

International Capital Flows to Emerging and Developing Countries: National and Global Determinants*

Joseph P. Byrne[§] and Norbert Fiess[†]

[§] *Economics, University of Glasgow, Glasgow, UK*

[†] *World Bank, Washington DC, USA*

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Abstract

This paper examines international capital flows to emerging and developing countries. We assess whether commonalities exist, the permanence of shocks to commonalities and their determinants. Also, we consider individual country coherence with global capital flows and we measure the extent of co-movements in the volatility of capital flows. Our results suggest there are commonalities in capital inflows, although aggregate or disaggregate capital flows respond differently to shocks. We find that the US long run real interest rate is an important determinant of global capital flows, and real commodity prices are relevant but to a lesser extent. We also find a role for human capital in explaining why some countries can successfully ride the wave of financial globalisation.

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1. Introduction

It is frequently suggested that international capital flows improve economic welfare, both for capital exporters and capital importers. Although, in almost equal measure, it is argued that these capital flows can have negative consequences. Capital flows, especially portfolio flows, can be volatile. Excessive dependence on flows exposes a country to capricious capital market participants. This is discussed extensively in the literature on Sudden Stops, which delineates incidence of the rapid cessation of capital inflows and its implications for recipients. With financial openness comes contagion and herding behaviour, countries pursuing coherent macroeconomic policies and providing substantial returns to investment are downgrade inappropriately with dire consequences for capital flows and the wider economy. Undoubtedly the impact of capital inflows is a contentious area of research and policy, and the consequences of the choice whether to encourage them or not will naturally involve some risk and return trade-offs. One hopes that if we identified what drives capital flows we would be able to shed greater light on whether, on balance, they are welfare improving.

The world has become increasingly financially integrated. Lane and Milesi-Ferretti (2008) document the degree of global capital market integration. Recently, industrial countries have embarked upon a period of intense integration, with emerging and developing countries having also integrated, albeit to a lesser extent. This had implications for the transmission of the Global Financial Crisis. What determines the magnitude and time variation of capital flows to emerging and developing countries? We can consider both why capital is diverted away from industrial countries and what is it about emerging and developing countries themselves which encourages capital inflows. Calvo, Leiderman and Reinhart (1993) were early exponents of global and idiosyncratic

determinants of capital flows. Reinhart and Reinhart (2008) emphasize the importance of global factors in driving capital flows to emerging and developing countries. They suggest commodity prices, international interest rates and economic growth in the world's largest economies account for a considerable proportion of the variation in flows. Lucas (1990) suggests human capital differences may explain why capital flows to some countries and not others. In contrast, Alfaro, Kalemli-Ozcan and Volosovych (2008) present empirical evidence suggesting that the quality of institutions in the recipient country may be important in determining the extent of capital flows.

In this study we consider capital inflow in emerging and developing countries data for up to 78 countries from 1993 to 2009. It is not necessarily realistic to believe that aggregate and disaggregate capital flows display the same time series properties, cross sectional correlation or determinants. Consequently, we examine both aggregate and disaggregate portfolio flows for our sample of countries. Rothenberg and Warnock (2006) are of the view that net capital flows conflate Sudden Stops and Sudden Flights, the latter (former) the rapid departure of domestic (foreign) investors, and since they may be driven by different factors it is therefore important to differentiate capital inflows and outflows. Kose, Prasad and Terrones (2008) suggest disaggregate capital flows have a different effect on Total Factor Productivity depending upon whether this is equity or debt. Contessi et al. (2009) and Contessi and De Pace (2009) argue that disaggregate capital flow data may be informative for aggregate capital flows since the disaggregate data have differing economic characteristics.

This study uses a panel time series methodology and endeavours to make five contributions to the empirical literature on financial globalisation. We first seek to identify whether there are common components in our capital inflow data using Ng's

(2006) correlation methodology. Ng's "Uniform Spacings" approach can be used to identify the proportion of countries that have statistically significant bivariate correlations, and hence the degree to which there are commonalities in the data. We also use Bai and Ng (2004) Panel Analysis of Nonstationarity in Idiosyncratic and Common components (PANIC) approach, to identify whether the data can be represented by a principal component using an information criteria developed by Bai and Ng (2002). Secondly, we use the PANIC approach to identify whether any common component has a stochastic trend and whether the idiosyncratic component (which excludes common elements) has a stochastic trend. This allows us to understand the extent of co-movement in capital flows, and whether shocks have temporary or permanent effects upon these commonalities. Thirdly, we examine what drives the common component, whether macro developments in the US and industrial countries are important in driving global capital flows. Fourthly, we examine the extent to which individual countries are associated with the common factor based on their institutional characteristics, financial openness and human capital. For this we use data from the PRS Group (2001), Chinn and Ito (2008) and Barro and Lee (2000) respectively. Finally, given that the variability of capital flows can have welfare implications and that this is a under examined area of the literature, we consider whether there are commonalities in the volatility of capital flows across countries.

To preview our main results, we find that there are commonalities in capital inflows, but these depend upon whether we consider aggregate or disaggregate capital flows. Shocks have permanent effects to the common element in capital inflows, irrespective of the type of capital flow. We find a crucial role for US long run real interest rates as an important determinant of this common element, and a role for commodity

prices to a lesser extent, consistent with the argument from Reinhart and Reinhart (2008). We also find that human capital is important in explaining why some countries benefit from capital inflows and some others do not, as suggested by Lucas (1990). Finally we identify some commonalities in capital flows volatility. This would imply that some of the problems created by capricious capital markets are not of emerging and developing countries doing. This paper is structured as follows. Section 2 provides a literature review and Section 3 sets out the data. Section 4 presents our aggregate and disaggregate capital flow results, considers evidence of commonalities, its time series properties and its determinants. Section 5 concludes and makes policy recommendations.

2. Brief Literature Review

At a basic microeconomic level, capital inflows are perceived to be welfare improving: they can change the time profile of consumption and can exploit a high Marginal Product of Capital (MPK). At the macroeconomic level they augment physical capital, productivity and economic growth.¹ However, Feldstein and Horioka (1980) were early exponents of the argument that capital may not fully exploit international investment opportunities. The failure of capital flows to fully exploit MPK differentials is known as the Lucas (1990) Paradox. More generally, this is also the *modus operandi* in the literature on Home Bias in Equity, see Lewis (1999) for a discussion. Barriers to international investment come in a number of forms. For example, market segmentation due to legal barriers, transaction costs, liquidity constraints, informational and herding

¹ See Henry (2003) for a discussion of the impact of capital inflows on investment. Obstfeld (1994) and Kose et al. (2008) consider the impact on productivity. Prasad, Rogoff, Wei and Kose (2003) examine the evidence on the impact on economic growth and suggest there may be some threshold effects based on country characteristics. The Macroeconomic Trilemma implies countries need to pursue coherent macro policies once an economy is open financially, and this is another potential benefit of financial globalisation. For further discussion see Obstfeld and Taylor (2004), Mishkin (2008) and Obstfeld (2009).

barriers, exchange rate risk and banking crisis (see Warnock, 2002, Reinhart and Rogoff, 2004, Caballero et al., 2008, and Mishkin, 2008).

Although many argue that capital flows are welfare enhancing and seek to rationalise why they are insufficient, others emphasize the negative consequences of international capital flows. The volatility of capital flows, in particular, portfolio flows is the prime argument for believing financial globalisation can be welfare reducing for emerging and developing countries, see Rodrik (1998) and Stiglitz (2002).² Exogenous shocks lead to this withdrawal of capital flows, and these could be international or domestic in origin, as in the literature on Sudden Stops and Sudden Flights (see Calvo and Reinhart, 2000, and Rothenberg and Warnock, 2006). Reduced capital flows will be correlated with a decline in sentiment, reduced investment, output and employment. Our study seeks to shed light on these welfare implications by adding to the literature on the nature of capital flows. By examining whether individual countries are partly responsible for capital flows, whether global factors determine the level and volatility of flows and whether shocks are permanent or temporary.

For these reasons it is important to examine whether there are commonalities in international capital flows and what drive these common flows. There exists some empirical work in this area for advanced and emerging economies. Contessi and De Pace (2009) examine whether there is a common factor in aggregate and disaggregate capital flows in the European Union. They find evidence of a common factor for disaggregate flows but not for aggregate flows, highlighting the importance of separating flow by asset type. Furthermore, it is important to consider the following question: if a number of countries are influenced by common flows, what drive these commonalities? Reinhart

² See also Ju and Wei (2006) for a model incorporating the idea that capital flows may be excessive on the basis of factor price equalization.

and Reinhart (2008) examine the relationship between capital flows and two measures of global economic activity. The first measure is real per capital GDP growth in advanced economies. A slow down in growth in advanced economies leads to an expansion of capital flows to emerging market economies, to take advantage of higher yields. The second global determinant is an index of real non-oil commodity prices. Reinhart and Reinhart present evidence of a statistically significant and positive (negative) relationship between commodity prices (economic growth) and capital inflows between 1967 and 2006. Frankel (2008) illustrates a potential link between strong commodity prices and low real interest rates. Finally, Reinhart and Reinhart (2008) consider the direct impact of short term real interest rates on capital flows, following the proposal of Calvo, Leiderman and Reinhart (1993). A fall in real rates of return in industrial countries leads to an increase in capital flows to emerging market economies, as investors search for higher rates of return. They measure capital inflows using current accounts and we go beyond this in our analysis by using actual capital inflow data.³

In addition to industrial countries growth and short term interest rates, there are other potential determinants of capital inflows to poorer countries. Long run interest rates may be equally important to short rates, or indeed more so, if investors substitute out of the long end of the yield curve and the expectation hypothesis of the term structure does not hold. Moreover, investment opportunities may be driven by uncertainty in advanced economies. This is related to the literature on investment and uncertainty, initiated by Dixit and Pindyck (1994). A recent and popular measure of US uncertainty is the *VIX* index of the Chicago Board. This is a measure of uncertainty in stock returns. It can

³ Maćkowiak (2008) discusses the impact of US monetary policy on fluctuations in emerging market economies. The impact of US monetary policy upon country spreads in emerging market economies is examined in Uribe and Yue (2006).

measure risk aversion in global capital markets and the extent to which capital market participants would like to take open positions in industrial countries or in alternative markets.

Another question we ask in this study is why some countries benefit from the wave of financial globalisation and others do not? In other words, why have only some, and not all, countries receive substantial capital inflows as a consequence of the recent period of interconnectedness? At a simple level current and capital account openness would appear to be an obvious reason why some countries receive more than their fair share of capital inflows. A country decides to open markets and foreign capital immediately flows in. However, this is to ignore the other potential obstacles to capital inflows, and indeed the case of China, which has received substantial capital inflows but does not have a liberalised financial account. A range of financial openness variables have been developed by the literature. We examine the importance of the measure by Chinn and Ito (2008) for capital inflows.

Other potential national determinants of capital inflows are the level of human capital in a country and the general quality of institutions, based on a suggestion from Lucas (1990) and North (1994) respectively. The main question in this line of research on the Lucas (1990) Paradox is why capital does not flow from rich to poor countries, despite a high relative marginal product of capital in, for example, India relative to the United States.⁴ Lucas (1990) suggests that accounting for human capital can reduce or indeed completely eliminate the differential in rates of return across different countries, assuming that human capital spillovers are internalized within a country. North (1994)

⁴ See Acemoglu (2009) outlines the Lucas Paradox within the context of the neoclassical growth model. See Caselli and Feyrer (2007) and Mello (2009) for recent progress in the measurement of the marginal product of capital for a large sample of countries.

suggested institutions may be important for capital flows and the role of institutions is considered in a systematic empirical framework by Alfaro et al. (2008) between 1970 and 2000. They suggest low institutional quality is the leading explanation for the Lucas Paradox. We utilise the International Country Risk Guide's (ICRG) variables from The PRS Group (2001) as a measure of the quality of institutions across countries and relate this to the extent of capital flows. In summary, we seek to discriminate between financial openness, the quality of institutions and also human capital in our subsequent analysis in explaining why some countries receive substantial capital inflows and some others do not.

3. Data

In this study we use quarterly data on capital inflows in up to 78 emerging and developing countries and a list of countries is provided in the Data Appendix. The quarterly inflow data is in per millions of US\$ from Euromoney Bondware and Loanware. The sample period is 1993Q1 to 2009Q1. We have three sources of disaggregate capital inflow data: Equity Issuance, Bond Issuance and Syndicated Bank Lending. We avoid a difficulty flagged by Rothenberg and Warnock (2006), since we use capital inflows and we do not conflate foreign and domestic investors which occurs when net capital flows are examined. We combined these three measures to represent our aggregate capital inflow data, where a country had data for the three asset types. Since our data set has a number of zero observations, we exclude countries in which we have less than four quarterly observations out of a potential 65 time series observations.

<FIGURE 1 ABOUT HERE>

In the last two decades according to Cardarelli et al. (2009) there have been two waves of capital inflows across emerging market economies. The first, in 1997, which

preceded the Asian Crisis. Then more recently a second wave which preceded the Global Financial Crisis (2007-2009). From Figure 1 the evidence is consistent with the idea that there has been one great wave of financial integration in the 2000s and two less important ripples (leading up to the Asian Crisis and also the US Dot Com Bubble in 2000). The great wave of financial integration ended with global financial crisis. It is worthwhile pointing out that, unlike the increase in the amplitude of sea waves as they approach the shallows of the shore, this most recent and large financial wave has been associated with a deepening of financial markets in emerging economies (see Lane and Milesi-Ferretti, 2008). Furthermore, bank flows have been fairly resilient during the financial crisis compared to equity flows, which since the 1990s have become more important than bond flows. Kose et al. (2007) argue that the ability of emerging economies to share consumption risk is hindered by limited access to external debt, although this contrasts with some of the data presented here.⁵

Figure 1 illustrates that at the disaggregate level, bank and bond flows were of a similar order of magnitude in the 1990s, and equity flows were a lesser amount relative to bank and bond flows. Bank flows increased substantially in the 1990s, as did equity flows such that they dominated bonds flows for our sample of countries.⁶ Descriptive statistics provided in Table 1 illustrate the greater relative importance of bank and bond flows for our sample of countries. Whilst equity is on average a lesser quantity, equity has a higher standard deviation than bond flows and a greater maximum and minimum range.

<TABLE 1 ABOUT HERE>

⁵ One idea popularized after the beginning of the financial crisis was that emerging market economies would decouple from the crisis. This has not been the case recently.

⁶ Some caution is required in the interpretation of our aggregate and disaggregate data since we do not have the same countries in each sample. Nevertheless, they do give a go indication of time variation and can be comparable on that basis.

<TABLE 2 ABOUT HERE>

4. Results

4.1 Uniform Spacings

To study the co-movement of time series, Ng's (2006) uniform spacings correlations have been utilised by a number of authors, including Herrera et al. (2008), Byrne, Fazio and Fiess (2010) and Contessi and De Pace (2009). Ng (2006) constructs a test statistic, the spacings variance ratio (*svr*) test, which examines the null hypothesis of no correlation in a panel time series. Ng (2006) framework also allows us to ascertain the proportion of small and large bivariate correlations in a panel dataset. From Table 2 we can see that the results are fairly consistent, irrespective of whether we consider aggregate or disaggregate capital flows.⁷ There is a proportion of bank inflow country pairings that are highly correlated, since we can strongly reject the null of no correlation for the subgroup of large correlations. We can also reject the null hypothesis of no correlation for a large group of correlations for bond flows. The largest proportion of significant high correlations for our disaggregate data is provided by equity flows.

Again for aggregate flows we are able to reject the null hypothesis of no correlation for a subgroup of countries (i.e. $\hat{\theta} = 0.571$ and large $svr = 2.062^*$). Indeed this subgroup is twice as large for the largest subgroup of disaggregate correlations. Why might this be the case? This may well be due to the combined information in the aggregate data, which is able to pick up correlations across countries. Whilst the disaggregate data on their own may not indicate. We go on and consider the role of

⁷ We exclude Brazil, China, India and Russia from our analysis. Scaling the inflows by real GDP per worker was not sufficient to alleviate these countries' dominant position in the subsequent analysis. Nevertheless, correlation results are fairly robust to these countries inclusion, see Appendix.

common factors in the aggregate and disaggregate data to shed further light on the differences across sectors and countries.

4.2 Aggregate and Disaggregate PANIC

Our uniform spacings evidence suggests that there are common factors in the data. To shed further light on the nature of the data, and as a basis of latter analysis, we now utilise a Panel Analysis of Nonstationarity in Idiosyncratic and Common components (PANIC) methodology to consider the degree of common movement in our aggregate and disaggregate capital flow data. Bai and Ng's (2004) PANIC approach separates a panel time series (y_{it}) into country specific fixed effect (c_i) for each country i , common factor (F_t), corresponding factor loading (λ_i) and idiosyncratic components (u_{it}). The panel specification is as follows:

$$y_{it} = c_i + \lambda_i F_t + u_{it} \quad (1)$$

The PANIC approach is advantageous since it can be used to identify commonalities and nonstationarity in the data. PANIC identifies a common factor taking account of nonstationarity by first differencing the data, identifying principal components and then recummulating this component.⁸ We subsequently test whether the common factor and the error are stationary using unit root tests. In a situation of more than one common factor we can use information criteria to determine the number of common factors.⁹ Table 3 indicates that there is evidence of a common component for all three

⁸ Kose et al. (2003), Byrne et al. (2009) and Ciccarelli and Mojon (2010) use factor models to examine comovement of real and nominal macroeconomic variables in large country panels.

⁹ Bai and Ng (2002) set out three information criteria to ascertain the number of common factors. With $\hat{\sigma}^2(k)$ based on the residuals from a regression of the first differenced data on k principal components, the first information criterion can be expressed as $IC_1(k) = \ln \hat{\sigma}^2(k) + k \ln(NT/(N+T))(N+T/NT)$. The second information criterion is of the form $IC_2(k) = \ln \hat{\sigma}^2(k) + k \ln(N+T/NT) \ln[\min\{\sqrt{N}, \sqrt{T}\}]^2$. Bai

information criteria that we use, for aggregate and disaggregate equity and bank flows. For international bond flows to emerging and developing countries there is less evidence of co-movement.

<FIGURE 2 ABOUT HERE>

Consequently, we impose one common factor on the data for each of our sectors and aggregate. Figure 2 presents the first principal component of our four panel time series data set. The factor of aggregate flows is characterized by a sharp increase towards the end of the sample period. Bond flows have experienced two waves, these peaked around 2000 and also towards 2007. Equity and bank flows appear to have experience one wave towards the end of the sample period.

<TABLE 3 ABOUT HERE>

According to Table 3, bond flows do not display evidence of a common factor for the third information criteria (i.e. $IC_3=0$). For the aggregate, bank and equity flows there is evidence of commonalities and for all three information criteria. In terms of its time series properties, this common factor is always nonstationary. In other words, we are unable to reject the null hypothesis of a unit root in the common component of aggregate data and disaggregate data for bank and equity flows. There appears to be much permanence in the aggregate and disaggregate data. Again it is a mute point whether bonds have participated in recent financial globalisation to the same extent as equity and bonds (see Figure 1). In contrast, the idiosyncratic components all appear to be stationary. Domestic capital inflows, abstracting from global components, have not experienced a permanent shock during our sample period. Individual country characteristics appear to have a less than permanent impact on capital flows.

and Ng (2002) emphasize that the third information criterion (IC_3) is to be preferred with panel cross sectional correlation: $IC_3(k) = \ln \hat{\sigma}^2(k) + k \hat{\sigma}^2(N - T - k) \ln(NT) / NT$.

<TABLE 4 ABOUT HERE>

4.3 Determinants of Capital Flow Common Factors

Having identified commonalities and delineated their time series behavior, in this section we investigate the relationship between the common elements of our capital flows across countries and their relationship to other macro variables. A similar methodology is set out in the papers by Bai (2004) and Gengenbach et al. (2006). We extract the common factor from our PANIC approach and examine their correlations with five global macroeconomic variables. In particular, we consider the relationship between the common factors in aggregate, bank, bond and equity capital inflows to emerging and developing countries and five potential explanatory variables. These explanatory variables include real non-oil commodity prices (RCP_t), the real short term (SR_t) and real long term (LR_t) US interest rate, VIX uncertainty index (VIX_t) and real GDP growth in the G7 (ΔY_t). Details of data construction are provided in the Data Sources Appendix.

Table 4 presents evidence on the global determinants of capital inflows for aggregate and disaggregate data. The results are intriguing. The determinants of global capital flows are dependent upon whether we examine aggregates and disaggregate flows and the type of disaggregate flows that we consider. Firstly in terms of aggregate capital flows, there appears to be a reasonable correlation between real commodity prices and aggregate flows in Table 4. Moreover, there is some evidence of a negative correlation with real long run interest rates. Short rates, uncertainty and real growth rates appear less important. Also in Table 4, the determinants of capital flows vary across the type of global disaggregate capital inflows presents different results depending upon which flow we examine. For bank flows the most important determinant is long run real US interest rates. Banks will actively lend to emerging and developing countries if there is a lower

rate of return to long term bonds and these countries may be willing to borrow if they are faced with a lower debt servicing cost than would otherwise be the case. In contrast there is less evidence of an important role for short term rates, which suggest that most of the implication for global capital flows come from the long end of the yield curve and are not clearly attributable to US monetary policy. Bond flows are also influenced by long run interest rates, although surprisingly to a lesser extent than the various other asset types. Equity inflows are influenced substantially by real commodity prices, the largest correlation of all results, and in a similar fashion to long term interest rates. This implies this channel works to a greater extent than others and is consistent with the suggested approach of Frankel (2008) and Reinhart and Reinhart (2008), that commodity prices are associated with interest rates. Finally, smaller correlation statistics suggest there is a less important role for short term interest rates, uncertainty, and economic growth in driving equity flows.

<TABLE 5 ABOUT HERE>

It should be noted that there is evidence of nonstationarity in the common factors and also in the explanatory variables (see the Appendix Table B1). Consequently, we should exercise caution when interpreting evidence of correlations in the data unless there is evidence of a cointegrating vector. Table 5 presents evidence of bivariate cointegration between the common factors in capital flows and also our explicators. We find evidence that the aggregate behaviour reflects components of the disaggregate results. For bank flows we are unable to discriminate between our explanatory variables using Johansen's (1988) Trace Test statistic for cointegration. A combined test nevertheless indicates that there is only one cointegrating vector. This is most likely to be US long run interest rates (LR_t) since this has the largest correlation in Table 4 and a simple regression of this factor

on a constant and LR_t had a t -statistic of 4.33 on the long run interest rate (see Appendix B). Bonds appear to be influenced by all possible global determinants in Table 5, however this should be treated with caution since bonds flows themselves may not have a common factor according to Bai and Ng's (2002) third information criteria. Equity follows the path of aggregate capital flows. It is related to both real commodity prices and also to real US long run interest rates.

4.4 Individual Country Determinants of Capital Inflows

We are also interested in the factors that determine an individual country's association with the global capital inflow factors. There are a number of potential explanations for why a country attracts global capital inflows and why it may be associated with the recent period of financial globalization. These range from Lucas's (1990) idea that human capital was important in explaining why capital may not equate the marginal product of capital in a neoclassical growth model, hence the magnitude of capital flows is dependent upon the level of human capital in a country. In contrast and following North (1994), Alfaro et al. (2007) suggest that institutions are the leading explanation of the Lucas Paradox and hence are a central determinant of capital inflows. An improvement in a country's institution will be associated with an increase in capital flows. Finally, a possible determinant of capital inflows could be the extent to which a country is financially open to the outside world. At this point we can clearly caveat that financial openness is a necessary but not sufficient condition for capital inflow to take place.

We have a range of means of measuring potential country determinants of capital inflows. Firstly, we have Chinn and Ito (2008) measure of financial openness (FO_t). This is based on capital account transactions and the extent of capital controls. Chinn and Ito

(2008) source their data from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*. We take the observation from 2000, which is approximately at the centre of our sample period. Secondly, for human capital (HC_t) we use the Barro and Lee (2000) data on the education attainment of total population of 25 year olds and over, hence we use the average number of years of schooling for 2000. This will be a proxy for human capital based on the suggestion from Lucas (1990). Finally, we have a measure of the quality of institutions (I_t), from the International Country Risk Guide on average over our sample period, and increase in the index means and improvement of institutions in that particular country.

<FIGURE 3 ABOUT HERE>

We again use the recummulated principal component from our PANIC analysis of our aggregate panel to measure the global wave of financial integration. We use the proportion of the total variation in each country's time series explained by the common factor (COM_t) as our dependent variable. If a country has benefited substantial from financial globalization it will be highly associated with the common component. The Ordinary Least Square regression results are as follows:

$$COM_t = 0.860 - 0.189*I_t - 0.047*FO_t + 0.101*HC_t ; \quad \sigma = 0.41, R^2 = 0.17$$

(t=1.40) (t=1.284) (t=0.942) (t=2.218)

Our results are very interesting and chime with the suggestion of Lucas (1990). Human capital appears to be a statistically significant determinant of capital inflows to emerging and developing countries. Figure 3 also highlights the nature of the positive relationship between the importance of the factor (i.e. the importance of global capital flows for each country) and human capital. In contrast, financial openness and institutions are statistically insignificant and the sign of the relationship is not as expected.

<TABLE 6 ABOUT HERE>

4.5 Volatility Co-movement

For an emerging or developing country it is not only the level of capital flows that is of interest. It is also important to consider the nature and determinants of the volatility of capital flows. This is also suggested in the literature on Sudden Stops, in which it is assumed that rapid reversal of capital flows (i.e. high volatility) has negative economics consequences. In this section we investigate the degree of co-movement across countries in volatility of capital inflows. This will give us an indication of the extent to which individual countries themselves are dependent upon the global nature of capital flows and hence not uniquely responsible for the capricious behaviour of capital markets that confronts them. We use a rolling window of the standard deviation of monthly data (12 observations) to measure the volatility of capital inflows. Table 6 presents our PANIC results for the volatility of capital inflows.

<TABLE 7 ABOUT HERE>

In Table 6 we see that there is some co-movement of volatility for the aggregate flows as indicated by the information criteria three, which is our preferred information criteria following Bai and Ng (2002). This result suggests that the volatile nature of capital flows is common across countries and not country specific. This result also stands for a panel time series of 50 countries for bank inflows, since there is some co-movement in volatility as indicated by information criteria three. In contrast there is less co-movement of the volatility for bond and equity flows. What determines this global volatility in capital inflows to emerging and developing countries? From Table 7 and Table 8 the main result is that the volatility of bank flows and the long run US interest rate (LR_t) appear to be associated with one other, since both are highly correlated

(correlation coefficient of -0.72), both time series are nonstationary and both cointegrate. It again may be the case that as interest rates fall and become more stable investors look for alternative, higher and maybe more risky rates of return elsewhere. Potentially there is a spillover to the aggregate capital inflows series, since aggregate volatility also has a high correlation with the long rate. The aggregate volatility appears unrelated to a commodity price channel, since there is a much smaller correlation with RCP_t equal to 0.26. Bond and equity flows may not be a common factor in volatility ($IC3 = 0$ for both in Table 6), so this somewhat counteracts the idea that there are commonalities in these flows volatilities.

<TABLE 8 ABOUT HERE>

5. Conclusion

This paper considers the extent and determinants of capital inflows to emerging and developing countries. We examine both aggregate and disaggregate capital inflows since they are unlikely to display the same time series behaviour nor have the same economic implications. We find differences in the cross country behaviour of the flows of different types of financial assets. For example, we find evidence of considerable cross sectional correlation in bank and equity flows across countries according to our PANIC approach. This is also the case for aggregate flows, which may primarily be a reflection of bank and equity capital inflows. In contrast bond flows do not appear to be correlated across countries since Bai and Ng's (2002) information criteria does not indicate a common component.

We went on to consider the potential determinants of these global capital flows. We find that real US long run interest rates are an important determinant of capital inflows, for aggregate flows and for disaggregate bank and equity flows. There is less of

an important role for short term interest rates. This indicates that financial globalization is mostly at the long end of the yield curve. On the other hand US monetary policy which operates through short term interest rates is not having such a powerful affect. Real commodity prices appear to be important for equity and aggregate data. But given the relatively small effect from real commodity price onto bank flows, in comparison with the effect of real US long rates, Frenkel's (2008) suggestion that there is a symbiotic relationship between commodity prices and interest rates, is not the whole story for bank flows. We also were able to identify common elements in the volatility of capital inflows. This suggests that some of the negative implications of capital flows (i.e. Sudden Stops) are not the result of specific policies associated with particular emerging market economies but seem much more generic to this investment group.

Finally, we considered the potential determinants of individual countries experience with capital inflows. We found evidence of an important role for human capital, using a proxy from Barro and Lee (2000), in determining the extent to which individual countries benefit from the global waves of capital inflows. And this is relatively more important than financial openness (see Chinn and Ito, 2008) and country institutions (see Alfaro et al., 2008). The policy implication is clear: countries can benefit to a greater extent from waves of financial globalization if they have a better quality of labour supply.

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Table 1. Descriptive Statistics of Aggregate and Disaggregate Capital Flows

	<i>Mean</i>	<i>Standard deviation</i>	<i>Maximum</i>	<i>Minimum</i>
<i>Aggregate</i>	53.2	3.9	179.5	5.4
<i>Disaggregate</i>				
<i>Bank</i>	28.6	2.1	160.0	5.5
<i>Bond</i>	18.7	1.1	53.6	1.0
<i>Equity</i>	9.8	1.4	70.4	0.1

Notes: data for the mean, maximum and minimum is US\$bn. Sample period is 1993Q1 to 2009Q1 for 78 emerging and developing countries. In this table the number of cross sections is $N = 40, 70, 38$ and 34 respectively for Aggregate, Bank, Bond and Equity flows.

Table 2. Uniform Spacings Analysis of the Level of Capital Inflows

	$\hat{\theta}$	<i>Number of small correlation pairings</i>	<i>Small svr</i>	<i>Large svr</i>
<i>Aggregate</i>	0.571	340 out of 595	0.880	2.062*
<i>Disaggregate</i>				
<i>Bank</i>	0.882	1892 out of 2145	-0.618	7.157*
<i>Bond</i>	0.727	511 out of 703	0.585	3.369*
<i>Equity</i>	0.706	396 out of 561	0.810	2.689*

Notes: This table presents evidence on the degree of cross sectional correlation. $\hat{\theta}$ is the proportion of correlations that are small. Ng (2006) Spacings Variance Ratio test statistic (*svr*) provides evidence of whether correlation is significantly different from zero, distributed as standard normal, therefore the critical value is 1.65 (significant at 5% with asterisk). First order serial correlation is removed following Ng (2006), using an AR(1) approach. There are $n = N \cdot (N-1)/2$ correlations, for $N = 36, 66, 38$ and 34 respectively for Aggregate, Bank, Bond and Equity flows. The time dimension is 1993Q1 to 2009Q1. We apply a four quarter moving average. Brazil, China, India and Russia have been excluded due to tendency to dominate the subsequent common factor analysis. Capital Inflow has been divided by real per capita GDP in 1996 from Caselli and Feyrer (2007).

Table 3. PANIC Analysis of the Level of Aggregate and Disaggregate Capital Inflows

	FACTOR	IDIOSYNCRATIC	IC1	IC2	IC3
<i>Aggregate</i>	-1.064	1.140	5	5	1
<i>Disaggregate</i>					
<i>Bank</i>	-2.121	4.314*	5	5	1
<i>Bond</i>	-2.329	4.923*	5	5	0
<i>Equity</i>	-2.040	10.228*	5	5	3
<i>Factor Correlations</i>					
F <i>Bank</i>	0.83				
F <i>Bond</i>	0.48	0.45			
F <i>Equity</i>	0.90	0.65		0.22	
	F <i>Sum</i>	F <i>Bank</i>		F <i>Bond</i>	

Notes: This table examines the stationarity properties of our panel time series by examining the unit root of factor nonstationarity and idiosyncratic nonstationarity. We use quarterly data on capital inflows 1993Q1 to 2009Q1 ($T=65$). Number of cross sections is $N = 36, 66, 38$ and 34 respectively for Aggregate, Bank, Bond and Equity flows. Four quarter moving average. Results are based on equation (2). We identify the factor structure using an information criterion from Bai and Ng (2002), see footnote 9 for more discussion. For the factor unit root test, we reject the null hypothesis of a unit root for large negative (less than -2.89) and for the idiosyncratic component we reject the null hypothesis of a unit root for large positive values of the test statistic. Capital Inflow has been divided by real per capita GDP in 1996 from Caselli and Feyrer (2007).

Table 4. Correlation of Capital Flow Factors and Explicators

	RCP_t	SR_t	LR_t	VIX_t	ΔY_t
<i>Aggregate</i>	0.42	-0.14	-0.49	-0.15	-0.13
<i>Bank</i>	0.13	-0.16	-0.35	-0.06	-0.15
<i>Bond</i>	-0.12	-0.10	-0.32	-0.14	0.22
<i>Equity</i>	0.57	-0.23	-0.51	-0.16	-0.16

Notes: This table presents evidence on the correlation of common factors in capital inflows with potential explicators. The time period is 1993Q3 to 2008Q3. RCP_t is real commodity prices excluding oil, SR_t is the real short run US interest rate, LR_t is the real long run US interest rate, VIX_t is a measure of volatility and ΔY_t is real GDP growth in the G7.

Table 5. Cointegration of Common Factors in Capital Flows and Explicators

	RCP_t	SR_t	LR_t	VIX_t	ΔY_t	COMBINED
<i>Aggregate</i>	1	0	1	0	1	1
<i>Bank</i>	1	1	1	0	1	1
<i>Bond</i>	0	0	0	0	0	0
<i>Equity</i>	1	0	1	1	1	1

Notes: This table presents evidence of the number of cointegrating vectors between the type of capital flow and explanatory variable. Hence, there can be either 0 or 1 cointegrating vectors in the bivariate system based on the Johansen (1988) Trace Test Statistic. Time period is 1993Q2 to 2008Q4. Lag length determined by AIC. RCP_t is real commodity prices excluding oil, SR_t is the real short run US interest rate, LR_t is the real long run US interest rate, VIX_t is a measure of volatility and ΔY_t is real GDP growth in the G7.

Table 6. PANIC Analysis of Volatility of Capital Flows

	FACTOR	IDIOSYNCRATIC	IC1	IC2	IC3
<i>Aggregate</i>	-2.896*	8.810*	5	5	1
<i>Disaggregate</i>					
<i>Bank</i>	-2.730	14.739*	5	5	2
<i>Bond</i>	-2.941*	8.472*	5	5	0
<i>Equity</i>	-1.876	9.186*	5	5	0
<i>Factor Correlations</i>					
F <i>Bank</i>	0.50				
F <i>Bond</i>	-0.48	-0.07			
F <i>Equity</i>	0.53	0.46		-0.19	
	F <i>sum</i>	F <i>Bank</i>		F <i>Bond</i>	

Notes: This table examines the stationarity properties of our panel time series by examining the unit root of factor nonstationarity and idiosyncratic nonstationarity. We use monthly data on capital inflows 1994M1 to 2009M3 ($T=183$). Number of cross sections is $N = 34, 50, 29$ and 18 respectively for Aggregate, Bank, Bond and Equity flows. See Table 3 for more details. Brazil, China, India and Russia have been excluded due to tendency to dominate common factor. Capital Inflow has been divided by real per capita GDP in 1996 from Casselli and Feyer (2007). Volatility is measured as a rolling standard deviation with a window of 12 monthly observations.

Table 7. Correlation of Capital Flow Volatility Factors and Explicators

	RCP_t	SR_t	LR_t	VIX_t	ΔY_t
Aggregate	0.26	-0.63	-0.72	0.14	-0.33
Bank	0.15	-0.44	-0.72	-0.27	-0.09
Bond	-0.43	0.26	0.08	-0.10	0.20
Equity	0.39	-0.08	-0.39	-0.17	-0.22

Notes: time period is 1994Q1 to 2008Q4. RCP_t is real commodity prices excluding oil, SR_t is the real short run US interest rate, LR_t is the real long run US interest rate, VIX_t is a measure of volatility and ΔY_t is real GDP growth in the G7.

Table 8. Cointegration of Common Factors in Volatility of Capital Flows and Explicators

	RCP_t	SR_t	LR_t	VIX_t	ΔY_t	COMBINED
Aggregate	0	0	0	0	1	1
Bank	0	0	1	0	0	1
Bond	1	0	1	1	0	0
Equity	0	1	1	0	0	2

Notes: This table presents evidence of the number of cointegrating vectors between type of capital flow and explanatory variable. Hence there can be either 0 or 1 cointegrating vectors in the bivariate system based on the Johansen (1988) Trace Test Statistic. Time period is 1994Q1 to 2008Q4. Lag length determined by AIC. RCP_t is real commodity prices excluding oil, SR_t is the real short run US interest rate, LR_t is the real long run US interest rate, VIX_t is a measure of volatility and ΔY_t is real GDP growth in the G7. Volatility based on ratio, quarterly aggregation.

Figure 1. Capital Inflows to Emerging and Developing Countries

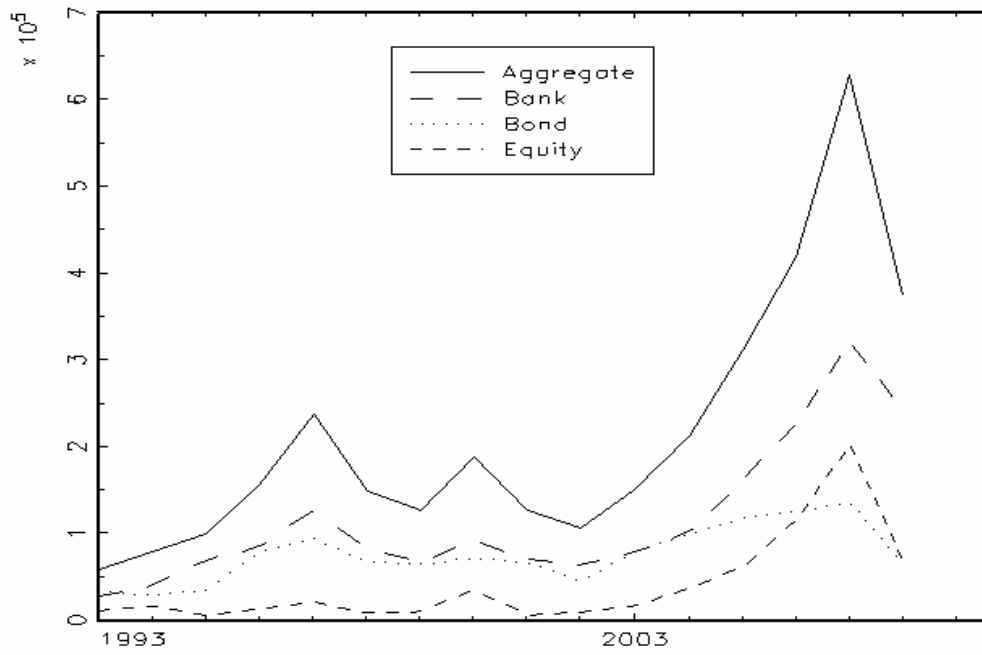


Figure 2. Principal Component of Capital Inflows

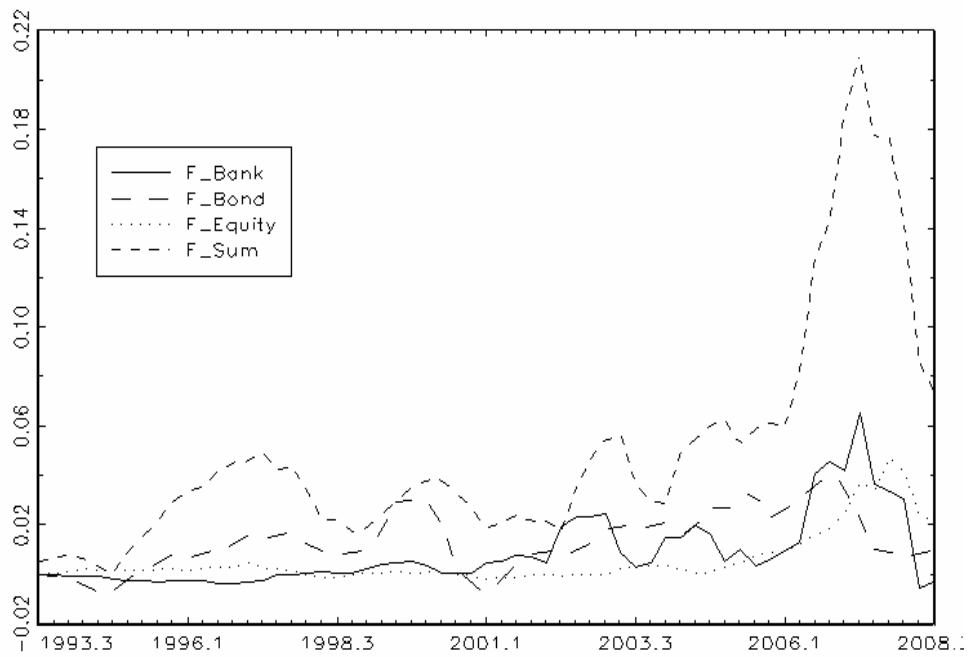
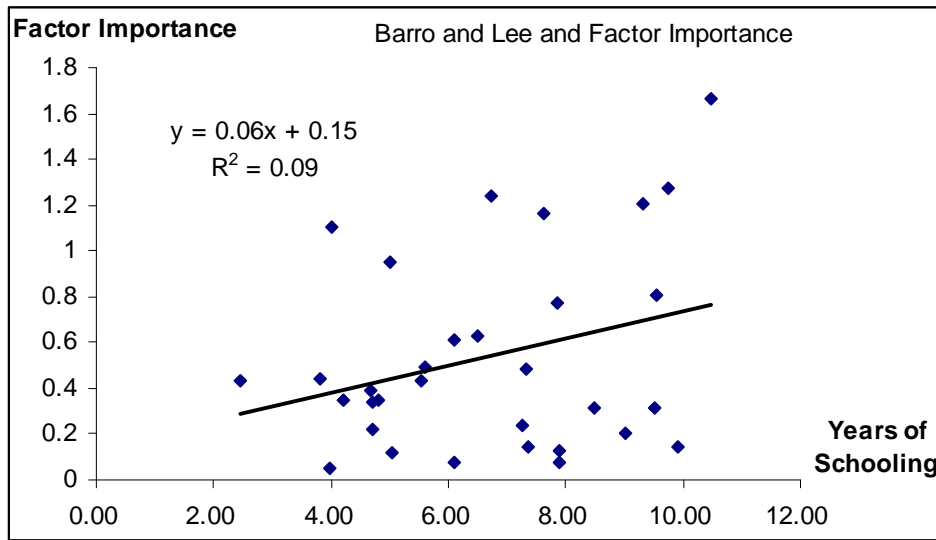


Figure 3. Human Capital (Years of Schooling) and Common Capital Inflows



Data Sources Appendix

We use quarterly **Capital Inflow** in US Dollars from Euromoney *Loanware and Bondware*. This data is for Equity, Bond and Bank. We sum the data to produce an aggregate flow of portfolio capital.

G7 Real GDP Growth is from the OECD *Main Economic Indicators*.

Real Commodity Prices are from IMF *International Financial Statistic*. Based upon Non-oil commodity prices deflated by US wholesale price index following Reinhart and Reinhart (2008).

Real Interest Rates are from IMF *International Financial Statistic*. They are 3 month Treasury Bill Rate (SR_t) and 10 year bond yield (LR_t) deflated *ex post* by the annual US Consumer Price inflation.

VIX Index. Is a measure of US stock market uncertainty from the Chicago Board Option Exchange.

Institutional Quality. A composite index from International Country Risk Guide (ICRG).¹⁰ The measure is from 0 to 12 and a rise in the index is associated with an improvement in institutions.

Human Capital Variable. We use the Barro and Lee (2000) measure of the average number of years of schooling in 2000.

Financial Openness: Chinn and Ito (2008) produce a *de jure* measure of financial openness based on capital account transactions and the extent of capital controls in 2000. From the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*. The index has a mean zero and an increase in the index indicates increasing openness.

Table A presents the countries that we have data from Euromoney. We restrict attention to countries that participate in International Capital Inflows. Hence we exclude those countries for which we have less than four quarters of observations between 1993Q1 to 2009Q1. We also exclude Brazil, China, India and Russia from the empirical work due to tendency to dominate common factor.

¹⁰ The twelve different institutional measures include: Government Stability, Socioeconomic Conditions, Investment Profiles, Internal Conflict, External Conflict, Corruption, Military Involvement in politics, Religious involvement in politics, Law and Order, Ethnic Tensions, Democratic Accountability and Bureaucratic Accountability.

Table A. Sample of Countries

Aggregate (N = 40)	Bank (N = 70)	Bond (N = 42)	Equity (N = 38)
Algeria	Algeria		
Argentina	Argentina	Argentina	Argentina
	Azerbaijan		
	Bangladesh		
		Barbados	
	Belarus	Belarus	
Bolivia	Bolivia		
Brazil	Brazil	Brazil	Brazil
Bulgaria	Bulgaria	Bulgaria	Bulgaria
	Burkina Faso		
	Cameroon		
Chile	Chile	Chile	Chile
China	China	China	China
Colombia	Colombia	Colombia	Colombia
	Congo		
	Costa Rica	Costa Rica	
	Cote D'Ivoire (Ivory Coast)		
Croatia	Croatia	Croatia	Croatia
	Dominican Republic	Dominican Republic	
	Ecuador		
Egypt	Egypt	Egypt	Egypt
	El Salvador	El Salvador	
		Estonia	Estonia
Georgia			
Ghana	Ghana		Ghana
	Guatemala	Guatemala	
	Guinea	Guinea	
	Honduras		
India	India	India	India
Indonesia	Indonesia	Indonesia	Indonesia
Iran	Iran		
	Jamaica	Jamaica	
Jordan	Jordan	Jordan	Jordan
Kazakhstan	Kazakhstan	Kazakhstan	Kazakhstan
Kenya	Kenya		
	Laos		
Latvia	Latvia	Latvia	
	Lebanon	Lebanon	Lebanon
Lithuania	Lithuania	Lithuania	Lithuania
	Macedonia		
			Malawi
	Malaysia		Malaysia
	Mali		
Mauritius	Mauritius		
Mexico	Mexico		Mexico
Morocco	Morocco	Morocco	
	Mozambique		
	Namibia		
Nigeria	Nigeria		Nigeria
			Oman
Pakistan	Pakistan	Pakistan	Pakistan
Panama	Panama	Panama	Panama
	Papua New Guinea		Papua New Guinea
Peru	Peru	Peru	Peru
Philippines	Philippines	Philippines	Philippines
Poland	Poland	Poland	Poland
		Qatar	
Romania	Romania	Romania	Romania
Russian Federation	Russian Federation	Russian Federation	Russian Federation
	Senegal		
		Slovak Republic	Slovak Republic
	Seychelles		
South Africa	South Africa	South Africa	South Africa
Sri Lanka	Sri Lanka	Sri Lanka	Sri Lanka
	Tanzania		
Thailand	Thailand	Thailand	Thailand
		Trinidad and Tobago	
Tunisia	Tunisia	Tunisia	Tunisia
Turkey	Turkey	Turkey	Turkey
	Turkmenistan		
Ukraine	Ukraine	Ukraine	Ukraine
Uruguay	Uruguay	Uruguay	
	Uzbekistan		
Venezuela	Venezuela	Venezuela	
Vietnam	Vietnam		Vietnam
	Yemen		
	Zambia		
	Zimbabwe		Zimbabwe

Appendix A: Results Robustness Analysis.

While it is possible China has driven the recent period of global expansion and financial integration, it is also highly unlikely. Instead of considering what is related to Chinese expansion we abstract from this in the main results. Nevertheless, our results are generally robust to excluding, Brazil, China, India and Russia.

Table A1. Uniform Spacings for Level of Capital Inflows with BRIC Countries

	$\hat{\theta}$	Number of small correlation pairings	Small svr	Large svr
<i>Aggregate</i> N = 40	0.561	438 out of 780	1.209	3.087*
<i>Disaggregate</i>				
Bank N = 66	0.868	2096 out of 2415	1.028	7.322*
Bond N = 42	0.721	621 out of 861	-1.089	4.181*
Equity N = 38	0.662	465 out of 703	1.110	3.439*

Notes: This table presents evidence on the degree of cross sectional correlation. For more details see Notes for Table 2. The time dimension is 1993Q1 to 2009Q3. Brazil, China, India and Russia have been included.

Table A2. PANIC for Level of Capital Inflows with BRIC Countries

	FACTOR	IDIOSYNCRATIC	IC1	IC2	IC3
<i>Aggregate</i> N = 40	-1.112	2.352*	5	5	3
<i>Disaggregate</i>					
Bank N = 70	-0.820	5.242*	5	5	2
Bond N = 42	-1.416	5.924*	5	5	1
Equity N = 38	-1.292	9.410*	5	5	5

Notes: This table examines the stationarity properties of our panel time series by examining the unit root of factor nonstationarity and idiosyncratic nonstationarity. See Notes to Table 3 for further details. Brazil, China, India and Russia have been included.

Appendix B: Factor for Level of Aggregate Capital Inflows and Explicators

Figure B1. Aggregate Capital Inflow Factor, Real US Interest Rates and Commodity Prices

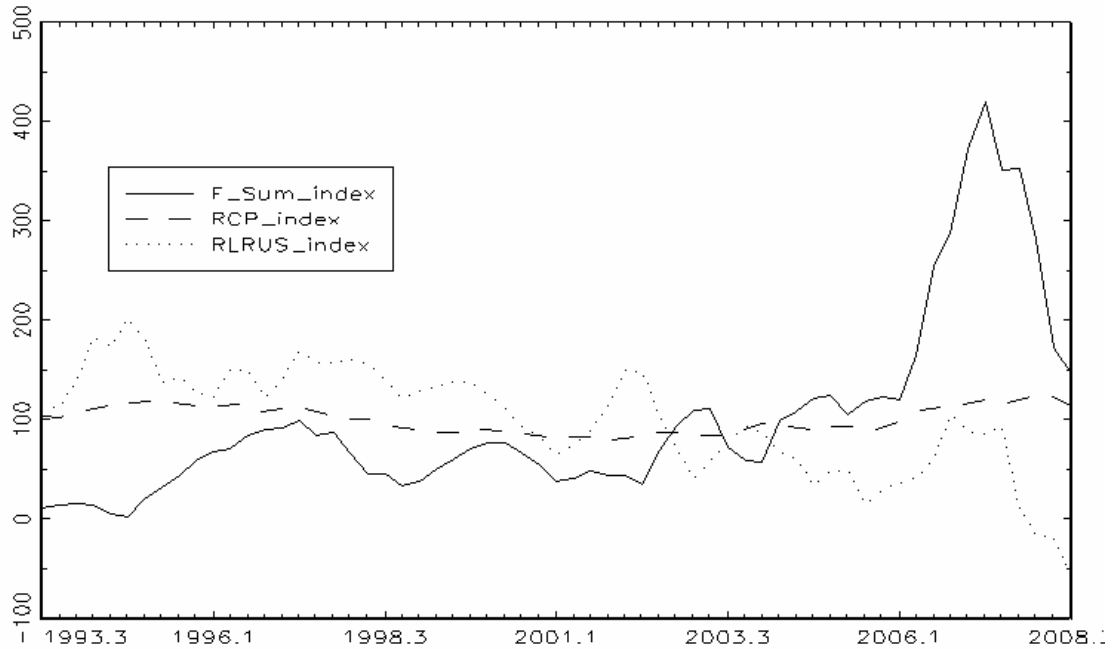


Figure B2. Aggregate Capital Inflow Factor, Real US Interest Rates and Commodity Prices

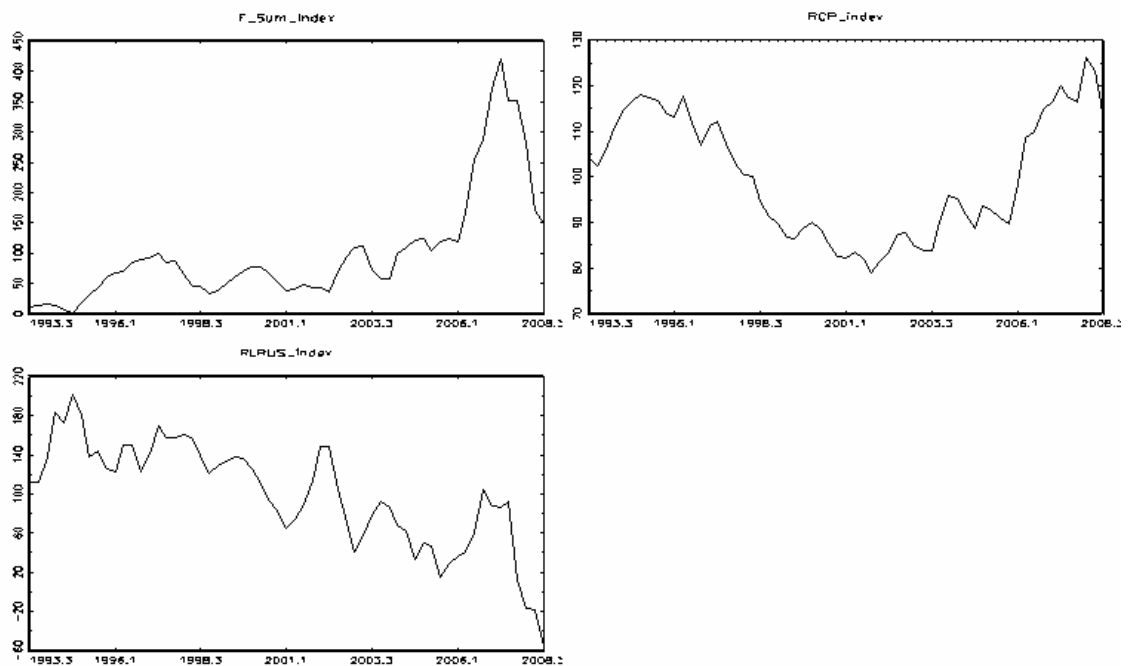
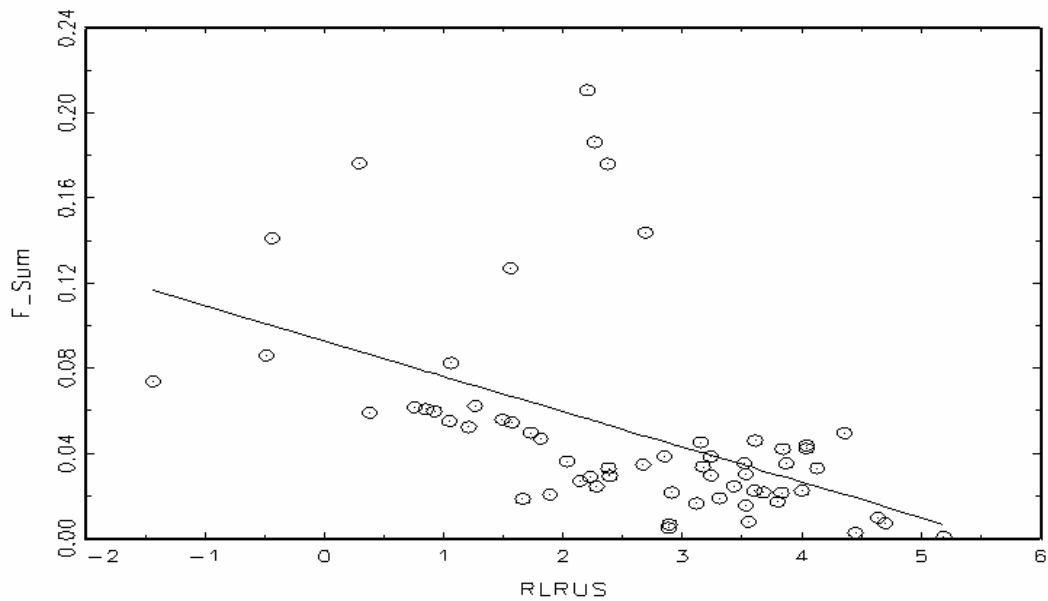


Figure B3. Cross Plot of Real Long US Interest Rate and Factor for Aggregate

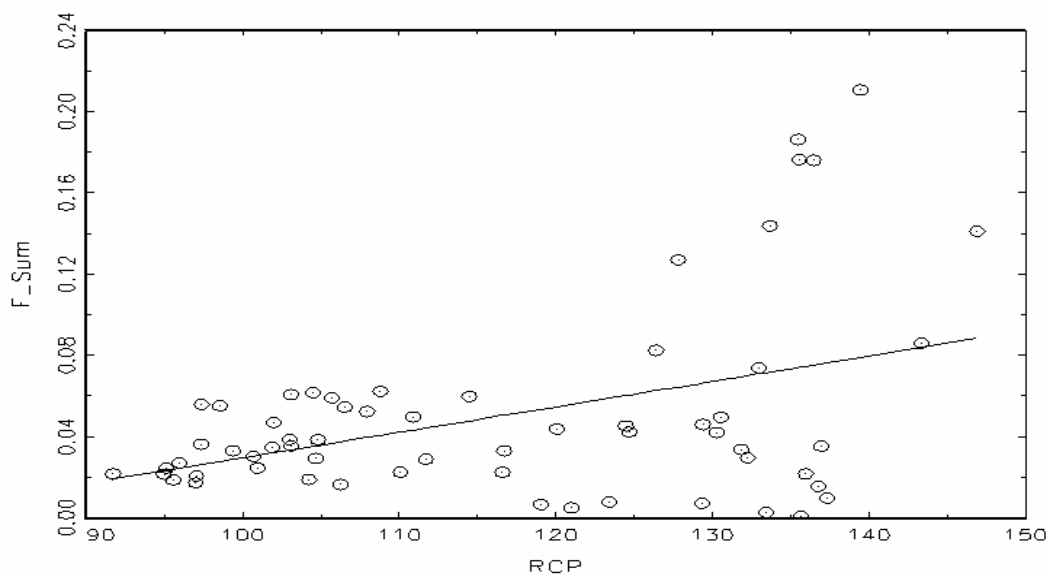


Notes: There has been a trend increase in capital inflows in the emerging countries and a trend decline in real long term US interest rates (see Figure B2 and B3). OLS estimation indicates there is a strong and statistically significant negative relationship between Real Long US Interest Rates (LR_t) and the common factors of aggregate capital flows (F_t).

$$F_t = 0.093 - 0.017 * LR_t; \quad \sigma = 0.04, R^2 = 0.24, [1993 \text{ Q3}, 2008 \text{ Q3}], T = 61$$

$$(t=8.30) \quad (t=4.33)$$

Figure B4. Cross Plot of Real Commodity Prices and Aggregate Capital Flows



Notes: There is a positive relationship between aggregate capital flows common factor (F_t) and real commodity prices (RCP_t) (see Figure B2 and B4). This relationship is also statistically significant, although there is a smaller R^2 and smaller t-statistic than for regression between the factor and real long run interest rates.

$$F_t = -0.096 - 0.001 * RCP_t; \quad \sigma = 0.04, R^2 = 0.18, [1993 \text{ Q3}, 2008 \text{ Q3}], T = 61$$

$$(t=2.32) \quad (t=3.56)$$

Table B1. Unit Root Evidence on Common Factors of Levels of Capital Inflows

VARIABLES	TEST STATISTIC	LAG LENGTH
RCP_t	-1.306	3
SR_t	-1.218	4
LR_t	-0.253	4
VIX_t	-2.525	0
ΔY_t	-4.322*	0

Notes: We use quarterly data on capital inflows 1993Q3 to 2008Q3 ($T=61$). The null hypothesis is of unit root, and we reject the null when we have test statistics which are less than the asymptotic critical value from Davidson and MacKinnon (1993) -2.86. Indicated by an asterisk at the 5% statistical significance level. Lag length is determined by Akaike Information Criteria. RCP_t is real commodity prices excluding oil, SR_t is the real short run US interest rate, LR_t is the real long run US interest rate, VIX_t is a measure of volatility and ΔY_t is real GDP growth in the G7. All variables are nonstationary apart from real economic growth.

Table B2. Johansen Trace Test Statistic on Common Factors

VARIABLES	TEST STATISTIC				LAG LENGTH
	R0 = 0		R0 = 1		
<i>Aggregate</i>					
RCP_t	24.59	[p=0.01]*	2.78	[0.63]	4
SR_t	16.47	[0.16]	1.30	[0.89]	3
LR_t	23.50	[0.02]*	1.77	[0.82]	3
VIX_t	13.74	[0.31]	4.63	[0.34]	2
ΔY_t	22.66	[0.02]*	5.26	[0.27]	3
<i>Bank</i>					
RCP_t	35.87	[0.00]*	2.37	[0.70]	4
SR_t	32.84	[0.00]*	1.47	[0.87]	4
LR_t	51.94	[0.00]*	2.51	[0.70]	4
VIX_t	19.91	[0.05]	2.64	[0.66]	4
ΔY_t	27.98	[0.00]*	6.44	[0.16]	4
<i>Bond</i>					
RCP_t	11.71	[0.48]	2.23	[0.73]	2
SR_t	11.22	[0.53]	1.61	[0.84]	3
LR_t	16.61	[0.15]	2.20	[0.74]	2
VIX_t	14.40	[0.27]	5.21	[0.27]	2
ΔY_t	19.62	[0.06]	9.00	[0.05]	2
<i>Equity</i>					
RCP_t	30.32	[0.00]*	2.99	[0.59]	4
SR_t	19.74	[0.06]	5.54	[0.24]	4
LR_t	24.20	[0.01]*	7.72	[0.10]	4
VIX_t	31.59	[0.00]*	2.02	[0.77]	4
ΔY_t	37.11	[0.00]*	7.44	[0.11]	4

Notes: We use quarterly data on capital inflows 1993Q1 to 2009Q1 ($T=65$). The null hypotheses are non cointegrating vector in the system (i.e. R0 = 0) and one cointegrating vector in the system (i.e. R1 = 0). The critical values are 20.16 and 9.14 respectively. Lag length is determined by Akaike Information Criteria.

Appendix C. Volatility Results

Table C1. PANIC Analysis of Volatility including BRICs

	FACTOR	IDIOSYNCRATIC	IC1	IC2	IC3
<i>Aggregate</i> <i>N = 34</i>	-2.352	9.251*	5	5	4
<i>Disaggregate</i>					
Bank <i>N = 52</i>	-2.519	15.522*	5	5	5
Bond <i>N = 29</i>	-1.550	8.530*	5	5	0
Equity <i>N = 18</i>	-2.426	10.947*	5	5	3

Notes: This table examines the stationarity properties of our panel time series by examining the unit root of factor nonstationarity and idiosyncratic nonstationarity. We use monthly data on capital inflows 1994M1 to 2009M3 ($T=183$). Results are based on equation (2). Volatility is based on a moving standard deviation of twelve monthly observations. Brazil, China, India and Russia have been included in this panel.