debt flows have played an increasingly important role, substituting for a decline in the share of syndicated bank lending.

[10] Since we have a limited number of time series observations, we are constrained in the number of determinants that we can include in our empirical work. As is detailed in subsection 3a, there are myriad channels by which these variables can potentially affect net foreign asset positions and a number of theoretical contributions highlight some of these individual mechanisms. Building an integrative general equilibrium model that would nest the various hypotheses is beyond the scope of this paper and our empirical specification will inevitably not be able to discriminate between all competing theories.

rate.

3a. Theoretical channels

Relative output per capita can affect net foreign asset positions through several channels. First, if the domestic marginal product of capital decreases as an economy grows richer, domestic investment will fall and home investors will seek out overseas accumulation opportunities. Second, an increase in domestic income may lead to a rise in the domestic savings rate. This result is most clearly generated in models with habit formation in consumption preferences: as an economy grows, consumption will lag behind output (see, for instance, Carroll, Overland and Weil 2000). An alternative explanation has been suggested by Rebelo (1992): under Geary-Stone preferences, the savings rate will also decrease as income increases, because once basic consumption needs are satisfied the marginal utility of extra consumption sharply diminishes. Even if the increase in the savings rate is temporary, there may be a permanent improvement in the net foreign asset position. A positive relation between relative output per capita and the net foreign asset position is also captured in the traditional “stages of the balance of payments” hypothesis (see Halevi 1971, Fischer and Frenkel 1972, 1974, Kindleberger 1987 and Eichengreen 1991).

Although these factors point to a positive relation between relative output per capita and the net foreign asset position, we note that developing countries operating under credit constraints may actually exhibit an opposite pattern. In models in which an improvement in net worth or cash flow relaxes financial constraints, an increase in production may allow greater recourse to foreign credit, implying a possibly negative relation between net external assets and relative output per capita at least over some interval.

The second variable we consider is the stock of public debt. In a world that exhibits departures from Ricardian equivalence, higher levels of public debt may be associated with a decline in the external position. For instance, in the Blanchard-Yaari finite-horizon model, an increase in public debt is not fully offset by an increase in private asset accumulation since public debt is perceived as net wealth by current generations, who will bear only part of the tax burden implied by the higher stock of debt (Blanchard 1985, Frankel and Razin 1987, Faruqee and Laxton 2000). This “twin debts” hypothesis is clearly linked to the “twin deficits” hypothesis that links budget deficits and current account deficits but the latter is difficult to empirically investigate, since the short-run correlation between changes in fiscal and external positions will depend on the underlying shocks that are driving the short-run dynamics of the economy.

Third, demographic factors are also potentially important in affecting the net foreign asset position. For instance, a country with an ageing population profile can prepare for an increase in the ratio of retirees to workers by accumulating overseas assets to supplement domestic income streams. Domestic investment in these countries will also be curtailed as the marginal product of capital is diminished by a reduction in the growth of (or an actual decline in) the working-age population (that defines the size of the labor force).

At the other end of the population distribution, a society with a high youth dependency ratio may require a heavy investment in social infrastructure (education, housing). A high youth dependency ratio may also reduce the savings rate, as households with children attempt to smooth consumption. Accordingly, we may expect to observe a decline in the net foreign asset position in countries that experience a rise in the youth dependency ratio (see also Taylor 1994, Taylor and Williamson 1994, Chapter 3 in Obstfeld and Rogoff 1996, Higgins 1998).

However, the impact of demographic factors on the net foreign asset position is not just a function of the youth and old-age dependency ratios but also depends on the age structure of the working-age population (Mundell 1991). For instance, a relatively young workforce may be associated with relatively low saving and high investment whereas an older workforce may be associated with a rise in the net foreign asset position, as the saving for retirement motive kicks in and domestic investment falls. For this reason, we will employ the entire age distribution in our empirical work.

Finally, some authors have recently modeled the determination of net foreign asset positions in a stylized mean-variance portfolio framework, with the demand and supply for domestic and foreign assets being determined by risk and return characteristics and by the profiles of investors (see Calderón, Loayza and Servén (2000), Kraay, Loayza, Servén and Ventura (2000) and Edwards (2001) for recent examples). As the preceding discussion has highlighted, our fundamentals --- output per capita, public debt and demography --- potentially affect these factors in complex ways. For instance, output per capita and years-to-retirement may plausibly affect the degree of risk aversion. However, the relation between risk aversion and the net foreign asset position depends on whether the "safe" asset is domestic or foreign, which is typically a model-specific choice.

3b. Previous Empirical Work

Several empirical studies have examined the "stages of the balance of payments hypothesis". Halevi (1971) performs rank correlations of GDP per capita and balance of payments positions for the 1960s and finds no systematic relationship between the two variables. Using a larger sample and averages over a longer time period (1968-1992) Roldós (1996) finds more supportive cross-sectional evidence that richer countries tend to have more positive external positions.

Masson, Kremers and Horne (1994) is one of the very limited number of studies focusing on the evolution of net foreign assets. In their country studies of the United States, Japan and Germany over the period 1960-85, they relate net foreign asset positions to the overall dependency ratio and the level of government debt, but do not include the level of income per capita.[11] They find evidence of a long run relation between these variables, and highlight the role of feedback mechanisms working through absorption in the adjustment process towards the long-run equilibrium.

[11] In a study of OECD countries, Bayoumi and Gagnon (1996) also control for fiscal and demographic effects but their primary focus is on the effects of inflation on net foreign asset positions.

Taylor (1994), Higgins (1998) and Herbertsson and Zoega (1999) have provided some evidence that demographic factors are an important driving force of medium-term current account behavior. Herbertsson and Zoega (1999) focus in particular on the link between population age structure and public and private saving behavior: they highlight how countries with high youth dependency ratios tend to have larger current account deficits.[12] Employing a demographic specification similar to ours, Taylor (1994) and Higgins (1998) show that the demographic structure is quantitatively important in explaining medium-term current account behavior.

Finally, Calderón, Loayza and Servén (2000) have recently related the evolution of net foreign asset positions to composite measures of risk and return and find support for their specification, particularly for countries with low barriers to international capital movements.

3c. Determinants of net foreign assets: empirical analysis

Our empirical analysis of the long-run behavior of net foreign assets uses data for both industrial and developing countries spanning the period 1970-1998. [13] Throughout our empirical work, we split the sample between these two groups of countries in order to allow for potentially different relations between our fundamentals and net foreign asset positions for the two groups and for differences in data quality. For instance, we have already noted that the output per capita may exert different effects in both groups and the difference in life expectancy and in retirement patterns means that demographic effects plausibly will also differ across the two subsamples.

We use the following variables: net foreign assets as a ratio of GDP (*CUMCA* and *CUMFL* measures, as well as the *IIP* measure for robustness checks), GDP per capita in 1995 US dollars (in log form), the stock of public debt as a ratio of GDP and the shares of population under 14, over 65 and between 15 and 64 (in 5-year cohorts).[14]

Public debt is defined as the sum of external public debt, net of foreign exchange

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[12] However, Chinn and Prasad (2000) instead find only weak evidence of a systematic impact of dependency ratios on current account balances in a wide sample of industrial and developing countries.

[13] 'Industrial' countries include the United States, United Kingdom, Austria, Belgium-Luxembourg, Denmark, France, Germany, Italy, Netherlands, Norway, Sweden, Switzerland, Canada, Japan, Finland, Greece, Iceland, Ireland, Portugal, Spain, Australia and New Zealand. 'Developing' countries are Turkey, South Africa, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Mexico, Panama, Paraguay, Peru, Uruguay, Venezuela, Jamaica, Trinidad and Tobago, Israel, Jordan, Kuwait, Oman, Saudi Arabia, Syrian Republic, Egypt, Sri Lanka, Taiwan, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Singapore, Thailand, Algeria, Botswana, Côte d'Ivoire, Mauritius, Morocco, Zimbabwe, Tunisia, and China. The industrial countries consist of long-standing members of the OECD, which approximately corresponds to the most-developed set of countries at the start of the sample period.

[14] Ideally, we would like to measure net foreign assets relative to a country's total wealth but this would require data on land values, natural resources, human capital and the value of domestic assets. In any event, it is plausible that GDP may serve as a reasonable proxy for wealth.

reserves, and gross domestic public debt.[15] For industrial countries, the main source of data for public debt is the OECD (general government definition); for developing countries, the data have been constructed using the World Bank's Global Development Finance, the IMF's Government Financial Statistics and national sources. Unfortunately the definition of government for developing countries is not homogeneous—it can refer to central government, general government or nonfinancial public sector. When data availability was not a constraint, we have used the broadest definition of government. A data Appendix detailing sources and definitions for the debt data is available from the authors.

Finally, the population shares were constructed using the United Nations' Demographic Yearbook (Historical Supplement 1948-1997), supplemented by data from Herbertsson and Zoega (1999).[16]

Bivariate Relations

As a precursor to the multivariate econometric work, we begin in Figures 6-8 by showing the bivariate relations between net foreign asset positions on the one side and output per capita, public debt and demographic structure on the other. In these graphs, the data are measured in terms of average changes between the 1980-89 and 1990-98, capturing the medium- or long-term movement in country positions.[17] In each figure, Panels A and B contain observations from the industrial and developing countries respectively.

Panel A of Figure 6 shows a quite striking positive bivariate relation between growth in output per capita and improvement in the net foreign asset position among the industrial nations. A significant positive relation between output per capita and the net foreign asset position is also evident in the developing country subsample in Panel B of Figure 6. However, the slope is flatter and the overall fit is much weaker. We will return to the difference in slopes between the industrial and developing subsamples when interpreting the results of the regression analysis below.

Figure 7 plots the change in the net foreign asset position against the change in the public debt to GDP ratio. For both industrial and developing countries, we observe an inverse bivariate relation: growth in public debt tends to be associated with a decline in the net foreign asset position.

We turn to the impact of demographic structure in Figure 8. This figure charts the

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[15] We would of course prefer to use net domestic public debt, but data availability for such a measure is much more limited. Since we focus on time series behavior, and given the strong co-movement between the two measures for those countries for which they are both available, we are confident that this choice still allows us to capture the right long-run relation. As we will discuss later, obstacles are more serious when undertaking cross-sectional analysis because of cross-country differences in the definitions of "government."

[16] We thank these authors for kindly sharing their data.

[17] This "cross-section in first differences" is essentially a country fixed-effects specification, picking up intra-country time variation. We get similar graphs if we also employ data from the 1970s but the more recent period offers more complete data and may better capture behavior under integrated capital markets.

correlation between the change in the net foreign asset position and the change in the population shares in each age cohort (0-14, 15-19, … , 60-64, 65+). For the industrial countries, we see that an increase in the youth dependency ratio is associated with a decline in the net foreign asset position, as is an increase in the 30-49 age groups (albeit these correlations are weaker). There is a "twin peaks" effect here: increases in both the 15-29 and 50-64 age groups are associated with an improvement in net foreign assets. For the developing countries, the impact of demographic structure is more uniform: an increase in the 15-29 population share is associated with a decline in the net foreign asset position, whereas the 30-49 population share exerts a positive effect.

Although these scatter diagrams provide some suggestive evidence, the interpretation of bivariate relations of course should not be pushed too far. For instance, there is a strong correlation in the data between demographic structure and output per capita, both along the time series and the cross-sectional dimension, which could explain the co-movements of one of these variables with net foreign assets. To uncover whether all of these variables play a simultaneous role in the dynamics of net foreign assets, we next turn to panel regressions for formal multivariate regression analysis.

Panel Fixed-Effects Regression Analysis

Since we are interested in the role played by shifts in our fundamentals in explaining the dynamic evolution of net foreign asset positions, we focus on a fixed-effects panel specification in this subsection (we consider the cross-section evidence in the next subsection). The country fixed effects also have the merit of soaking up unobserved variables that may lead to permanent differences in measured net foreign asset positions across countries.[18] To control for common global movements, in particular of world GDP per capita, demographics and public debt, we also include time dummies in all the regressions.

As a precursor to the regression analysis, we explored the univariate time series properties of the data. We tested for nonstationarity in our series for net foreign assets, demographic variables, government debt and log GDP per capita using the NPT1.1 econometric package--see Chiang and Kao (2000). The tests were performed separately on the industrial and the developing country samples, using the panel unit root test of Hadri (2000) (allowing for fixed effects and no time trend). For all series in the four samples, the test rejects the null hypothesis of stationarity.[19] In light of the evidence on the presence of unit roots, we subsequently tested for panel cointegration among our variables using tests suggested by Kao (1999) and Pedroni (1999). Both are residual-based tests for which the null hypothesis is lack of cointegration (nonstationarity of residuals). These test statistics are reported in Table 1 and strongly suggest the existence of a cointegrating relation among net foreign assets and our fundamentals.

Having ascertained that the variables display a common trend, we follow Stock and

[18] This may capture both country-specific determinants of net foreign asset positions and permanent measurement errors in our estimates of national net foreign asset positions.

[19] Other panel unit root tests gave broadly similar results. The unit root test results are available from the authors.

Watson (1993) and estimate their long-run relation using a dynamic ordinary least squares (DOLS [-1,1]) specification.[20] We report estimates for the 1970-98 and 1980-98 intervals. The data set is more complete for the post-1980s period and, in addition, this latter period may better reflect an environment of open capital accounts.[21]

With respect to the specification, we want to allow the entire age structure to influence the net foreign asset position but do not wish to estimate independent parameters for our twelve age cohorts. We therefore follow Higgins (1998) by restricting the coefficients on the population share variables to lie along a cubic polynomial, so that only three composite demographic variables need actually be entered into the regression specification (see the Appendix for details).

Tables 2 and 3 reports the results of the (country and time) fixed-effects panel estimation for the industrial and developing country subsamples respectively. For the industrial country sample, we use both our measure of net foreign asset positions (*CUMCA*) and, for robustness, a measure that replaces *CUMCA* by official international investment position data where it is available for most of the sample period (*CUMCA+IIP*). For the developing country subsample, we employ the two alternative measures of the net foreign asset position (*CUMCA* and *CUMFL*) described in Section 2. We also report results when Singapore is excluded from the subsample, since it is an extreme observation with respect to its net foreign asset position, and its role as banking center complicates considerably the construction of accurate net foreign asset measures (indeed, *CUMFL* is not available). Finally, in each case, we also report results for balanced samples.

For the industrial country sample, Table 2 shows a consistently strong positive influence of output per capita on the net foreign asset position. The stable point coefficient of about 0.9 means that a 10 percent improvement in a country's relative output per capita is associated with a 9 percentage point improvement in its ratio of net foreign assets to GDP. This result provides supporting evidence those theories outlined in section 3a that predict a positive comovement between output per capita and net foreign assets.

If we consider the 1970-98 interval, the results for public debt and demographic structure are also quite strong. In line with our theoretical prior, net foreign assets are negatively related to the size of the government debt. A -0.125 point estimate implies that the net foreign asset to GDP ratio falls by 4 percentage points in a country that experiences a 50 percentage point increase in its fiscal debt to GDP ratio (relative to the world average) --- a significant effect but the magnitude also implying that the government debt is largely domestically absorbed.

The relation between net foreign assets and demographic structure also accords with the

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[20] A DOLS[-2,2] specification gave similar results. Only leads and lags of output growth and changes in the public debt are included, since we do not expect annual changes in the demography variables to be correlated with the net foreign asset position. Standard errors are corrected for heteroskedasticity. We have also experimented with a serial correlation adjustment, which typically reduces the t-statistics but our main results largely remain significant.

[21] In future work, we plan to explicitly look at measures of capital account liberalisation.

thrust of the theoretical literature: a decline in the net foreign asset occurs if there is an increase in the population shares of younger age cohorts, whereas the net foreign asset position responds positively to an increase in the share of workers nearing retirement, with a maximum effect for the 50-54 age group. It is also interesting to note that the over-65 age group exerts a negative effect, consistent with the running down of net foreign assets.

However, as is evident from columns (2) and (4) in Table 2, the significance of the public debt and demographic results is lost if we just look at the more recent 1980-98 period. With regard to public debt, the weakening of the conditional correlation is due to just one country, Australia, where public debt exhibits a strong *positive* co-movement with net foreign assets. If Australia is excluded from the sample, the coefficient on public debt rises to -0.12 and is strongly statistically significant.[22] Finally, the results for the balanced sample are largely similar to those for the 1970-98 period for the full sample.[23]

We next turn to the results for the developing country sample. First, across columns (1)-(6), we observe a negative relation between output per capita and the net foreign asset position: as a developing country becomes relatively richer, it typically sees an increase in its net external liabilities. The contrast with the result for the industrial country subsample is quite striking, although the negative coefficient is typically small and is insignificant in column (2). As was noted in section 3a, a negative association between output per capita and net foreign assets is consistent with the relaxation of binding credit constraints on developing countries.[24]

Second, Table 3 shows a very strong inverse relation between public debt and the net foreign asset position. A point estimate in the range [-0.67, -0.86] implies that a 20 percentage point increase in government debt is associated with a [13.4, 17.2] percentage point decline in net foreign assets. We note that this high "pass-through" from net government liabilities to net external liabilities is also consistent with pervasive credit constraints in developing countries, since credit market imperfections are understood to be a primary source of deviations from Ricardian Equivalence (Bernheim 1987).

With respect to the impact of demographic structure on the net foreign asset positions of developing countries, the evidence in Table 3 shows a pattern similar to that for industrial countries: an increase in the population share of younger age groups is associated with a decline in the net foreign asset position. A comparison of the α coefficients between the industrial and developing countries also shows a greater sensitivity of the net foreign asset position to age structure in the latter group. However, the significance of these

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[22] At this point, we have not yet explored the source of the loss of significance for the demographic variables.

[23] Belgium-Luxembourg, Denmark, Finland, Greece, Norway and Portugal were dropped to obtain a balanced sample.

[24] Clearly over the entire sample of industrial and developing countries, the relation between output per capita and net foreign assets is non-monotonic. We plan to probe this result further and estimate the "turning point" in this relation.

demographic effects is weakened when Singapore is excluded from the sample.[25] Finally, the results for the balanced sample in column (7) are quite similar to those for the full sample, although the magnitude of the public debt effect falls somewhat to –0.50.[26]

We turn now to examining how well our panel specification, which imposes equality of all slope coefficients within our two country groupings, can match the dynamics of net foreign assets at the individual country level. For this purpose, Figures 9A and 9B plot actual and fitted long-run values of net foreign assets for selected industrial and developing countries.[27]

For the richer countries, the graphs suggest that our specification matches the time-series behavior of net foreign assets quite well in small open economies, but does not do as well for Germany, the United Kingdom and the United States. For the latter country, public debt has been declining and growth has been strong in the late 1990s, and both factors would lead us to expect an improvement in net foreign assets. Instead, the level of US net external liabilities has increased substantially during this period.[28] A similar diverging pattern between actual and fitted values occurs in the late nineties for Japan, for exactly the symmetric reason—faltering GDP growth and rapidly increasing public debt would lead us to expect, ceteris paribus, a worsening in the net foreign asset position, while Japan’s improved throughout the period.

For developing countries, the overall fit shown in Figure 9B is very good, with very few exceptions. One is Venezuela, which has severe measurement problems for its net foreign asset position because of the size of unrecorded assets held abroad. The divergence for Malaysia’s actual and fitted values in the 1990s is due to the same factors at work in the United States: our model predicts that fast growth and a declining public debt should be associated with falling external liabilities.

In summary, the data suggest that foreign asset positions in industrial countries exhibit a strong co-movement with relative output per capita, while their quantitative link with public debt is relatively weak. Conversely, public debt is very strongly correlated with the dynamics of net external liabilities in developing countries, while the relation with income per capita along the time series dimension is weak or negative. In addition, in both samples, the demographic variables generally play an important role in determining net foreign asset positions. Our simple econometric specification captures long-run trends in net foreign assets very well for developing countries and small open industrial economies, although it is less successful in explaining the behavior of net foreign assets in larger countries.

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[25] Singapore has undergone a dramatic demographic transition, with a rapid ageing of the population. Of course, this may precisely represent very good evidence regarding the effect of demography on net foreign assets, since Singapore has also been rapidly accumulating external assets in recent years.

[26] The balanced sample for developing countries excludes Algeria, Argentina, Bolivia, Botswana, Brazil, Chile, Cote d’Ivoire, Dominican Republic, Paraguay, Peru, Trinidad & Tobago, Turkey and Zimbabwe.

[27] Graphs for all remaining countries are available from the authors. The fitted values are generated from fixed-effects panel OLS regressions: the coefficient estimates are very similar to those obtained from the DOLS specification.

[28] See Mann (1999) and Obstfeld and Rogoff (2000b) on the sustainability of the US external position.

Cross-sectional evidence

The panel data analysis presented in the previous sub-section has focused on the evolution of the net foreign asset position within countries. In this sub-section, we investigate the pure cross-sectional relation between net foreign assets and their determinants, focusing on the 1990s. Table 4 presents results of cross-sectional regressions of net foreign assets on log output per capita, public debt and demographic variables, where all variables are averages during the period 1990-98.[29]

Relative output per capita is the only significant variable in explaining the cross-sectional variation in net foreign asset positions across industrial countries. As in the time series dimension, richer countries have larger net foreign asset positions, although the cross-section point estimate is 40-50 percent smaller in magnitude. Neither fiscal debt nor demography is helpful in explaining the 1990s cross-section for industrial countries.

The cross-section performance of our fundamentals is stronger for the developing country subsample. In contrast to the time series result, we find a positive association between output per capita and the net foreign asset position in the cross-section, although the point estimate is typically small and not quite significant in column (6). The cross-sectional effect of public debt is again negative and significant: developing countries with indebted governments also have larger net external liabilities. Finally, the demographic structure has a significant impact on the cross-section distribution of net foreign asset positions among developing countries, with a pattern that is qualitatively similar to that found in the time series data.

Overall, the results of this subsection are that only output per capita is helpful in explaining the cross-sectional heterogeneity in net foreign asset positions for industrial countries. For developing countries, we find some evidence of a positive cross-section association between net foreign assets and output per capita, a strong negative comovement between net foreign assets and public debt and a significant role for demographic structure in explaining the cross-section distribution of net foreign asset positions.

4. The Dynamics of Net Foreign Assets and the Trade Balance

In the previous section, we have focused on the long-run behavior of net foreign assets, arguing that it can be characterized as a cointegrating relation $b_{it} = \sigma' Z_{it} + \varepsilon_{it}$. In this section, we shift our attention to the "adjustment mechanism"—namely, the role played by our long-run model in shaping the short-run dynamics of net foreign assets, as well as the implications these dynamics have for the trade balance.

Since the underlying long-run relation is a cointegration equation, we can obtain the

[29] Results are virtually unchanged if we focus on a single year, given the fact that these variables move only slowly year to year.

desired change in net foreign assets $\widehat{\Delta b_{it}}$ as the fitted values from estimating an "error correction mechanism" representation:

$$\Delta b_{it} = \beta' \Delta Z_{it} + \eta \Delta b_{it-1} - \lambda (b_{it-1} - \sigma' Z_{it-1}) + \nu_{it} \tag{4}$$

In order to keep the model specification as parsimonious as possible we impose equality of all slope coefficients among the industrial and among the developing country samples in estimating this error-correction specification.

Table 5 reports the estimated error-correction coefficient λ and the overall fit of equation (4) for the different country groups and samples. The specification of the regression also includes the lagged change in the dependent variable as well as contemporary changes in all explanatory variables (coefficients not reported). Table 5 highlights that deviations of net foreign assets from their long-run trend tend to be quite persistent, with a half-life of around five years, and that the speed of adjustment is quite similar between industrial and developing countries. Given the very restrictive specification of the short-run dynamics, the fit of the regressions is remarkably good, especially so for developing countries.

It is useful to ask how well this simple specification accounts for the dynamics of net foreign assets at the individual country level. For this purpose, Table 6 reports the country-by-country bivariate correlations between actual and fitted values for changes in net foreign assets for the period 1970-98. For industrial countries, the model does relatively poorly in explaining the short-run dynamics of the net foreign asset position for most of the 'large' economies—Germany, Japan, United Kingdom and United States, while it tracks of the smaller open economies, such as Ireland, Portugal and the Scandinavian countries, quite nicely.[30] For developing countries, the model performs remarkably well across the board, explaining a substantial fraction of year-to-year changes in net foreign assets, with very few exceptions.

Implications for the trade balance

The net foreign asset position influences the behavior of the trade balance via two channels. First, changes in the desired net foreign asset position require shifts in the trade balance. Second, for a given desired net foreign asset position, there is an inverse relation between the investment returns on the outstanding stock of net foreign assets and the trade balance.

In an accounting sense, changes in the net foreign asset position reflect trade imbalances, investment income payments and receipts and capital gains and losses. Formally,

$$B_{it} - B_{it-1} = TB_{it} + TR_{it} + i_{it}^{*} B_{it-1} + KG_{it} \tag{5}$$

[30] One reason why the model may not fully capture the dynamics of the net foreign asset position for the former group of countries is that these countries are financial centers and high levels of gross international asset trade means that the impact of volatile revaluation effects on the net foreign asset position is likely to be especially important.

where TB_{it} is the balance of trade in goods and services, TR_{it} are net current account and capital account transfers, $i_{it}^{*}B_{it-1}$ is investment income and KG_t is the capital gain/loss on outstanding net external assets. The current account is given by the sum of TB_{it}, the current transfers component of TR_t and investment income $i_{it}^{*}B_{it-1}$. Dividing both sides of equation (5) by GDP measured in US dollars and re-arranging terms, we obtain

$$\Delta b_{it} + \frac{\gamma_{it}}{1+\gamma_{it}} b_{it-1} = tb_{it}^{*} + inc_{it} + kg_{it} \tag{6}$$

where tb_{it}^{*} is the ratio to GDP of the balance of goods and services, plus net transfers; $inc_{it} = \frac{i_{it}^{*}}{1+\gamma_{it}} b_{it-1}$ is the ratio of investment income to GDP; γ is the rate of change of GDP measured in current dollars; and kg_{it} is the ratio of capital gains/losses on outstanding net foreign assets to GDP.[31]

In turn, we can re-arrange equation (6) to relate the "transfer-corrected" trade balance to our estimate of the change in the net foreign asset position, given in equation (4):

$$tb_{it}^{*} = \widehat{\Delta b_{it}} - (inc_{it} + kg_{it}) + \frac{\gamma_{it}}{1+\gamma_{it}} b_{i,t-1} + \nu_{it} \tag{7}$$

The "transfer-corrected" trade balance is related to four factors. The first term on the RHS of this equation reflects changes in the fundamentals driving the long-run net foreign assets position; the second term (in parenthesis) is the effect of overall returns on the net foreign assets position; the third term is the effect of growth interacted with the net foreign assets position (the sign of this effect depends on whether the net foreign assets position is positive or negative) and the fourth term is the error term that captures the component of the change in net foreign assets that is not explained by the dynamics of its long-run "fundamentals".

Note also that if we combine the second and third term on the RHS of equation (7), we obtain the "standard" expression for net foreign assets accumulation, relating the change in net foreign assets to the trade balance and the intrinsic dynamics of net foreign assets, driven by real GDP growth (g), the overall real rate of return (r) and rate of real exchange rate appreciation or depreciation (ε):

$$tb_{it}^{*} \cong \widehat{\Delta b_{it}} - \frac{r_{it} - g_{it} - \varepsilon_{it}}{(1+g_{it})(1+\varepsilon_{it})} b_{t-1} + \nu_{it} = \widehat{\Delta b_{it}} - \psi_{it} b_{it-1} + \nu_{it} \tag{8}$$

[31] Note that $1+\gamma = (1+g)(1+\varepsilon)(1+\pi^{*})$, where g is the real GDP growth rate, ε is the rate of real exchange rate appreciation of the home country's currency vis-à-vis the US$ and π^{*} is US inflation.

We then proceed to construct the empirical counterpart of the various terms in the relations above. The predicted series for the desired change in net foreign assets $\widehat{\Delta b_{it}}$ is generated from the fitted values by estimating equation (4). The transfer-corrected trade balance tb_t^* is constructed as the sum of the balance of goods and services and net current and capital transfers from balance of payments data. For developing countries, we also add debt forgiveness operations whenever these are not recorded as capital transfers in the balance of payments.

For industrial countries, the series for capital gains and losses kg_{it} includes the difference between the change in the outstanding stock and the flow for portfolio equity investment assets and liabilities, foreign direct investment assets and liabilities, and foreign exchange reserves. These differences are particularly significant for portfolio equity assets and liabilities, especially during the 1990s, because of the fluctuations in market values generated by stock markets trends and volatility. A limitation is that our data do not allow us to account for capital gains and losses on the debt portfolio of industrial countries. For developing countries, the series on capital gains and losses includes one additional item--the impact of cross-currency fluctuations on the outstanding stock of gross external debt (data that are reported in the World Bank's Global Development Finance database).

In Tables 7 and 8 we present the results of panel regressions describing the time-series co-movements between the transfer-adjusted trade balance tb_{it}^* and:

a) adjusted returns $\psi_{it} b_{i,t-1}$;

b) its underlying components inc_{it}, kg_{it} and $\gamma / _{1+\gamma}\, b_{it-1}$;

c) the estimated change in the net foreign asset position $\widehat{\Delta b_{it}}$.

In all regressions, we also include the lagged trade balance to allow for dynamics. We start in Table 7 with bivariate regressions, and present the results of multivariate regressions in Table 8.

In general, holding fixed the desired change in the net foreign asset position, we would expect to find that negative investment returns on net foreign assets are associated with trade surpluses and vice-versa, thus preventing "perverse" dynamics of net foreign assets. Moreover, we may expect this effect to be stronger in developing countries that face more significant credit constraints on international capital markets: a credit-constrained country experiencing a shock to, say, the rate of return on its external liabilities may be forced to run a larger trade surplus immediately rather than being able to smooth the effects of the shock over time.

These results are indeed borne out in the data. In Table 7, the bivariate correlation coefficients on adjusted returns and its underlying components are all negative and statistically significant. Moreover, the trade surplus tends to be larger (smaller) when the intrinsic dynamics of net foreign assets imply a further accumulation of liabilities (assets). The magnitude of the short-run co-movement between trade balance and returns is also very similar between industrial and developing countries, with a ten percent shock to investment returns reflected in a 2 percentage point change in the trade balance to GDP ratio.

When we break down investment returns into investment income and capital gains/losses, we find a stronger dichotomy between industrial and developing countries: the short-run coefficient on investment income for developing countries is considerably larger than for industrial countries (although the difference disappears in the long run) while there is no statistically significant contemporaneous bivariate relation between capital gains and the trade balance. For industrial countries, the trade balance is negatively correlated with capital gains. The bivariate correlation between the trade balance tb_t^*, and the fitted change in net foreign assets $\widehat{\Delta b_{it}}$ is statistically significant in both samples, albeit low in the short run and below unity even in the long run. We return to this issue below.

We present results of multivariate regressions in Table 8, where we separate out the impact of investment income, capital gains and the effects of growth on the outstanding net foreign asset position. The results are in line with those obtained in the bivariate regressions. We find that the negative relation between investment returns and the trade balance is again stronger in developing countries in the short run, and that the strong co-movement between investment income and the trade balance emerges again. For industrial countries, capital gains and losses have a stronger correlation with the trade balance than they do for developing countries. Overall, shocks to the trade balance appear more persistent in industrial than in developing countries.

Our measure of the fitted change in desired net foreign assets is typically significantly correlated with the trade balance, especially for the developing countries. Although the framework implies that, holding fixed the desired net foreign asset position, the trade balance should negatively respond one-for-one to shifts in investment returns on the outstanding stock of net foreign assets, it is not surprising that we typically find a coefficient below unity (in absolute value). First, the investment returns data are significantly contaminated with measurement error, reducing the estimated coefficient. Second, our model of year-to-year changes in the net foreign asset positions is surely incomplete, such that omitted variables bias may also affect the estimated coefficients.

In summary, the results in this section show that the long-run fundamentals driving the net foreign asset positions can also explain an important fraction of short-run changes in countries' external wealth. By extension, the behavior of the trade balance is tightly related to the dynamics of the net foreign asset position. Desired changes in the net foreign asset position--both shifts in the underlying fundamentals and correction in any drift from the long-run equilibrium relation—are reflected in the trade balance. Holding fixed these factors, the trade balance is inversely related to the returns on the outstanding net foreign asset position. This result ties together the performance of financial markets and net flows of goods and services: for instance, all else equal, a European country whose residents owned US equity during the 1990s could run a larger trade deficit by virtue of the high investment returns earned on such assets.

5. Net Foreign Assets and Real Interest Differentials

Rates of return on external assets and liabilities play a crucial role in determining the dynamic behavior of net foreign assets, and are likely to be influenced by their level and composition. For instance, a home bias in asset demand and/or an upward-sloping supply of international funds means that interest rates may be linked to net foreign asset positions: debtor countries should experience higher interest rates than creditor countries. Applications of this "portfolio balance" approach have typically related currency returns to shifts in relative asset supplies in different currencies (e.g. a model of dollar interest rates versus yen interest rates) but the model should hold more generally as a framework for thinking about country risk (see Frankel and Rose 1995, Dooley and Isard 1991).

In this spirit, the real interest rate differential can be written as

$$r_{it} - r_{wt} = \delta_{it} - E_t[\Delta RER_{t+1}] \qquad (9)$$

where δ_{it} is the country risk premium and the second term on the right hand side is (minus) the expected rate of real exchange rate appreciation.

If the rate of real appreciation is zero in a steady state, then the long-run real interest differential just depends on the steady-state country risk premium

$$r_{it} - r_{wt} = -\delta_{it} = -\delta b_{it} \qquad \delta > 0 \qquad (10)$$

where we model the country risk premium as inversely (and linearly) related to the net foreign asset position.[32]

Empirical Results

We confine attention to the industrial country sample. The real interest data are those employed by Obstfeld and Rogoff (2000a, 2000b).[33]

We report the panel fixed-effects results in Table 9. In columns (1)-(4), we include all countries and the time dummies soak up the "world real interest rate" that is common to all countries; in columns (5)-(8), we employ the real interest differential vis-à-vis the US.

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[32] The coefficient on net foreign assets may plausibly be increasing in the volatility of the interest rate (in general, it may depend on the entire variance-covariance matrix of asset returns: see, for instance, Frankel 1982). We have experimented with specifications in which the net foreign asset position is multiplied by the volatility of the interest rate and the results are typically stronger than those reported below. Expressing net foreign assets as a ratio to exports rather than GDP gives a similar picture. Results for these alternative specifications are available upon request from the authors.

[33] We thank these authors and Jay Shambaugh for generous assistance with these data. Following these authors, the real interest rate is measured as the December nominal interest rate in year t minus the inflation rate in year t. Iceland is excluded from the sample.

The results in columns (1)-(2) and (5)-(6) are for the 1970-98 period; and for 1980-98 in columns (3)-(4) and (7)-(8). To control for possible long-run expected changes in real exchange rates, we also enter the rate of real exchange rate appreciation in alternate specifications.[34]

Across columns (1)-(4), the results show clear evidence of a "portfolio balance" effect in the determination of real interest differentials: according to the point estimate of –4.2 in column (1), a 20 percentage point improvement in the net foreign asset position is associated with an 84 basis point reduction in the real interest rate differential. The effect is also significant for the 1980-98 period but the estimated point coefficient is smaller at –3.04 in column (3). This decline in the coefficient may not be surprising: it is plausible that the greater integration of capital markets in the more recent period may have improved the capacity of investors to absorb country-specific risks. These findings are little affected by inclusion of the rate of real exchange rate appreciation in columns (2) and (4). Even stronger results are obtained for the bilateral real interest rate differentials in columns (5)-(8): the point estimate for net foreign assets is enlarged and the real exchange rate is now also significant in columns (6) and (8). Here again, we observe some decline in the impact of net foreign assets in the more recent 1980-98 period.

Figure 10 provides a scatter plot of average net foreign assets and real interest rates over the period 1990-98, documenting a negative relation between these variables. Table 10 reports cross-sectional results for the same period. In the cross-section, net foreign assets again have a significant effect on the real interest rate differential across all specifications. For instance, the point estimate of –3.36 in column (3) indicates that a country with an average net foreign asset position of 21.5 percent of GDP (the Japanese case) enjoys a real interest rate that is 72 basis points below the US real interest rate. We note also that the rate of real exchange rate appreciation has no impact on the real interest differential in the cross-sectional specification.

The results in this section provide some suggestive evidence that net foreign asset positions matter in determining real interest rate differentials, in line with the spirit of the portfolio balance literature.[35] In future work, it would be instructive to experiment with different bond maturities and alternative techniques for calculating expected inflation and the expected rate of real appreciation. Moreover, it would be interesting to distinguish between different components of the net foreign asset position (e.g. is it just net external debt that matters? / do portfolio equity liabilities and FDI liabilities have different effects?) and to investigate the interaction between net foreign asset positions and other risk factors in determining real interest rate differentials.

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[34] In line with the method for measuring expected inflation, the actual rate of real exchange rate appreciation in year t corresponds to the expected rate of real appreciation. In columns (2) and (4), we use a multivariate CPI-based real exchange rate series; in columns (6) and (8), it is the bilateral CPI-based real exchange rate vis-à-vis the US.

[35] Bayoumi and Gagnon (1996) predict that a country's net foreign asset position should be negatively correlated with its (after-tax) real interest rate. In this case, our estimate of the portfolio balance effect will be understated if a high real interest rate endogenously improves the net foreign asset position. We further note that inflation and real interest rates are negatively correlated in the time series dimension of our data set but positively correlated in the cross-section.

6. Conclusions

Our primary goal in this paper has been to demonstrate the fruitfulness of studying the behavior of a key state variable in international macroeconomics: namely, the net foreign asset position. By shifting the focus from short-term capital flows, we have shown that persistent fundamentals --- output per capita, fiscal debt and demographic variables --- have a major influence on the direction of international asset trade. Moreover, our results demonstrate that both the desired and actual net foreign asset position are centrally important in determining the trade balance, the former since trade balances are typically required to accomplish changes in the target net foreign asset position, the latter due to the role played by investment returns on outstanding foreign assets and liabilities in determining the relation between the trade balance and the dynamics of the net foreign asset position. Finally, we have presented suggested evidence that the net foreign asset position is also important in determining international asset prices, exerting a negative influence on real interest rate differentials.

We believe that this paper has barely scratched the surface in exploring the properties of net foreign asset positions and their relation with other key international macroeconomic variables. Much more work is required to fully exploit the potential of this promising research program.

Appendix

Our demographic specification follows Fair and Dominguez (1991) and Higgins (1998). We divide the population into $J = 12$ age cohorts and the age variables enter the net foreign assets equation as $\sum_{j=1}^{12} \alpha_j p_{jt}$ where p_{jt} is the population share of cohort j in period t and $\sum_{j=1}^{12} \alpha_j = 0$. We make the restriction that the coefficients lie along a cubic polynomial

$$\alpha_j = \gamma_0 + \gamma_1 j + \gamma_2 j^2 + \gamma_3 j^3$$

The zero-sum restriction on the coefficients implies that

$$\gamma_0 = -\gamma_1 (1/J) \sum_{j=1}^{12} j - \gamma_2 (1/J) \sum_{j=1}^{12} j^2 - \gamma_3 (1/J) \sum_{j=1}^{12} j^3$$

In turn, we can estimate $\gamma_1, \gamma_2, \gamma_3$ by introducing the age variables into the estimated equation in the following way

$$\gamma_1 DEM_{1t} + \gamma_2 DEM_{2t} + \gamma_3 DEM_{3t}$$

where

$$DEM_{1t} = \sum_{j=1}^{12} j p_{jt} - (1/J) \sum_{j=1}^{12} j \sum_{j=1}^{12} p_{jt}$$

$$DEM_{2t} = \sum_{j=1}^{12} j^2 p_{jt} - (1/J) \sum_{j=1}^{12} j^2 \sum_{j=1}^{12} p_{jt}$$

$$DEM_{3t} = \sum_{j=1}^{12} j^3 p_{jt} - (1/J) \sum_{j=1}^{12} j^3 \sum_{j=1}^{12} p_{jt}$$

Finally, we can easily recover the implicit α_j once we know $\gamma_0, \gamma_1, \gamma_2, \gamma_3$.

References

Bayoumi, T. and J. Gagnon (1996), "Taxation and Inflation: A New Explanation for Capital Flows", *Journal of Monetary Economics* 38, 303-330.

Bergin, P. (2000), "How Well Can We Explain the Current Account in Terms of Optimizing Behavior? (or Testing an Intertemporal Model of the Current Account and Investment)," *mimeo*, UC-Davis.

Bernheim, B.D. (1987), "Ricardian Equivalence: An Evaluation of Theory and Evidence", *NBER Macroeconomics Annual*, 263-303.

Blanchard, O. (1985), "Debts, Deficits and Finite Horizons," *Journal of Political Economy* 93, April, 223-47.

Bohn, H. (1998) "The Behavior of US Public Debt and Deficits," *Quarterly Journal of Economics* CVIII, August.

Branson, W. and D. Henderson (1985), "International Asset Markets: Specification and Influence," in (R. Jones and P. Kenen, eds) Handbook of International Economics, vol 2, North-Holland: Amsterdam.

Calderón, C., N. Loayza and L. Servén (1999), "External Sustainability: A Stock-Flow Perspective," World Bank Policy Research Working Paper No 2281, January.

Chiang, M. and C. Kao (2000), "Nonstationary Panel Time Series Using NPT 1.1 --- A User Guide," *mimeo*, Syracuse University.

Chinn, M. and E. Prasad (2000), "Medium-Term Determinants of Current Accounts in Industrial and Developing Countries: An Empirical Exploration," IMF Working Paper 00/46, March.

Dooley, M. and P. Isard (1991), "A Note on Fiscal Policy, Investment Location Decisions and Exchange Rates," *Journal of International Money and Finance*, 10, 161-168.

Edwards, S. (2001), "Does the Current Account Matter?", *mimeo*, UCLA.

Eichengreen, B. (1991), "Trends and Cycles in Foreign Lending," in Capital Flows and The World Economy, edited by Horst Siebert, Tübingen: Mohr.

Fair, R. and K. Dominguez (1991), "Effects of the Changing US Demographic Structure on Macroeconomic Equations," *American Economic Review* 81, 1276-1294.

Faruqee, H. and D. Laxton (2000), "Life Cycles, Dynasties, Saving: Implications for Small, Open Economies," International Monetary Fund Working Paper No. 00/126, July.

Feldstein, M. and C. Horioka (1980), "Domestic Savings and International Capital Flows," *Economic Journal* 90, 314-329.

Fischer, S. and J. Frenkel (1974), "Economic Growth and The Stages of The Balance of Payments," in G. Horwich and P. Samuelson (editors), Trade, Stability and Macroeconomics, New York: Academic Press, 503-21.

Frankel, J. A. (1982), "In Search of the Exchange Risk Premium: A Six-Currency Test Assuming Mean-Variance Optimization," *Journal of International Money and Finance* 1, 255-274.

Frankel, J. and A. Rose (1995), "Empirical Research on Nominal Exchange Rates," in (G. Grossman and K. Rogoff, eds) Handbook of International Economics, vol 3, North-Holland: Amsterdam.

Frankel, J. and A. Rose (1996), "Currency Crashes in Emerging Markets: An Empirical Treatment." *Journal of International Economics* 41, 351-366.

Frenkel, J. and A. Razin (1998), Fiscal Policy and Growth in the World Economy, MIT Press.

Hadri, K. (2000), "Testing for Stationarity in Heterogenous Panel Data," *Econometrics Journal* 3, 148-161.

Halevi, N. (1971), "An Empirical Test of The "Balance of Payments Stages" Hypothesis," *Journal of International Economics* 1, 102-18.

Hayashi, F. (2000), Econometrics, Princeton, NJ: Princeton University Press.

Herbertsson, T. and G. Zoega (1999), "Trade Surpluses and Life-Cycle Saving Behavior," *Economics Letters* 65, 227-237.

Higgins, M. (1998), "Demography, National Savings and International Capital Flows," *International Economic Review* 39, 343-369.

Judson, R.A. and A.L. Owen (1999), "Estimating Dynamic Panel Data Models: A Guide for Macroeconomists," *Economics Letters* 65, 9-15.

Kao, C. (1999), "Spurious Regression and Residual-Based Tests for Cointegration in Panel Data," *Journal of Econometrics* 90, 1-44.

Kindleberger, C. (1987), International Capital Flows, Oxford University Press: UK.

Kraay, A., N. Loayza, L. Serven and J. Ventura (2000), "Country Portfolios," NBER Working Paper No. 7795.

Krugman, P. (1991), Has The Adjustment Process Worked?, Institute for International Economics, Washington DC.

Lane, P.R. and G.M. Milesi-Ferretti (1999), "The External Wealth of Nations," CEPR Discussion Paper 2231, July. Forthcoming in *Journal of International Economics*.

Lane, P.R. and G.M. Milesi-Ferretti (2000a), "The Transfer Problem Revisited: Net Foreign Assets and Long-Run Real Exchange Rates," CEPR Discussion Paper no. 2511, June.

Lane, P.R. and G.M. Milesi-Ferretti (2000b), "External Capital Structure: Theory and Evidence," CEPR Discussion Paper no. 2583, October.

Mann, C. (1999), Is the US Trade Deficit Sustainable?, Institute for International Economics, Washington DC.

Masson, P., J. Kremers and J. Horne (1994), "Net Foreign Assets and International Adjustment: The United States, Japan and Germany," *Journal of International Money and Finance* 13, 27-40.

Milesi-Ferretti, G.M. and A. Razin (2000), "Current Account Reversals and Currency Crises: Empirical Regularities," in Currency Crises, edited by Paul Krugman, Chicago: University of Chicago Press for NBER.

Mundell, R.A. (1991), "The Great Exchange Rate Controversy: Trade Balances and the International Monetary System," in F. Bergsten (ed.) International Adjustment and Financing: The Lessons of 1985-1991, Institute for International Economics.

Obstfeld, M. and K. Rogoff (1996), Foundations of International Macroeconomics, MIT Press.

Obstfeld, M. and K. Rogoff (2000a), "The Six Major Puzzles in International Macroeconomics: Is There a Common Cause?," NBER Working Paper No. 7777, July.

Obstfeld, M. and K. Rogoff (2000b), "Perspectives on OECD Economic Integration: Implications for US Current Account Adjustment," in Global Economic Integration: Opportunities and Challenges, Proceedings of a Symposium Sponsored by the Federal Reserve Bank of Kansas City.

Obstfeld, M. and A.M. Taylor (2000), "Real Interest Equalization and Real Interest Parity over the Long Run: A Reconsideration," *mimeo*, UC-Berkeley and UC-Davis.

Pedroni, P. (1999), "Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors," *Oxford Bulletin of Economics and Statistics* 61, 653-678.

Pesaran, H. (1997), “The Role of Economic Theory in Modelling the Long Run,” *Economic Journal*, 107, 178-191.

Roldós, J. (1996), “Human Capital, Borrowing Constraints and The Stages of The Balance of Payments,” *mimeo*, International Monetary Fund, February.

Senior, S. and R. Westwood (2000), “The External Balance Sheet of the United Kingdom: Implications for Financial Stability?,” *mimeo*, Bank of England.

Smithers, A. (1999), “Britain: The World’s Largest Hedge Fund,” *mimeo*, United Kingdom: Smithers & Co.

Stock, J.H. and M.W. Watson (1993), “A Simple Estimator of Cointegrated Vectors in Higher Order Integrated Systems,” *Econometrica* 61, 783-820.

Taylor, A.M. (1994), “Domestic Savings and International Capital Flows Reconsidered,” NBER Working Paper No. 4892.

Taylor, A.M. and J.G. Williamson (1994), “Capital Flows to the New World as an Intergenerational Transfer,” *Journal of Political Economy* 102, 348-371.

United Nations (2000), Demographic Yearbook: Historical Supplement 1948-1997, CD-ROM.

Table 1. Kao (1999) and Pedroni (1999) cointegration tests

	Industrial 1970-98	Industrial 1980-98	Developing 1970-98	Developing 1980-98
Kao (1999) DF ρ* test	10.89	10.42	-15.65	11.62
	(0.00)	(0.00)	(0.00)	(0.000)
Kao (1999) ADF stat, 1 lag	-4.24	-4.48	-4.73	-4.17
	(0.00)	(0.00)	(0.00)	(0.00)
Kao (1999)ADF stat, 2 lags	-4.36	-4.52	-4.29	-4.61
	(0.00)	(0.00)	(0.00)	(0.00)
Pedroni (1999) t stat for $\widehat{\rho}_{NT}$	-333.6	-237.1	-472.4	-315.2
	(0.00)	(0.00)	(0.00)	(0.00)

Note: cointegration tests are performed on the vector including NFA, log GDP per capita, public debt and the three composite demographic variables. The table reports the value of the statistic, with p-values in parenthesis. The null hypothesis in all tests is lack of cointegration. DF (ADF) stands for (augmented) Dickey-Fuller.

Table 2. Determinants of net foreign assets, industrial countries
Panel DOLS regressions with fixed time and country effects

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
	CUMCA	CUMCA	CUMCA+IIP	CUMCA+IIP	CUMCA Balanced
	1970-98	1980-98	1970-98	1980-98	1972-97
Log GDP per capita	0.91	0.91	0.9	0.89	0.94
	(12.63)**	(7.26)**	(12.55)**	(6.71)**	(11.66)**
Public Debt	-0.125	-0.05	-0.124	-0.07	-0.18
	(3.1)**	-0.9	(3.01)**	-1.1	(4.54)**
χ^2 **(Demog.)**	30.1	2.3	22.1	4.2	43.6
	(0.00)**	(0.51)	(0.00)**	(0.24)	(0.00)**
Adjusted R^2	0.89	0.91	0.89	0.93	0.9
No. of observations	516	389	516	382	390
No. of countries	22	22	22	22	15
α **(POP<15)**	-1.47	-0.81	-1.24	-1.2	-2.26
α **(POP>64)**	-0.66	-0.59	-1.29	-0.44	-0.05
α **max**	1.41	0.46	1.24	0.63	1.24
	(50-54)	(35-39)	(50-54)	(30-34)	(50-54)
α **min**	-1.49	-0.81	-1.29	-1.2	-2.26
	(15-19)	(0-14)	(15-19)	(0-14)	(0-14)

* Dynamic ordinary least squares, t-statistics in parentheses (p-value for the χ^2 **(Demog.)** statistic). * (**) indicates statistical significance at the 5% (1%) confidence level. In regressions (1) and (2) the dependent variable is *CUMCA* for all countries except Belgium, for which it is the IIP estimate of net foreign assets minus gold. In regression (3) the dependent variable is the IIP estimate of NFA for Belgium, Canada, Italy, Japan and United Kingdom, and *CUMCA* for all other countries. In regression (4) it is the IIP estimate of NFA for Austria, Belgium, Canada, Finland, Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, United Kingdom and United States and *CUMCA* for the remaining countries.

Table 3. Determinants of net foreign assets, developing countries
Panel DOLS regressions with fixed time and country effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	CUMCA 1970-98 All	CUMCA 1980-98 All	CUMCA 1970-98 No Sing.	CUMCA 1980-98 No Sing.	CUMFL 1970-98 No Sing.	CUMFL 1980-98 No Sing.	CUMCA 1977-97 Balanced
Log GDP per capita	-0.21 (4.59)**	-0.08 (1.05)	-0.29 (6.76)**	-0.2 (2.98)**	-0.31 (6.8)**	-0.25 (3.6)**	-0.26 (3.55)**
Public Debt	-0.67 (14.03)**	-0.67 (13.3)**	-0.73 (16.8)**	-0.71 (14.6)**	-0.86 (21.4)**	-0.86 (19.6)**	-0.50 (8.87)**
χ^2 **(Demog.)**	28.7 (0.00)**	21.2 (0.00)**	5.5 (.14)	4.6 (.20)	12.7 (.01)**	6.4 (.10)	38.7 (0.00)**
Adjusted R^2	0.83	0.87	0.85	0.88	0.89	0.91	0.89
No. of observations	779	590	753	572	728	566	416
No. of countries	39	39	38	38	38	38	16
α **(POP<15)**	-1.01	-0.38	-0.49	-0.78	-0.9	-1.11	-1.17
α **(POP>64)**	-0.522	0.158	2.05	2.47	4.33	4.6	0.55
α **max**	3.92 (50-54)	3.54 (55-59)	2.05 (65+)	2.47 (65+)	4.33 (65+)	4.6 (65+)	5.66 (55-59)
α **min**	-3.92 (20-24)	-3.54 (20-24)	-1.19 (25-29)	-1.1 (20-24)	-1.18 (45-49)	-1.14 (35-39)	-5.67 (20-24)

*Dynamic ordinary least squares, t-statistics in parentheses (p-value for the χ^2 **(Demog.)** statistic). * (**) indicates statistical significance at the 5% (1%) confidence level. In regressions (1)–(4) the dependent variable is *CUMCA*, in regressions (5) and (6) it is *CUMFL*. Regressions (3)-(6) exclude Singapore from the sample.

Table 4. Net foreign assets: cross-sectional regressions

	(1)	(2)	(3)	(4)	(5)
	CUMCA 1990-98 Industrial	CUMCA+IIP 1990-98 Industrial	CUMCA 1990-98 Devel	CUMCA 1990-98 Dev, no Sing	CUMFL 1990-98 Dev, no Sing
Log GDP per capita	0.45 (3.58)**	0.54 (2.92)**	0.18 (2.32)**	0.17 (2.0)**	0.15 (1.6)
Public Debt	0.10 (0.7)	-0.11 (0.35)	-0.44 (4.52)**	-0.45 (4.47)**	-0.65 (5.18)**
χ^2 **(Demog.)**	3.05 (0.38)	2.21 (0.53)	35.3 (0.00)**	33.6 (0.00)**	36.7 (0.00)**
Adjusted R^2	0.45	0.33	0.62	0.57	0.63
No. of observ.	22	22	39	38	38
No. of countries	22	22	39	38	38
α **(POP<15)**	-1.2	394.2	-489.2	-442.3	-276.9
α **(POP>64)**	-0.44	-1314.6	1527.8	1389.0	921.8
α **max**	0.62 (30-34)	424.3 (15-19)	1527.8 (65+)	1389.0 (65+)	921.8 (65+)
α **min**	-1.2 (0-14)	-1314.6 (65+)	-511.9 (20-24)	-464.0 (20-24)	-298.1 (35-39)

* Ordinary least squares, heteroskedasticity-corrected t-statistics in parentheses (p-value for the χ^2 **(Demog.)** statistic). * (**) indicates statistical significance at the 5% (1%) confidence level. In regressions (1) the dependent variable is *CUMCA* for all countries except Belgium, for which it is the IIP estimate of net foreign assets minus gold. In regression (2) the dependent variable is the IIP estimate of NFA for Austria, Belgium, Canada, Finland, Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, United Kingdom and United States and *CUMCA* for the remaining countries. Regressions (3)-(6) refer to the developing country sample, In regressions (3) and (4), the dependent variable is *CUMCA*, in regression (5) it is *CUMFL*. Regressions (4)-(5) exclude Singapore.

Table 5. Changes in net foreign assets: speed of adjustment
Panel regressions, error-correction specification

A. Industrial countries*

	(1)	*(2)*	*(3)*	*(4)*
	CUMCA 1970-98	**CUMCA 1980-98**	**CUMCA+IIP 1970-98**	**CUMCA+IIP 1980-98**
Error Correct.	-0.0990	-0.1430	-0.1068	-0.0966
	(4.70)**	(5.08)**	(5.03)**	(2.61)**
R^2 within	0.31	0.31	0.30	0.16
Observations	539	393	537	374
No. of co.	22	22	22	22

* Ordinary least squares, t-statistics in parentheses (p-value for the χ^2 **(Demog.)** statistic). * (**) indicates statistical significance at the 5% (1%) confidence level. Regressions also include the lagged first difference in *CUMCA*, contemporaneous first differences in the other variables belonging to the *Z* vector and country and time dummies. In regressions (1) and (2) the dependent variable is the change in *CUMCA* for all countries except Belgium, for which it is the change in the IIP estimate of net foreign assets minus gold. In regression (3) the dependent variable is the change in the IIP estimate of NFA for Belgium, Canada, Italy, Japan and United Kingdom, and the change in *CUMCA* for all other countries. In regression (4) it is the change in the IIP estimate of NFA for Austria, Belgium, Canada, Finland, Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, United Kingdom and United States and the change in *CUMCA* for the remaining countries.

B. Developing countries**

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	CUMCA All 1970-98	**CUMCA All 1980-98**	**CUMCA No Sing 1970-98**	**CUMCA No Sing 1980-98**	**CUMFL No Sing 1970-98**	**CUMFL No Sing 1980-98**
Error Correct.	-0.056	-0.094	0.096	-0.151	-0.094	-0.130
	(3.63)**	(4.21)**	(6.11)**	(6.75)**	(5.09)**	(5.09)**
R^2 within	0.47	0.47	0.50	0.52	0.57	0.59
Observations	849	612	822	594	786	585
No. of countr.	39	39	38	38	38	38

** Ordinary least squares, t-statistics in parentheses (p-value for the χ^2 **(Demog.)** statistic). * (**) indicates statistical significance at the 5% (1%) confidence level. In regressions (1)-(4) the dependent variable is the change in *CUMCA*, in regressions (5)-(6) it is the change in *CUMFL*. Regressions also include the lagged first difference in the dependent variable, contemporaneous first differences in the other variables belonging to the *Z* vector and country and time dummies. Regressions (3)-(6) exclude Singapore from the sample.

Table 6. Correlation between actual and fitted change in net foreign assets*

Industrial countries	*No. of obs.*	*CORREL*	*Devel. countries*	*No. of obs.*	*CORREL*
AUSTRALIA	(obs=24)	0.103	ALGERIA	(obs=8)	0.480
AUSTRIA	(obs=27)	0.771	ARGENTINA	(obs=7)	0.889
BELGIUM	(obs=16)	0.387	BOLIVIA	(obs=4)	0.949
CANADA	(obs=27)	0.149	BOTSWANA	(obs=19)	0.661
DENMARK	(obs=18)	0.718	BRAZIL	(obs=18)	0.792
FINLAND	(obs=27)	0.730	CHILE	(obs=10)	0.752
FRANCE	(obs=21)	0.574	COLOMBIA	(obs=27)	0.780
GERMANY	(obs=27)	0.018	COSTA RICA	(obs=27)	0.879
GREECE	(obs=26)	0.697	COTE D'IVOIRE	(obs=8)	0.947
ICELAND	(obs=18)	0.855	DOMINIC. REP.	(obs=5)	0.815
IRELAND	(obs=27)	0.790	ECUADOR	(obs=27)	0.880
ITALY	(obs=27)	0.698	EL SALVADOR	(obs=27)	0.598
JAPAN	(obs=27)	0.137	GUATEMALA	(obs=24)	0.324
NETHERLANDS	(obs=27)	-0.380	INDIA	(obs=24)	0.420
NEW ZEALAND	(obs=27)	0.608	INDONESIA	(obs=26)	0.520
NORWAY	(obs=27)	0.605	ISRAEL	(obs=27)	0.723
PORTUGAL	(obs=25)	0.808	JAMAICA	(obs=27)	0.806
SPAIN	(obs=22)	0.441	JORDAN	(obs=23)	0.769
SWEDEN	(obs=27)	0.710	KOREA	(obs=27)	0.779
SWITZERLAND	(obs=18)	-0.320	MALAYSIA	(obs=27)	0.535
UNITED KINGDOM	(obs=27)	0.169	MAURITIUS	(obs=26)	0.807
UNITED STATES	(obs=27)	0.148	MEXICO	(obs=24)	0.175
			MOROCCO	(obs=27)	0.914
			PAKISTAN	(obs=26)	0.864
			PANAMA	(obs=27)	0.198
			PARAGUAY	(obs=22)	0.779
			PERU	(obs=8)	0.806
			PHILIPPINES	(obs=27)	0.577
			SOUTH AFRICA	(obs=27)	0.602
			SRI LANKA	(obs=25)	0.771
			TAIWAN	(obs=23)	0.706
			THAILAND	(obs=27)	0.458
			TRINIDAD&T.	(obs=21)	0.765
			TUNISIA	(obs=27)	0.756
			TURKEY	(obs=22)	0.449
			URUGUAY	(obs=24)	0.869
			VENEZUELA	(obs=27)	0.323
			ZIMBABWE	(obs=20)	0.634

* Correlation coefficient between actual and fitted values of changes in the ratio of net foreign assets to GDP. Regressions for the period 1970-98 corresponding to column (1) in Table (5), panel A for industrial countries and column (5) in Table 5, panel B for developing countries.

Table 7. Trade balance, fitted changes in NFA and returns (bivariate panel regressions)

A. Industrial countries, 1970-98

	(1)	(2)	(3)	(4)	(5)
	Tr. Bal.	Tr. Bal.	Tr. Bal.	Tr. Bal.	Tr. Bal.
TB(t-1)	0.69	0.66	0.68	0.67	0.64
	(21.15)**	(20.79)**	(21.26)**	(20.70)**	(16.64)**
Adj. Returns	-0.08				
	(3.44)**				
Returns		-0.21			
		(6.56)**			
Inv. income			-0.44		
			(5.74)**		
Capital gain				-0.16	
				(4.45)**	
Fitted $\widehat{\Delta b_{it}}$					0.11
					(2.34)*
R^2 (within)	0.48	0.51	0.50	0.48	0.46
R^2 (between)	0.99	0.84	0.54	0.99	0.98
Observations	530	530	530	530	489
No. of countries	20	20	20	20	20

B. Developing countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Tr. Bal.	Tr. Bal.	Tr. Bal.	Tr. Bal.	Tr. Bal.	Tr. Bal.	Tr. Bal.
	CUMCA	CUMFL				CUMCA	CUMFL
TB(t-1)	0.55	0.55	0.53	0.49	0.56	0.47	0.50
	(21.16)**	(20.75)**	(20.04)**	(19.27)**	(21.23)**	(14.55)**	(15.00)**
Adj. Returns	-0.11	-0.11					
	(5.29)**	(5.74)**					
Returns			-0.20				
			(5.09)**				
Inv. income				-0.82			
				(11.94)**			
Capital gain					0.04		
					(0.90)		
Fitted $\widehat{\Delta b_{it}}$						0.17	0.09
						(5.88)**	(3.53)**
R^2 (within)	0.33	0.33	0.33	0.40	0.31	0.31	0.28
R^2 (between)	0.96	0.98	0.90	0.55	0.98	0.92	0.92
Observations	1032	1001	1032	1041	1032	773	742
No. of co.	41	41	41	41	41	38	38

The dependent variable is the balance on goods, services and transfers as a ratio of GDP. All regressions include fixed country effects, t-statistics in parenthesis. ** (*, +) denotes significance at the 1% (5%, 10%) confidence level. Returns, investment income and capital gains do not depend on the definition of NFA. Adjusted returns are total returns minus the adjustment term capturing the effects of growth in US$ GDP on net foreign assets. $\widehat{\Delta b_{it}}$ is the fitted value of changes in NFA from a first-difference regression of changes in NFA on changes of its long-run determinants and an ECM term. Regressions for industrial countries exclude Belgium and Ireland. Regressions for developing countries exclude Singapore.

Table 8. Trade balance, fitted changes in NFA and returns
Multi-variate panel regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	CUMCA Industr 1970-98	CUMCA Industr 1980-98	CUMCA Devel. 1970-98	CUMCA Devel. 1980-98	CUMFL Devel. 1970-98	CUMFL Devel. 1980-98
TB(t-1)	0.61	0.64	0.35	0.33	0.39	0.36
	(16.43)**	(14.61)**	(11.79)**	(9.28)**	(12.79)**	(10.12)**
Inv. income	-0.48	-0.36	-0.84	-0.86	-0.84	-0.88
	(6.12)**	(3.83)**	(10.42)**	(9.16)**	(10.13)**	(9.04)**
K-gain	-0.16	-0.14	-0.18	-0.17	-0.16	-0.14
	(4.56)**	(4.22)**	(3.82)**	(3.21)**	(3.27)**	(2.60)**
Growth effect	-0.04	-0.02	-0.27	-0.25	-0.26	-0.25
	(1.31)	(0.65)	(9.28)**	(7.73)**	(8.95)**	(7.59)**
Fitted $\widehat{\Delta b_{it}}$	0.14	0.08	0.39	0.36	0.28	0.26
	(2.79)**	(1.66)	(11.37)**	(9.67)**	(9.41)**	(7.89)**
R^2 (within)	0.52	0.51	0.47	0.45	0.45	0.42
R^2 (between)	0.58	0.75	0.88	0.84	0.86	0.84
Observations	489	358	764	575	734	566
No. of countries	20	20	38	38	38	38

t-statistics in parenthesis. * (**) denotes significance at the 5% (1%) confidence level. The growth effect is defined as minus the impact of US$ GDP growth on outstanding net foreign assets ($-\frac{\gamma_{it}}{1+\gamma_{it}} b_{i,t-1}$). The industrial country sample excludes Belgium and Ireland. The developing country sample exclude oil-producing countries and Singapore.

Table 9. Real Interest Differentials: Panel Regressions

Panel DOLS regressions with fixed time and country effects

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
	Real int. rate	Real int. rate	Real int. rate	Real int. rate	Real int. diff.	Real int. diff.	Real int. diff.	Real int. diff.
Net Foreign Assets	-4.21 (3.2)**	-4.44 (3.31)**	-3.04 (2.01)*	-3.09 (1.87)+	-4.7 (3.51)**	-4.61 (3.49)**	-3.85 (2.52)*	-3.79 (2.53)*
D(log(RER))		-0.024 (1.07)		-0.03 (1.19)		-0.05 (2.94)**		-0.06 (3.13)**
Adjusted R^2		0.56	0.41	0.41	0.49	0.5	0.55	0.56
No. of observations	482	464	380	362	456	456	361	361
No. of countries	21	21	21	21	20	20	20	20

*Sample is Industrial Countries, with exception of Iceland. Dependent variable in regressions (1)-(4) is real interest rate. In regressions (5)-(8), dependent variable is real interest differential vis-à-vis the US. In regressions (2) and (4), multivariate real exchange rate is employed; in regressions (6) and (8), it is bivariate real exchange rate vis-à-vis the US.

Table 10. Real Interest Differentials: Cross-Section Evidence

	(1)	(2)	(3)	(4)
	Real int. r.	Real int. r.	Real int. diff.	Real int. diff.
Constant	3.71	3.71	2.2	2.2
	(13.3)**	(12.9)**	(8.4)**	(6.5)**
Net Foreign Assets	-3.18	-3.15	-3.36	-3.38
	(3.48)**	(2.83)*	(3.6)**	(2.46)*
D(log(RER))		-2.78		1.03
		(.11)		(.04)
Adjusted R^2	0.27	0.23	0.36	0.32
No. of countries	21	21	20	20

*Sample is Industrial Countries, with exception of Iceland. Dependent variable in regressions (1)-(2) is real interest rate. In regressions (3)-(4), dependent variable is real interest differential vis-à-vis the US. In regression (2), multivariate real exchange rate is employed; in regression (4), it is bivariate real exchange rate vis-à-vis the US.

Figure 1A. Distribution of net foreign asset positions, industrial countries*

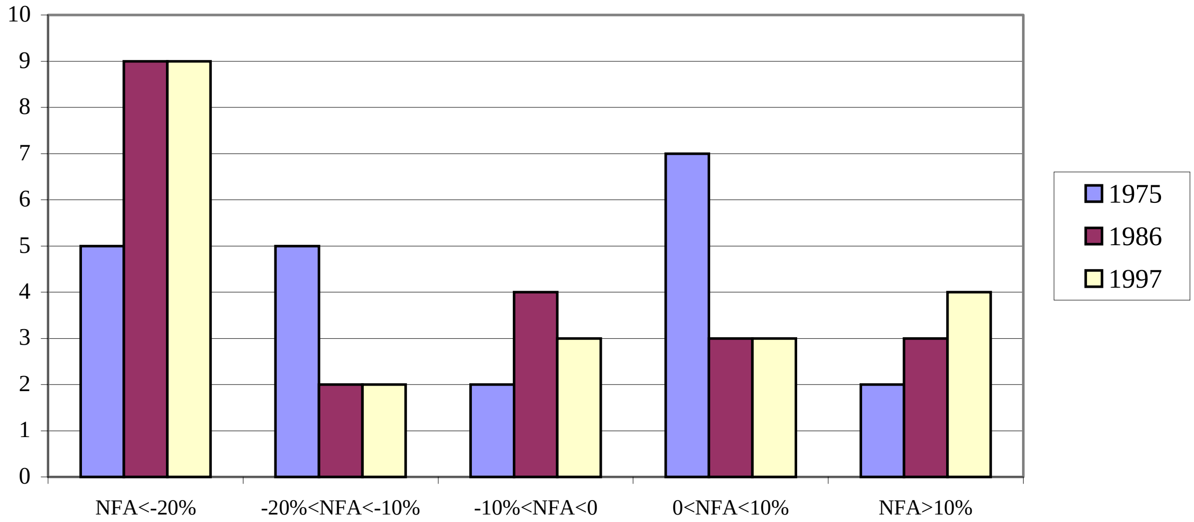
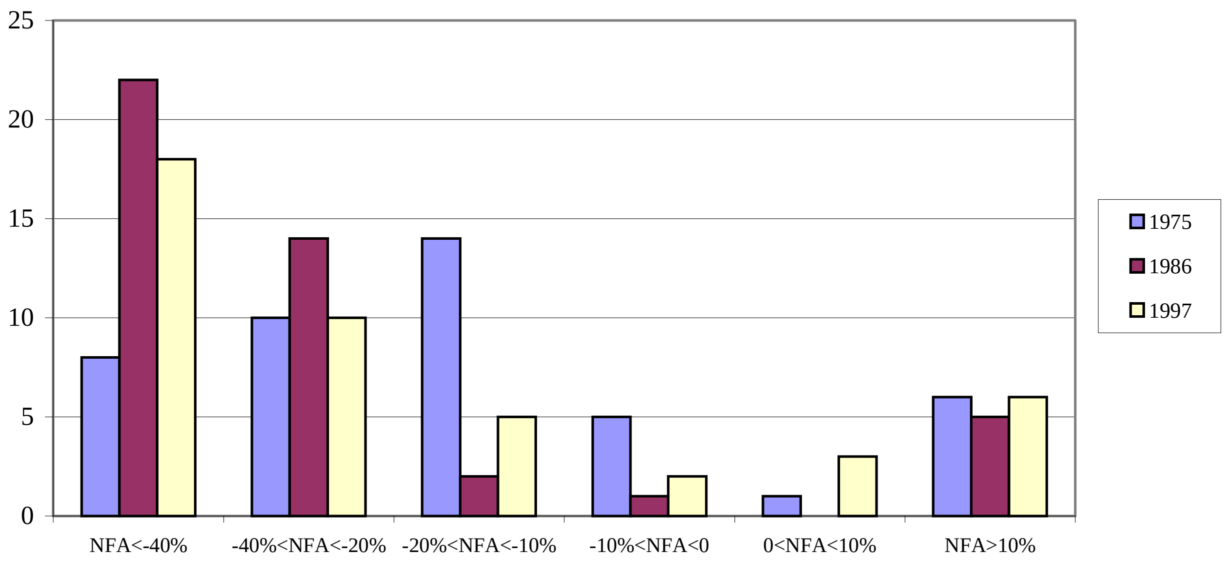
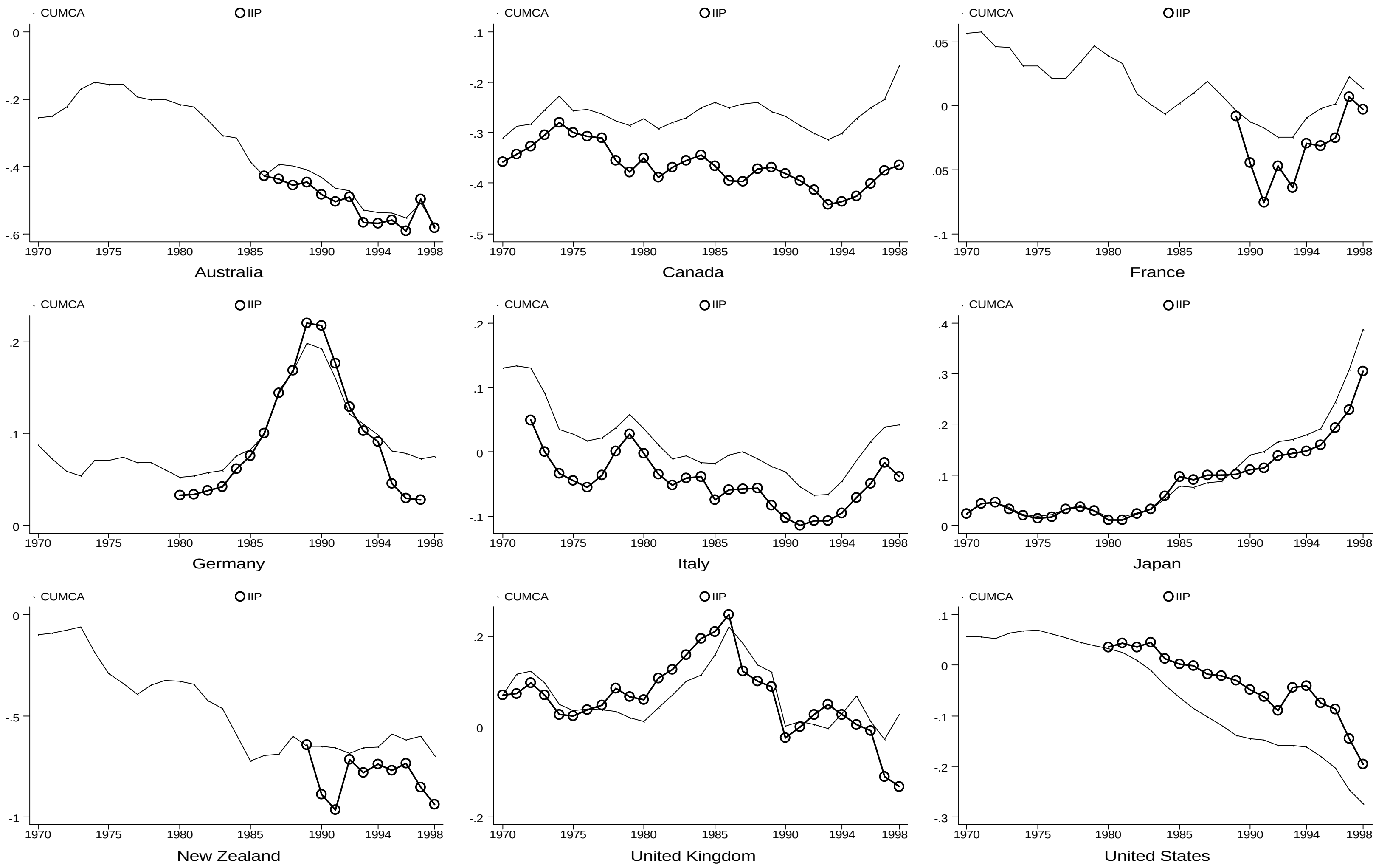


Figure 1B. Distribution of net foreign asset positions, developing countries*



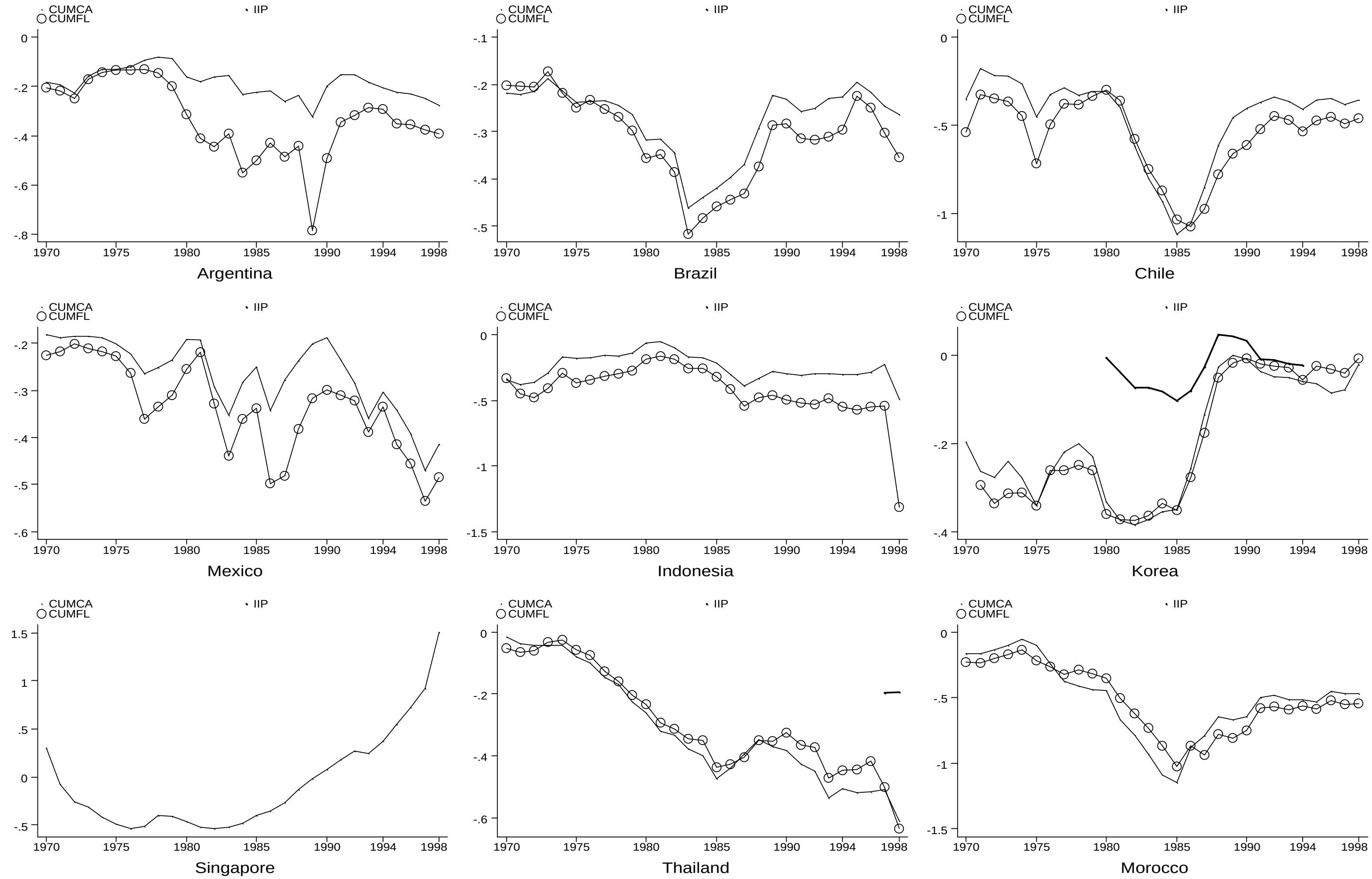
* Number of countries with net foreign asset position in the given range on the specific year on the vertical axis.

Figure 2. Net Foreign Assets, Industrial Countries



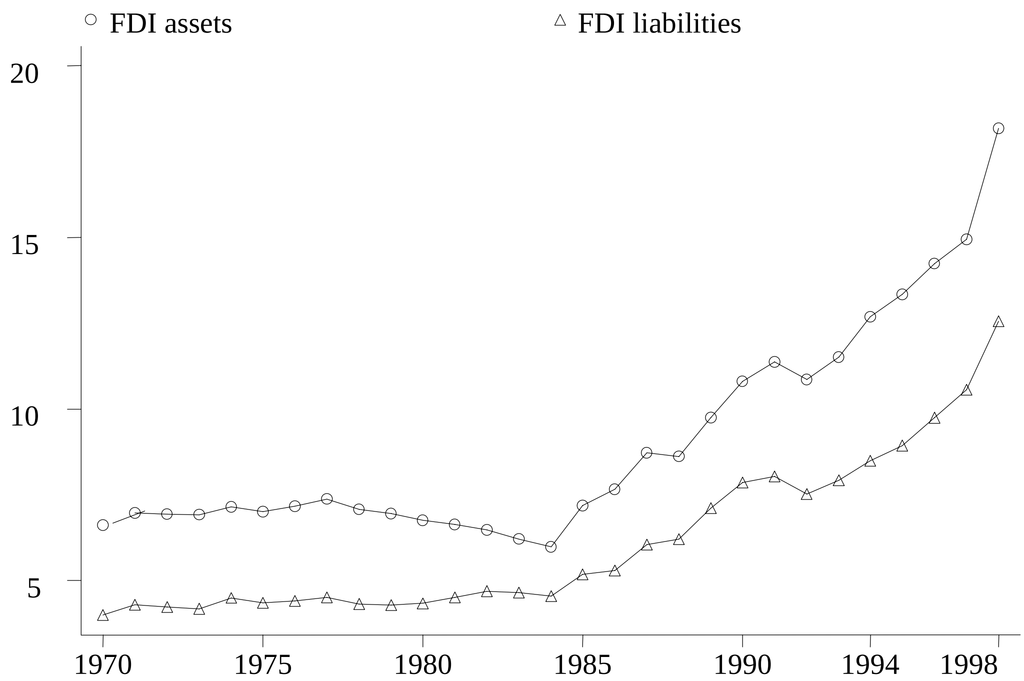
International investment position (*IPNFA*)
Adjusted cumulative current account (*CUMCA*)

Figure 3. Net Foreign Assets, Developing Countries



International investment position (*IPNFA*)
Cumulative current account (*CUMCA*)
Cumulative capital flows (*CUMFL*)

Figure 4. FDI and portfolio equity stocks, industrial countries



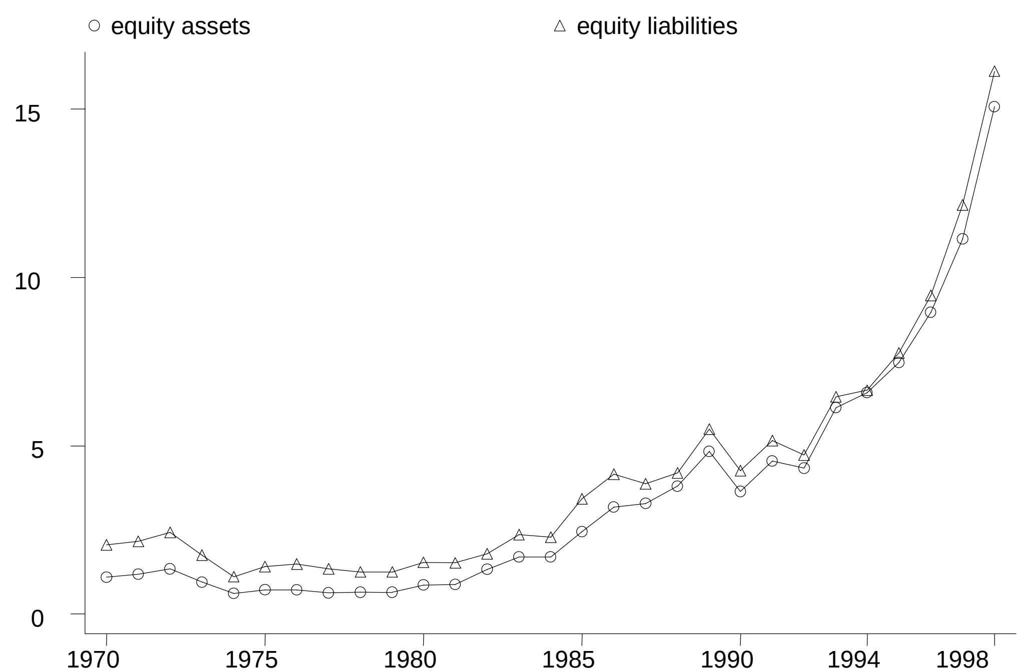


Figure 5. Composition of external liabilities, developing countries

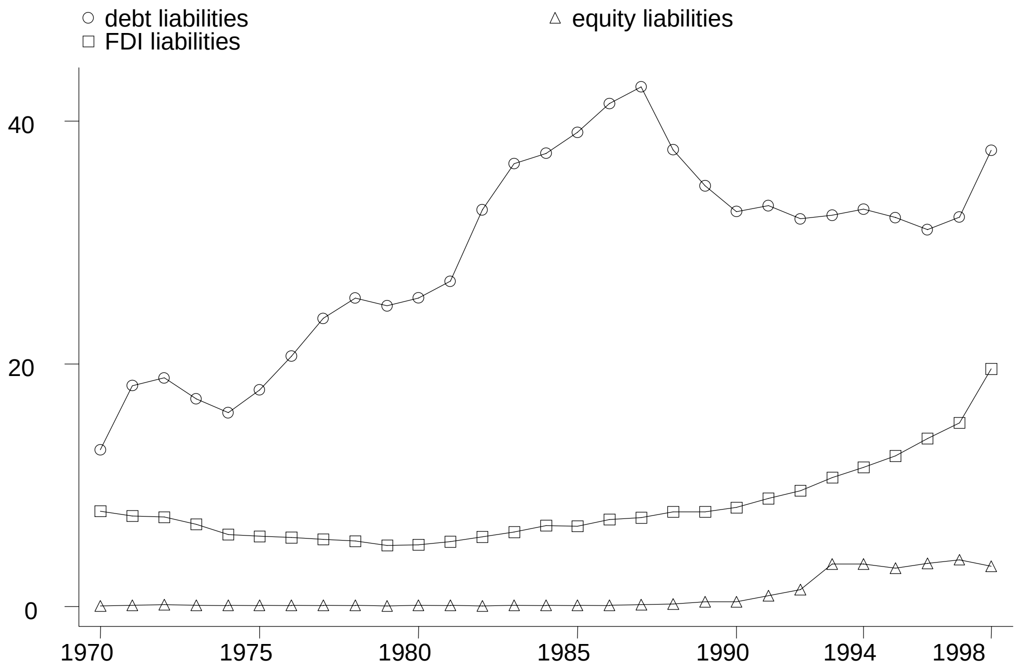
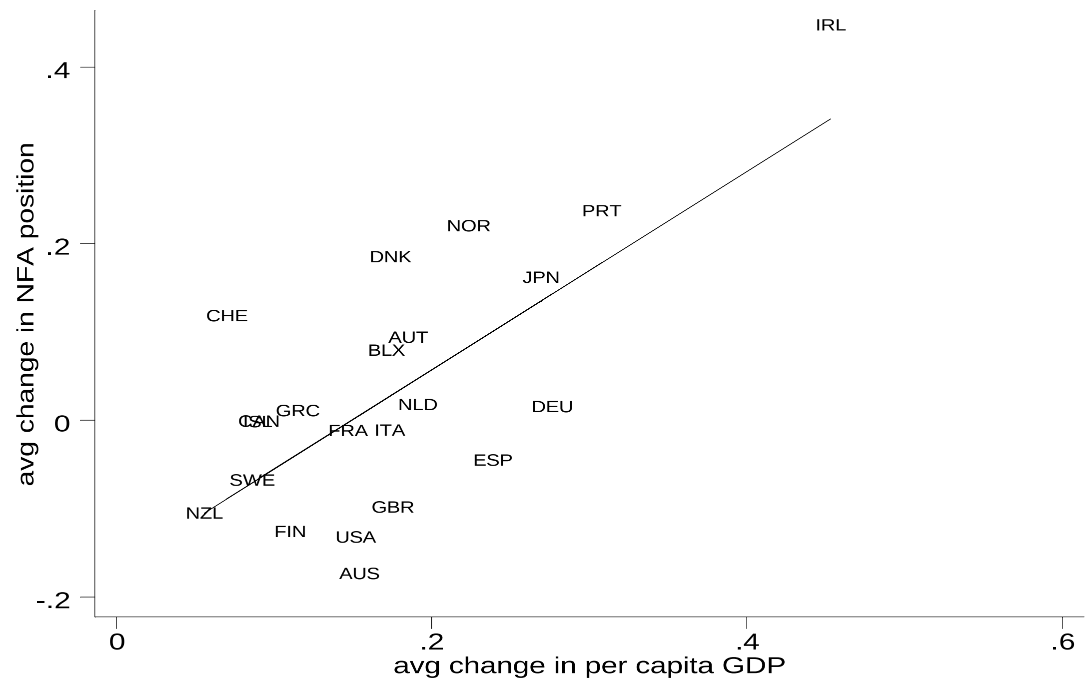


Figure 6. Net foreign assets and GDP per capita
(average change, 1990-98 over 1980-89)

A. Industrial countries



B. Developing countries

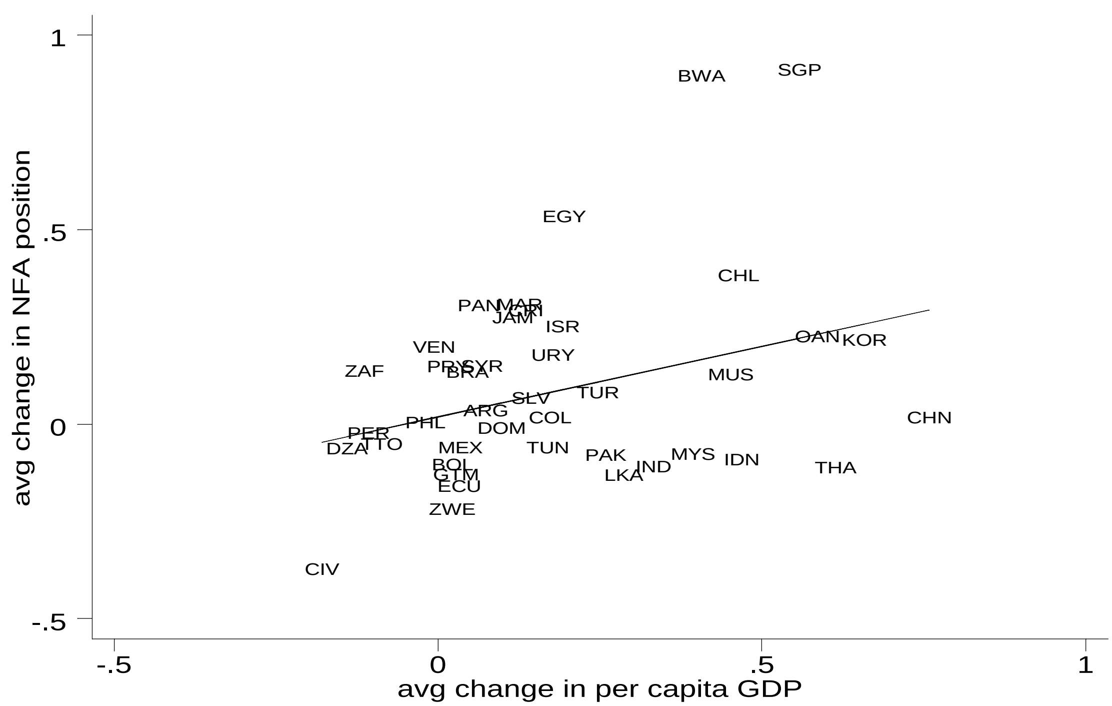
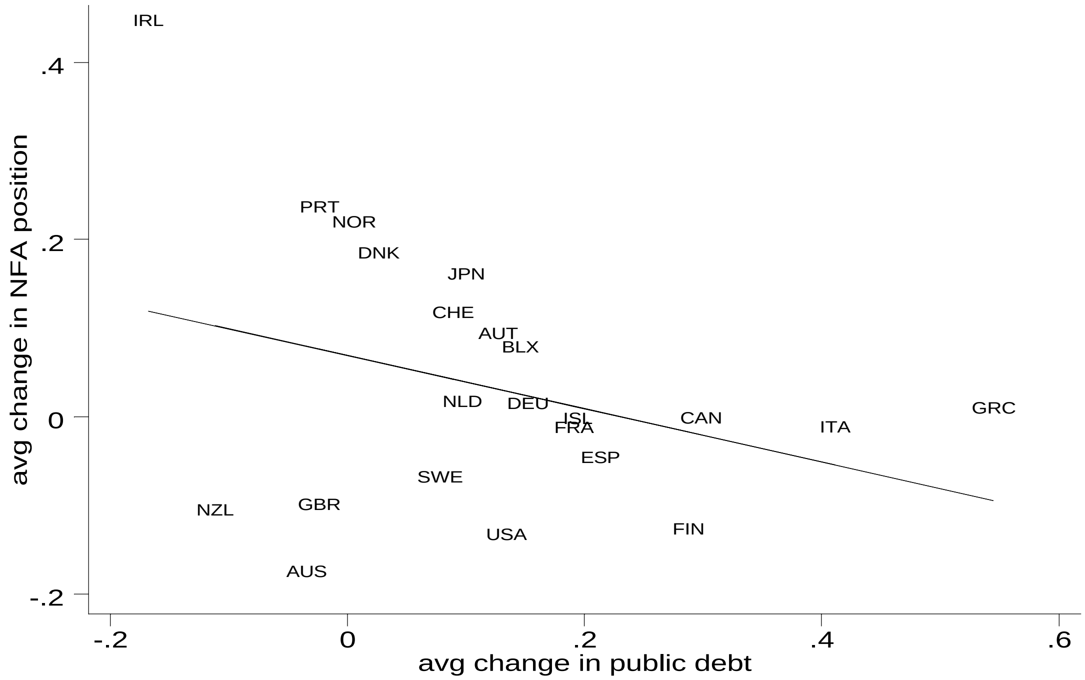


Figure 7. Net foreign assets and public debt
(average change, 1990-98 over 1980-89)

A. Industrial countries



B. Developing Countries

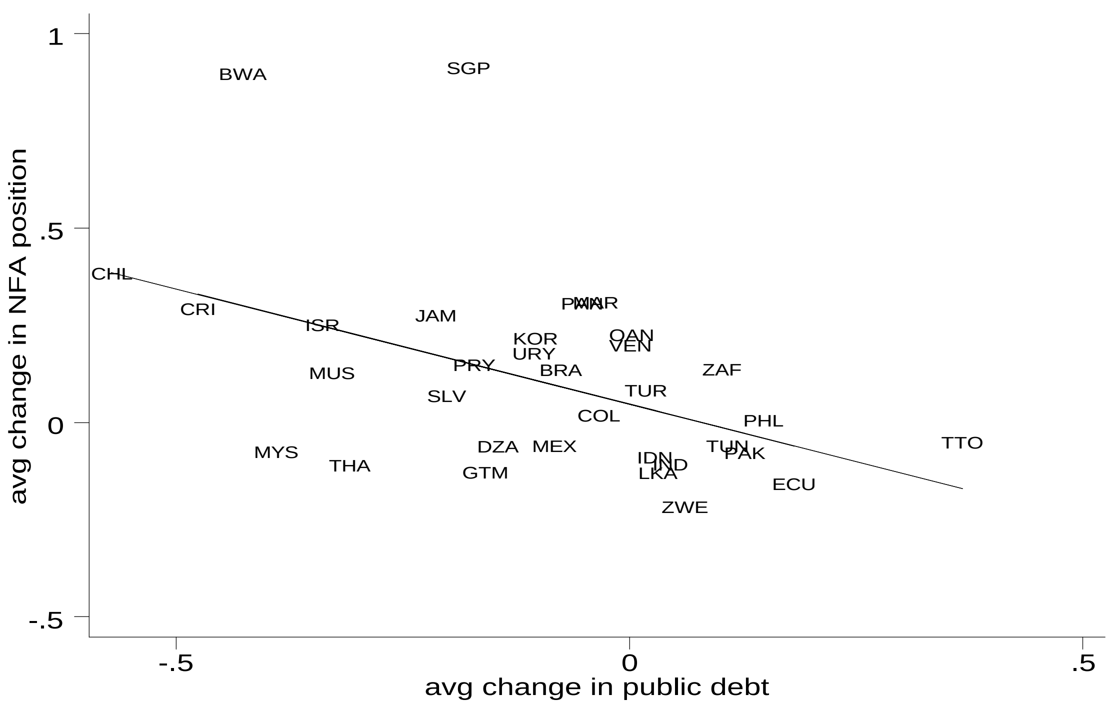
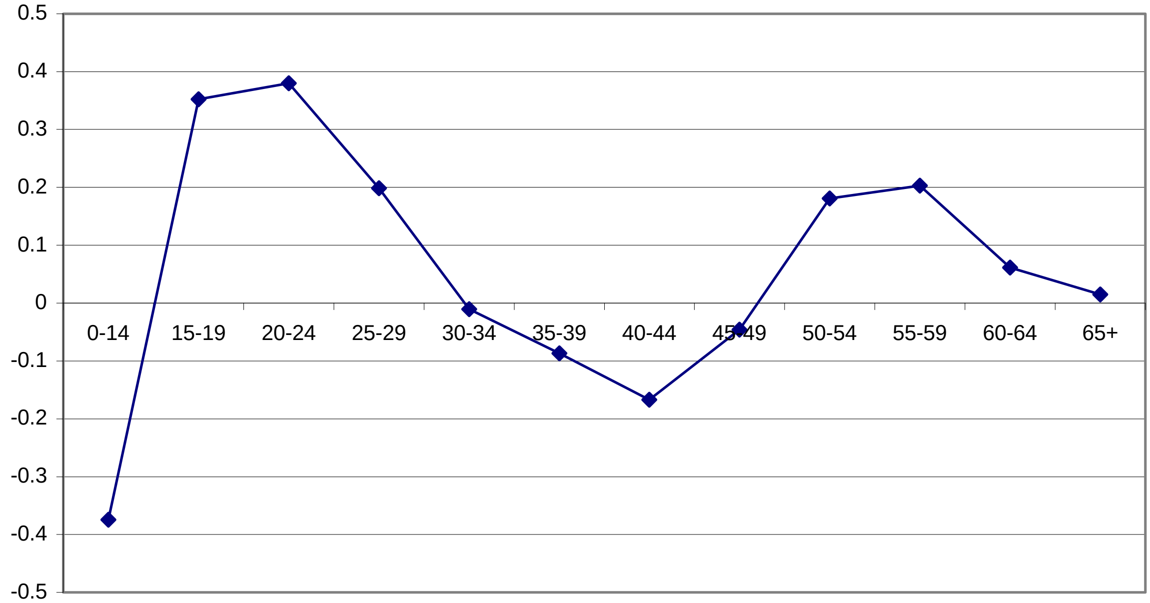


Figure 8. Impact of change in demographics on change in net foreign assets.
(average change, 1990-98 over 1980-89)

A. Industrial countries



B. Developing countries

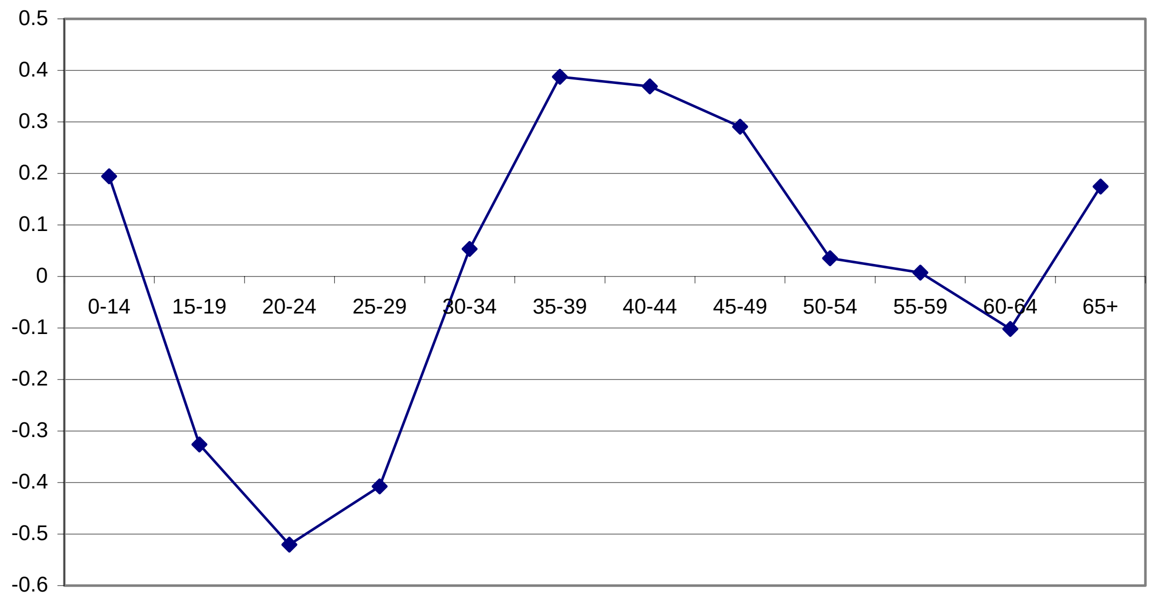


Figure 9A. Actual and fitted values, net foreign assets, selected industrial countries

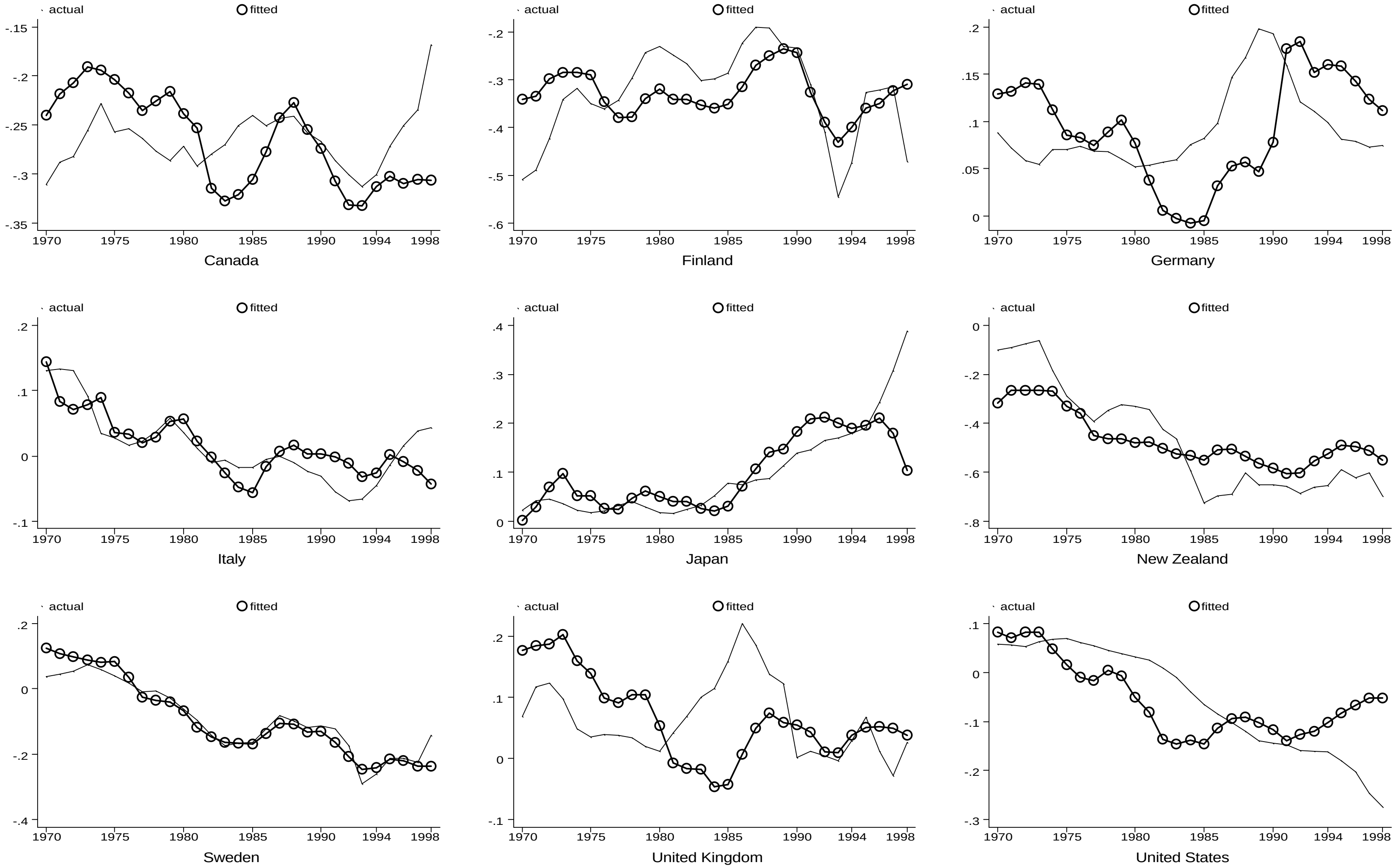


Figure 9B. Actual and fitted values, net foreign assets, selected developing countries

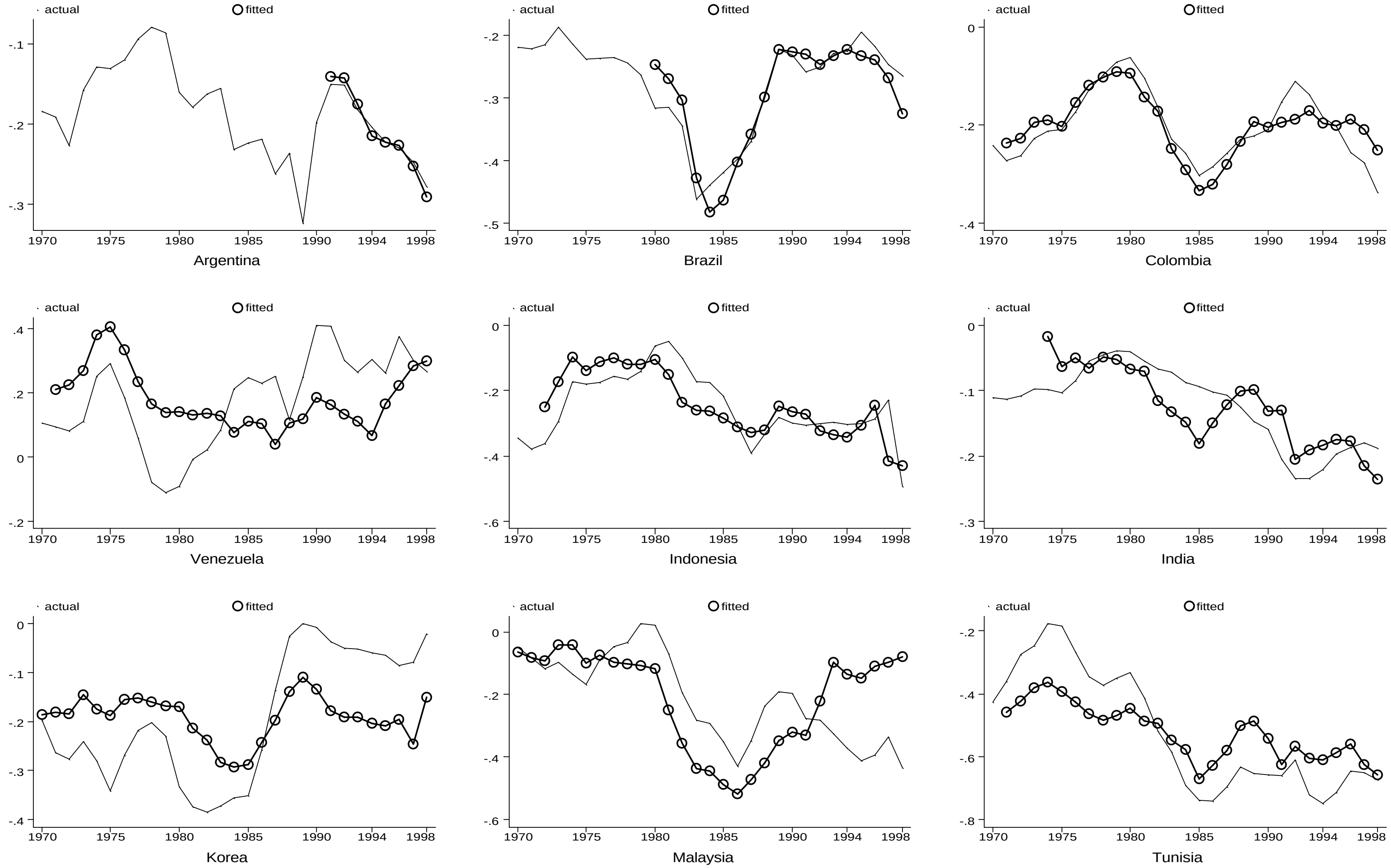
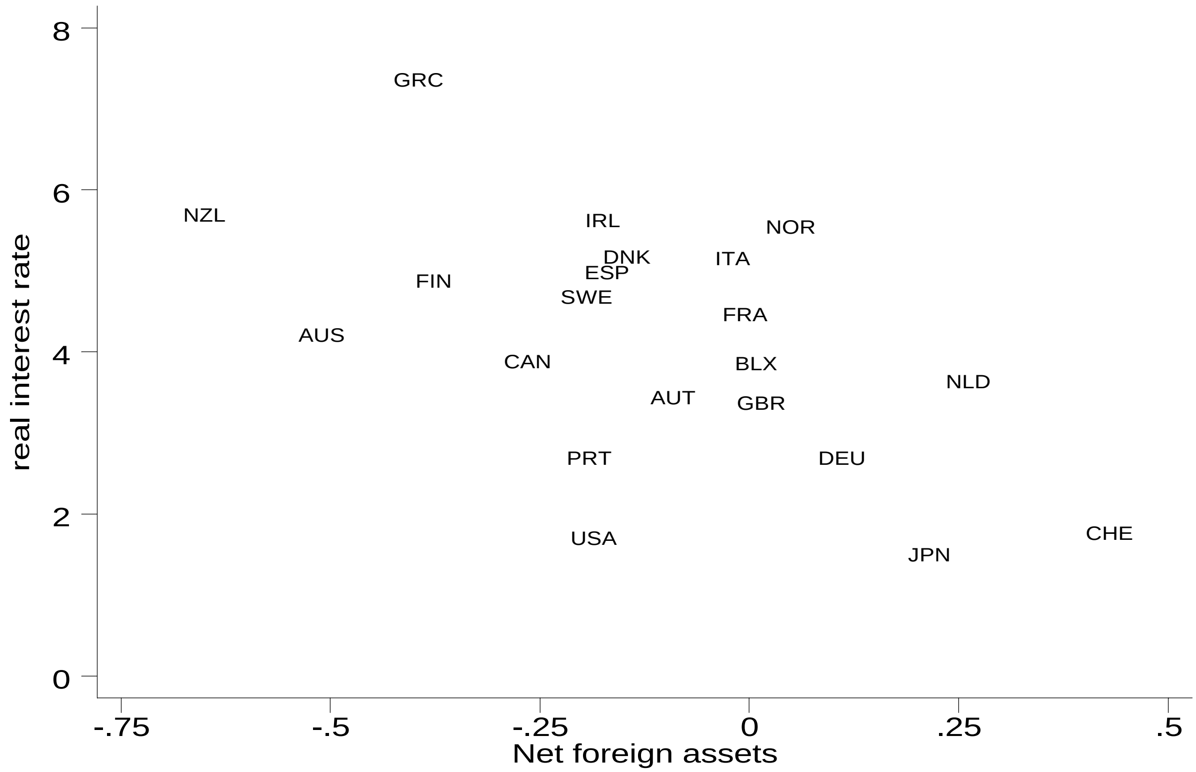


Figure 10. Real interest rates and net foreign assets*



* Average data, 1990-1998.