Taxi, Takeoff and Landing: Behavioural Patterns of Capital Flows to Emerging Markets

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30 March 2017

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ABSTRACT

This paper analyses volatility, persistence, predictability, correlation, comovement (or contagion risk) and sudden stop (reversibility) of capital flows (foreign direct investment (FDI), foreign portfolio equity investment, long-term and short-term debt flows) using time series econometric techniques for 24 emerging economies over 1970-2014. This is informative on the pattern and relationship between capital inflows, with implications for accommodating macroeconomic policies in countries receiving inflows. The paper also addresses the predictions of conventional theory, that differences are associated with the maturity of the capital (long-term vs. short-term), with the information based trade-off model of Goldstein and Razin (2006), that differences are associated with the structure of the capital (equity vs. debt). In line with the latter, equity flows (FDI and portfolio) are less volatile and persistent, more predictable and less susceptible to sudden stops than debt flows. Contrary to conventional theory, short-term flows are not more volatile, but there is evidence that correlations and risks of contagion are strong within all capital flow components.

JEL CODES F21, F32, F34, F37, G01, O57

KEYWORDS Capital flows, Volatility, Persistence, Forecasting, Comovement, Sudden stop

1. Introduction

> "The loans from creditor countries . . . begin with modest amounts, then increase and proceed crescendo. They are likely to be made in exceptionally larger amounts toward the culminating stage of a period of activity and speculative upswing, and during that stage become larger from month to month so long as the upswing continues. With the advent of crises, they are at once cut down sharply, even cease entirely."—Taussig (1927, quoted in Dornbusch, 2002, p. 745).

International capital mobility is a crucial theme in open economy macroeconomics. It has been treated within different theoretical and empirical frameworks under monetary, fiscal, financial, trade, growth and development economics with a global outlook. Foreign capital flows to emerging markets, despite being underweighted (a lower share than expected) in international portfolios (Tesar, 1999, Sarno and Taylor, 1999a), constitute an integral part of that broad topic of economic research.

According to the observed realizations as shown in Figure 1, external funding to emerging markets have followed three recurring phases: crawling initially (the taxi phase) then having surges (the takeoff phase) and finally ending up with either soft or hard declines (the landing phase).

[Figure 1]

In conjunction with the controversies on financial liberalization and integration, it is argued that there are pros and cons of capital flows to emerging economies. Besides their direct function in financing current account imbalances, potential benefits include investment inducement, growth acceleration, consumption smoothing, competitiveness gain, macroeconomic discipline reinforcement, financial system efficiency and stability enhancement, risk sharing and diversification (see Agénor, 2003, Stulz, 1999, Tesar, 1999). In contrast, rather than financing and reconciling current account imbalances, capital inflows are blamed for enlarging the deficits even further and making them unsustainable by aggravating economic overheating (WEO, 2007). Among others, Obstfeld (1985, 2009) views capital inflows as a 'problem' claiming that stabilization programmes based on fixed or pegged exchange rate regimes give rise to excess capital inflows which magnify real exchange rate appreciations as well as macroeconomic instability and add to deterioration of economic fundamentals through inflationary pressures.[1]

These problems are closely related to the first generation financial crisis models (Krugman, 1979, Flood and Garber, 1984). They propose that macro-structural rudiments that are weakened by external and internal over-expansions, due to risen foreign financing, trigger a deterministic process of speculative attacks against international reserves. This process ultimately leads to reserve depletions and currency collapses. Building on an explanation of this type, Sachs *et al*. (1996) show that excessive capital inflows make a financial crisis more likely. Other negative side-effects attributed to capital flows are asset price bubbles (Sarno and Taylor, 1999b), contagion and spillovers (Obstfeld, 1996, Calvo and Mendoza, 2000), transmission of foreign shocks and monetary instability under the compromised policy mix of the central bank (Hermalin and Rose, 1999). Some argue that the size and liquidity of international capital markets create the potential for self-fulfilling speculative attacks and that financial movements across those markets are subject to animal spirits and investor sentiments which characterize surges of panics and manias or euphoria and despair.[2]

Frankel and Wei (2005) and Kose *et al*. (2009) conclude that the evidence on advantages and disadvantages of international financial liberalization, capital market integration and capital flows is mixed and inconclusive. This inconclusiveness arises from a kind of 'one size fits all' conduct, which entails the use of total (gross or net) capital flows in studying these issues. Hence, total capital flows should be disentangled into appropriate components to ensure an accurate, convincing and conclusive analysis. Furthermore, behavioural patterns of those components should be illuminated for better understanding and effective management.

The rest of the paper is organized as follows. Section 2 reviews the literature. Section 3 sets out the hypotheses to be tested and Section 4 devises the methodology. Data and measurement issues are discussed in Section 5, while Section 6 delves into realized volatility of the external financing components. Section 7 deals with the process modelling and forecasting, as correlations and comovements are considered in Section 8. Volume, volatility and sudden stop linkages are probed in Section 9 and Section 10 assembles final remarks.

[1] Not just in case of emerging and developing countries but also for advanced nations capital flows are, at times, regarded as troublesome. The following excerpt (from a speech of the former US president, Bill Clinton) in Karolyi (2004) exemplifies this: "...it is now time for the world to take the next steps of implementing a new financial architecture and long-term reform of the global financial system. This should include steps to reduce the entire financial system's vulnerability to rapid capital flows..."

[2] See McKinnon and Pill (1998), Kindleberger and Aliber (2005).

2. Literature review

In the literature, there are theoretical and applied treatments that consider compositional and behavioural aspects of international financial movements. Modelling financial development and instability in open economies, Aghion *et al*. (2004) suggest that unrestricted and infinitely elastic foreign direct investment (FDI, as a substitute for domestic investment), acts countercyclically and stabilizes the economy. Foreign credit, on the contrary, is a highly procyclical funding source that—by having knock-on effects on the domestic credit expansion—destabilizes the economy. Envisaged as a part of or an addition to the equity of domestic firms, restricted and finitely elastic FDI (which may well be interpreted as portfolio equity-like FDI or directly as foreign portfolio equity investment that is considered to be complementary to the domestic investment) may also cause aggregate instability. Agénor and Aizenman (1998) and Aizenman and Powell (2003) conjecture that amplified volatility in cross-border lending (i.e. random shifts in external factors acting as aggregate contagious 'shocks' to productivity) increases financial spreads and the producer cost of capital, resulting in higher incidence of default, lower employment and welfare losses. Empirically, transitory and volatile portfolio inflows are detected to have negative impacts on future returns (Froot *et al*., 2001) and new investment spending of private firms (Demir, 2009). The volatility of FDI is predicted to decrease economic growth (Lensink and Morrissey, 2006).[3]

On the other hand, Caballero and Krishnamurthy (2006) take a holistic approach while focusing on the behavioural side of capital flows. They show that excessive capital flow volatility leads to real and financial asset price bubbles which expose the emerging country to bubble-bursts and funding reversals. Financial crises are preceded by volatile capital flows resulting from information frictions and default problems in Chari and Kehoe (2003). Besides, the notion of 'capital flow volatility' is interchangeably used with the term 'sudden stops in capital flows' by Jeanne and Ranciére (2011), and likewise, with the concept 'financial crises'—both of which are linked to investor herding—by Chari and Kehoe (2004). From this perspective, any comment on sudden stops, reversals and financial (banking and currency) crises could be ascribed to capital flow volatility and contagion.

Mendoza (2010) hypothesizes that hampered access to working capital financing, due to sudden stops in capital inflows, induces contractions in factor allocations (e.g. heightens unemployment) and production. Popularizing the term 'sudden stop', Calvo (1998) argues that sudden stops cause insolvency, lower the productivity of physical and human capital and engender across-the-board bankruptcies after sharp and unexpected changes in relative prices. Forbes and Warnock (2012) demonstrate that the depressed capital flow episodes (i.e. sudden stops and retrenchments) are more prone to contagion than the normal episodes of surges and flights. Employment and output costs of sudden stops and financial crises are documented in Hutchison and Noy (2005, 2006) and Bordo (2008).

Some applied works have adopted direct approaches to compositional and behavioural dynamics of international capital flows. Employing univariate time series data on five industrial and five developing

[3] There are also policy prescriptions to contain and control volatility and speculative activity in international financial markets and capital flows. In his presidential address at the conference of the Eastern Economic Association in 1978, Washington DC; James Tobin proposed a tax (credited to him as 'Tobin tax') on capital market transactions to mitigate excess fluctuations and stampedes across the markets and thus to serve as 'sand in the wheels' of international finance. Tobin (1978) and Eichengreen *et al*. (1995) formalize the idea, while Uppal (2011) reviews its costs and benefits. José Manuel Barroso, then European Commission president, has called for a tax for similar purposes on financial transactions throughout the European Union or at least for the Euro Zone (Financial Times, September 28, 2011).

countries, Claessens *et al*. (1995) discover that long-term funding components are at least as volatile and unpredictable as short-term components. Hence, the data labels 'short-term' and 'long-term' do not signal any information about the time series properties of the component in question. Sarno and Taylor (1999a) find relatively low permanent components in portfolio and official flows and high permanent components in commercial bank lending, while FDI flows are detected to be almost entirely permanent. For nine emerging East Asian economies plus Japan and Australia, Sarno and Taylor (1999b) report similar findings. Using group medians and means instead of individual time series for the countries from all income levels, Levchenko and Mauro (2007) show that there are limited differences across types of flow with respect to volatility, persistence, cross-country comovement and correlation with growth. Nevertheless, striking differences are explored around the sudden stop episodes: FDI is the most stable, portfolio flows undergo quickly recovering reversals whereas bank loans and trade credits tumble severely and stay depressed for some time. Albeit providing useful insights about the characteristics of various forms of capital movements, these studies have some shortcomings. There are inconsistencies and lack of clarity in sampling (often whether the data are monthly, quarterly or annual is unclear), definition (distinguishing the series as net or gross is arbitrary), measurement and scaling of the data used.

My goal in this investigation is to draw on the literature to elucidate the behavioural features of the main capital flow components by testing directly the conventional wisdom and the predictions from information-based trade-off model. Summarized in Claessens *et al*. (1995), conventional wisdom implies that short-term, as labelled on some balance of payments accounts, capital flows (short-term debt and portfolio equity) that are influenced by market sentiment are inherently speculative 'hot' money sources. Conversely, long-term flows (FDI and long-term debt) that are determined by structural factors are considered stable 'cold' money sources. According to the information-based trade-off model of Goldstein and Razin (2006), equity flows are expected to see lower reversals (FDI least and portfolio equity less) and hence they are more persistent and predictable. Liquid debt flows, however, are predicted to go through higher incidence of sudden stops. In order to analyse these maturity (short-term—long-term) and structure (debt—equity) distinctions and thus to provide cogent evidence I identify four basic capital flow types: foreign direct investment, foreign portfolio equity investment, long-term debt and short-term debt and four structured capital flow types: equity, debt, long term and short term.

Extending earlier papers and systematically testing the hypotheses that distinguish external funding components according to maturity vs. structure, I will also be answering the following questions: *(i)* Is the increase in identified forms of capital flows part of a long-run trend toward greater international diversification and risk sharing or is it simply a short-run phenomenon that could reverse suddenly? *(ii)* Do foreign investors take a long horizon in making their investments or are they in pursuit of short-run capital gains? *(iii)* Are there systematic differences across the funding components within the answers to *(i)* and *(ii)*?

3. Theoretical considerations

Claessens *et al*. (1995) argue that there is a conventional wisdom shaped by common beliefs about the behavioural patterns of different forms of international capital flows. Some accounting labels in the balance of payments and some time series tags in other databases (e.g. WDI and GDF of the World Bank) also reflect this understanding. The approach is that there is a distinction between foreign financing components as short-term and long-term. Short-term capital flows (STERM) which include debt bearing money market securities and

loans with a maturity of one year or less and foreign portfolio equity investment (FPEI) are regarded as inherently volatile and speculative hot money (i.e. funding sources that react to changes in expected risk and return, investor psychology and exchange rate differentials) that are also highly reversible and susceptible to sudden stops.[4] On the contrary, long-term capital flows (LTERM) including bonds and loans with a maturity of more than one year and foreign direct investment (FDI) are construed as intrinsically stable and predictable cold money (i.e. funding sources that respond to slow-moving structural factors and economic fundamentals) which are rather irreversible and immune to sudden stops. Therefore, the hypotheses pertinent to the so called conventional wisdom can be stipulated as:

$H1 :=$ STERM is more volatile than LTERM.

$H2 :=$ LTERM is more persistent and predictable than STERM.

$H3 :=$ Short term flows are less strongly correlated and co-moving than long term flows.

$H4 :=$ LTERM are less prone to sudden stops than STERM.

In their comprehensive model of information-based trade-off among foreign financing components Goldstein and Razin (2006) show that if FDI and FPEI coexist in the equilibrium then, on average, the expected liquidity needs of FPEI investors are higher than the expected liquidity needs of FDI investors.[5] This implies that the withdrawal rate of FPEI is higher than that of FDI, resulting in greater volatility of the former relative to the latter. It is also proposed that as the investor heterogeneity in terms of the degree of being sensitive to liquidity shocks increases, a separating equilibrium—with a large difference between the withdrawal rates and volatilities of FDI and FPEI—becomes more likely. They finally suggest that, albeit not explicitly formulated but deduced from the model, debt instruments are anticipated to attract investors with even higher liquidity needs so such capital movements face the highest withdrawal frequencies and severest fluctuations. This is because the return on debt is expected to be less sensitive to liquidity shocks as asymmetric information problems do not depress the secondary market price of debt. Thus, a pecking order among the capital flow components is established in the sense that there is an equity-debt distinction following the subordinate differentiation within equity flows.[6] Then, the information-based trade-off hypotheses are:

$H5 :=$ DEBT is more volatile than EQUITY.

$H6 :=$ EQUITY is more persistent and predictable than DEBT.

$H7 :=$ Debt flows are less strongly correlated and co-moving than equity flows.

$H8 :=$ EQUITY is less prone to sudden stops than DEBT.

[4] The view that FPEI is reckoned as a kind of short term capital flow could be traced in Stulz (1999) who states that in a positive feedback trading prevalent stock market environment highly liquid short-term financial instruments are open to volatility spawning speculative trading. Also see Sachs *et al*. (1996) as well as 'hot money' on Wikipedia.

[5] Information asymmetries in the model are envisaged to take place at two stages. At first stage there is a principal-agent kind of information asymmetry that exists between entrepreneurs and managers where the level of ownership reduces the costs and improves efficiency by mitigating the effects of information failures. The second stage information asymmetry arises between the current owner and the potential buyer when the former happens to sell prior to the maturity. The investor liquidity needs and preferences, instead of market conditions, determine the 'liquidity shocks' definition of the paper.

[6] Under the assumptions of financial frictions and partial inalienability, Albuquerque (2003) offers an FDI–non-FDI dichotomy for capital flow volatility profiles.

The hypotheses above will be tested with respect to volatility, persistence and predictability, correlation and comovement (or contagion risk) and incidence of sudden stop in turn.

Under the Bacchetta and van Wincoop (2000) model of overshooting effects of deterministic liberalization, it is also expected that all funding types indicate some degree of permanence as the market reforms and liberalizations giving rise to these flows are themselves predominantly permanent events.

4. Methodology

It is widely accepted that a consistent measure for the true volatility of a time series is not readily available yet. This might partly be due to varying definitions and use of the concept of volatility and partly because of the contingent or context-dependent nature of the current measures of volatility.[7] Hence, I consider feasible alternatives to identify consistent regularities in the realized volatility patterns of univariate time series of capital flow components and to assess $H1$ and $H5$. For the original series I calculate standard deviations and coefficients of variation as a preliminary exercise. The latter is used only as a complementary measure to the former because I am interested in absolute volatility more than the relative one.[8]

Following the practice in World Bank (2005) I further decompose the series into trend and cyclical components by the Hodrick-Prescott (HP) filter, taking the penalty parameter as $\lambda = 6.25$ in accordance with the frequency power rule of Ravn and Uhlig (2002). Realized fluctuations are measured through standard deviations of the cyclical components of these filtered series. The last method is preferred as it is sort of a Bayesian approach, similar to the one that Aizenman and Pinto (2005) mention, whereby the relatively more predictable and persistent trend component of the underlying variable is abstracted from the unanticipated cyclical (stochastic or random) component whose *volatility* is deemed to capture pure *risk* or *uncertainty* and to constitute a *shock* as conceived in Agénor and Aizenman (1998).[9] This is tantamount to a quasi detrended fluctuation analysis (Peng *et al*., 1994) by which I seek to eliminate the effects of potential nonstationarities and long-range dependence in the data—due to high volume, magnitude or scaling—so as to gauge true volatility without necessarily modelling it.

I formally test the difference between realized volatilities (i.e. standard deviations) of the actual and detrended capital flow series using Brown-Forsythe variance equality test (Brown and Forsythe, 1974) where the sample sizes are taken into account too. This test is chosen among the alternatives since it is found to be superior in terms of robustness and power even when the population means are unknown (Conover *et al*., 1981). Line plots are also depicted to show the evolution of volatilities through time.

I carry forward the behavioural analysis by undertaking process modelling to explore stationarity and persistence properties of capital flow series in question and thus to appraise the second and the sixth hypotheses. ADF (Dickey and Fuller, 1979), PP (Phillips and Perron, 1988) and KPSS (Kwiatkowski *et al*., 1992) unit root tests are performed to determine the order of integration and hence to decide whether a series is stationary. The

[7] For instance, Liu *et al*. (1999) quantify volatility by logarithmic growth rates of the series.

[8] Cox and Sadiraj (2010) argue that the coefficient of variation has poor normative and descriptive performance in risk appraisal and Polly (1998) shows that there is size-related bias in the coefficient of variation. See also Sørensen (2002).

[9] Volatility of the cyclical component obtained from the partitioning through HP filter could also be seen analogous to the *random component* in Chari and Kehoe (2003) and *stochastic component* in Acemoglu and Zilibotti (1997).

limitation is that possible outliers or breaks in the series (especially if early or late in the sample period) could engender low power in these tests. Following this, an autoregressive integrated moving average (ARIMA) model is fitted to the data along with a general-to-specific specification search strategy. Impulse response function diagnostics (the period statistics) from these data generating processes (DGPs) are derived to provide secondary line of evidence on the degree of permanence of the time series. Furthermore, dynamic out-of-sample forecasts are obtained from DGP estimations. Predictability conditions of structured capital flow components are, then, assessed with an explicit recourse to mean absolute percentage error (MAPE) and Theil inequality coefficient (TIC); the favoured statistics as they are scale-independent absolute measures. The lower are these indicators the more accurate forecasts are acquired and the higher predictability of the series.

I compute simple pairwise correlations and percentage proportions of the total variances explained by the first principal components to evaluate Hypotheses 3 and 7. Following Levchenko and Mauro (2007), I use first principal components to measure comovement among funding types *within* a specific country and risk of contagion *across* countries for a pair or a group of funding type. The principal component method is used for factor analysis because, as Rigobon (2002) argues, estimates are consistent even if the data would have simultaneous equations or omitted variable biases.[10]

The last hypotheses of conventional theory and information-based trade-off model ($H4$ and $H8$, respectively) are assessed through identifying and comparing sudden stops or reversibility incidences. A reduction of at least 50% from the previous year is defined as a sudden stop in the inflow of a capital flow component.

Finally, as a robustness exercise I carry out random-effects probability unit (probit; à la Bliss, 1934) estimations for the potential links between sudden stop, volume and volatility of capital flows. The population regression function takes the form of conditional probit representation of an index model of binary response

$$\Pr(S_{it} = 1|\mathbf{x}_{it}) = \boldsymbol{\Phi}(\mathbf{x}_{it}\boldsymbol{\beta}) \qquad i = 1, \dots, N; \quad t = 1, \dots, T \tag{1}$$

where, S_{it} denotes the dependent variable of sudden stop which is essentially a categorical factor variable taking on the dichotomous values of either 0 (failure, no sudden stop) or 1 (success, or sudden stop). $\mathbf{x}_{it}$ is a $1 \times K$ ($K \geq 2$ being the number of covariates) row vector of observed explanatory variables containing volumes, volatilities and time dummies. $\boldsymbol{\beta}$ is a $K \times 1$ column vector of parameters to be estimated, and $\boldsymbol{\Phi}$ is the standard cumulative normal distribution function.[11]

5. Data and measurement

To analyse univariate time series properties of international capital flow composition in 24 emerging countries and to test the hypotheses ($H1 - H8$) I identify four basic categories as foreign direct investment (FDI), foreign portfolio equity investment (FPEI), long term debt (LTDEBT) and short term debt (STDEBT) and four structured categories as equity (EQUITY), debt (DEBT), long term (LTERM) and short term (STERM).

[10] Boyson *et al*. (2010), Pukthuanthong and Roll (2009), Bekaert *et al*. (2009), Bordo and Murshid (2006), Mauro *et al*. (2002) also employ principal component analysis to gauge comovement and contagion.

[11] As stated in Wooldridge (2002), achieving a $\sqrt{N}$-consistent estimator of $\boldsymbol{\beta}$ is possible by maximizing the *partial* (sometimes *quasi*, *pseudo* or only *probit*) log-likelihood function $\sum_{i=1}^{N}\sum_{t=1}^{T}\{S_{it}\log\boldsymbol{\Phi}(\mathbf{x}_{it}\boldsymbol{\beta}) + (1 - S_{it})\log[1 - \boldsymbol{\Phi}(\mathbf{x}_{it}\boldsymbol{\beta})]\}$.

FDI refers to net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvested earnings, and other such long-term and short-term capital as shown in the balance of payments of the reporting economy.

FPEI represents non-debt-creating portfolio equity flows which are the sum of country funds, depository receipts and direct purchases of shares by foreign investors. EQUITY is the sum of FDI and FPEI.

LTDEBT is composed of publicly guaranteed and nonguaranteed debt from bonds that are either publicly issued or privately placed, publicly guaranteed and nonguaranteed long-term commercial bank loans and non-concessional credits (with an original or extended maturity of more than one year and owed to non-residents and repayable in foreign currency, goods or services) from private banks, other private financial institutions, official creditors (international organizations like the World Bank, regional development banks, other multilateral and intergovernmental agencies and other sovereign governments), manufacturers, exporters and export credit agencies.

STDEBT consists of publicly guaranteed and nonguaranteed debt arising from underwriting such as notes, repos and other money market instruments like treasury bills, commercial papers, bankers' acceptances and certificates of deposit and all the other loans with an original maturity of one year or less.

To construct FDI, FPEI, LTDEBT and STDEBT series annual liability balances of the relevant balance of payments accounts reported by the World Bank and IMF databases are considered.[12] All four variables of fundamental capital flow components (FDI, FPEI, LTDEBT and STDEBT) and structured flows (EQUITY, DEBT, LTERM and STERM) are expressed in real (billions of constant 2010 US dollars) terms that are believed to be more compatible with the theoretical formulations such as in Gourinchas and Jeanne (2013), Kraay *et al*. (2005), Boyd and Smith (1997). I keep the currency representation of the data that I would lose should I use GDP as numéraire.[13] Besides, conversion of the nominal values into real terms (using the US consumer price index as deflator) eliminates potential inflationary and exchange rate valuation effects.

[Table 1]

Table 1 provides summary statistics. Having smallest share in international portfolios per country per year FPEI is only 2.13 as most emerging countries liberalized their capital accounts and set up domestic exchange markets for stock and share trading much later (late 1980s) than the beginning of the overall sampling time (1970). Although the long term debt seems to have the highest share, FDI flows are catching up. Short term debt is third on average but more than twice as much as FPEI as both have negative minimums indicating net outflows. Regarding structured components, LTERM is highest followed by DEBT and EQUITY respectively whereas STERM lowest on the mean scale that has a negative minimum of a net outflow.

Figure 1 encompasses four panels of bar charts and line plots illustrating the average realizations and fluctuation patterns of the capital flow components. In terms of capital flow types, the précis given by Table 1

[12] I opt to use the net liability balances as they constitute the data of interest. The idea is that, as Dornbusch (2002) argues, when foreign financing to a particular sector is withdrawn (i.e. a sudden stop or reversal occurs) that means a capital outflow and not a substitution into other assets currently held by that sector.

[13] Binici *et al*. (2010), Aykut *et al*. (2010), Neumann *et al*. (2009), Alfaro *et al*. (2008), Schularick (2006), UNCTAD (2000) adopt similar practice.

can broadly be traced throughout this figure as well. [14] Over time both volume and volatility of all forms of capital flows increase and reach a crescendo in the last decade. During the years of financial crisis as shown by vertical grey lines capital flows indicate more oscillatory behaviour. [15]

[Figure 2]

6. Realized volatilities

Using alternative procedures I measure how basic capital flow components fluctuate over time to evaluate the first and fifth hypotheses. The results are sensitive to the choice of measurement, scaling and magnitude of the series and the length of time. Regarding the structured capital flow components, however, one can still observe important regularities throughout so as to reach conclusions on the volatility hypotheses (i.e. $H1$ and $H5$). Table 2 gives volatility metrics and tests of variance equality. High standard deviations reinforce the widely accepted conviction that capital flows to emerging markets are extremely volatile.[16] The conventional approach specified in $H1$, that short-term capital flows (STERM) fluctuates more than the long-term capital flows (LTERM), does not come out unambiguously from the data. However, the information-based trade-off model prediction in $H5$ is confirmed in that equity flows (EQUITY) are observed almost always to be more stable than debt flows (DEBT). This finding implicationally supports the premise that debt flows (including long-term maturity structured public and publicly guaranteed private external borrowings) pose the main policy challenges for and require more effective management by emerging economies.[17] DEBT being the most volatile structural capital flow type also indicates a country level (partially sovereign) debt overhang problem precipitated by highly leveraged balance of payments positions which might have added to outbreak of the crises (Krugman, 1999, Frankel and Wei, 2005). By and large, erratic oscillations in all forms of financing increase over time (Figure 3). Ironically, volatilities themselves are observed to be quite volatile and they increase over time especially during crisis years.

[Table 2]

[Figure 3]

7. Process modelling and forecasting

In addition to volatility, I provide more direct evidence on the persistence and predictability characteristics of the capital flow components under consideration (re $H2$ and $H6$). To capture the degree of persistence or permanence I identify appropriate data generating processes (DGP) by fitting autoregressive integrated moving average (ARIMA) models to the data series and derive the impulse responses from those models. To evaluate the degree of predictability for the same series, I get dynamic forecasts using the estimated equation or DGP where the time trend is allowed for in each case.

[14] As an alternative presentation of the raw data two-way line plots of the time series are illustrated in the appendix.

[15] On the vulnerability generating impact of short-term external borrowing see Kose *et al*. (2009), Dornbusch (2002), Chang and Velasco (2001), Cole and Kehoe (2000), Calvo (1998).

[16] See Martin and Rey (2006), Caballero and Krishnamurthy (2006), Aizenman and Pinto (2005), Aghion *et al*. (2004), Chari and Kehoe (2003), Sarno and Taylor (1999a), McKinnon and Pill (1998).

[17] The surmise has been developed and discussed around the concept of 'debt intolerance' in Reinhart *et al*. (2003), Reinhart and Rogoff (2004), Eichengreen *et al*. (2007).

Table 3 reports the specified ARIMA models (explicitly indicating the orders of auto-regression, integration and moving average only), *periods* (the number of years during which impulse responses to a one standard deviation shock in the estimated model (i.e. corresponding DGP in the table) innovation remain above 0.50 threshold), and scale independent forecasting measures of mean absolute percentage errors (MAPE; to capture forecast accuracy and precision) and Theil inequality coefficients (TIC; to account for the goodness of fit and forecast quality).[18]

[Table 3]

Inspection of the presented ARIMA models show that all series are the realization of at least difference stationary or $I(1)$ processes like the case in Sarno and Taylor (1999a). This shows that all capital flow types exhibit some degree of permanence as Bacchetta and van Wincoop (2000) predict.

Considering the DGPs (the actual models and primarily the order of integration counts of each type) in the first place and *periods* of the capital flow components secondarily, it is seen that LTERM has the longest memory and hence is the most persistent whereas EQUITY is the least permanent. Thus, considering the persistence part of the second and sixth hypotheses, results support the second hypothesis that LTERM is more persistent than STERM whereas EQUITY is less persistent than DEBT unlike the sixth hypothesis.

Regarding the predictability of the capital flow components, the values of MAPE and TIC demonstrate that forecast accuracy, quality and goodness of fit properties of EQUITY are the best, lending support to hypothesis 6. As per hypothesis 2 the outcome is ambiguous as MAPE is highest for STERM (in line with the hypothesis) but TIC is lower than LTERM (contrary to the hypothesis). Therefore, it is clear that equity flows are more predictable than debt flows but unclear whether long term flows are more predictable than short term flows.

8. Correlations and comovements

Pairwise correlation and first principal component variance proportion matrices are given in Table 4. Correlations between capital flow components support hypothesis 3 that long-term flows are more strongly correlated than short-term flows but does not support hypothesis 7 as debt flows are more strongly correlated than equity flows. Regarding the nature of correlations as whether the financing components are substitutes (if negatively correlated) or complements (if positively correlated) within emerging markets, they are found to be complements. Generally, my findings contradict those of Claessens *et al*. (1995) and Levchenko and Mauro (2007) who show that for countries from all income levels capital flow types are substitutes.

[Table 4]

Variance proportions of the first principal components indicate strong comovement and contagion risk across countries for a specific (group of) component(s).[19] Similar to the case in correlations factors common to all countries account for more of the total variation in FDI-LTDEBT than in FPEI-STDEBT as in $H3$ but in

[18] Three alternative unit root tests, ADF (Dickey and Fuller, 1979), PP (Phillips and Perron, 1988) and KPSS (Kwiatkowski *et al*., 1992), are employed to determine the order of integration of a series. The decision is made for a particular outcome (i.e. the order of integration) if the results from at least two tests are statistically equivalent. This is consistent with the account of Stock (1994) that interpretation of the unit root tests is a matter of judgement. Results from unit root tests and correlograms with Q-statistics are in the appendix.

[19] Similar observation qualitatively noted for portfolio equity flows in Stulz (1999).

contrast to $H7$ comovement and contagion risk is higher for LTDEBT-STDEBT pair than FDI-FPEI pair. Higher risk of contagion in long term and debt-like financial investments implies that determining factors behind them might be correlated across emerging countries. Short term and equity-like financing seem to be influenced by rather destination-specific factors and policy choices which make them to be less prone to contagion. However, no matter their maturity and structure type comovement and contagion risk is high for all capital flow components as the proportion explained by first principal component is 51.

9. Volume, volatility and sudden stop nexus

Broadly defined as swift decline, reversal or crunch in capital flows; *sudden stop* is a crucial phenomenon in several research efforts for understanding the mechanism of financial crises, evaluating the benefits and harms of economic integration and liberalization and assessing pros and cons of capital controls. Sudden stop is also intimately linked to the concept of capital flow volatility. Indeed, Jeanne and Rancière (2011) use these terms interchangeably. By quantifying the subject matter of sudden stop I test the final hypotheses of conventional wisdom and trade-off model ($H4$ and $H8$, respectively). I also investigate if there is a close association between capital flow volatility and sudden stop.

The sudden stop frequencies are provided in Table 5. In the context of this investigation, a decrease in a certain type of foreign financing of at least 50% from the previous year is identified as an incidence of sudden stop.[20] Frequency, then, becomes the number of such measured sudden stops in the capital flow component under consideration during the corresponding time period.[21]

[Table 5]

In general conformity with the fourth and eighth hypotheses equity and long term flows are less prone to sudden stops than debt and short term flows. These results are largely similar to Levchenko and Mauro (2007) and Sarno and Taylor (1999a, 1999b): FDI is least reversible while some debt flows (bond and official flows) appear quite reversible. More sudden stop incidence is observed for debt and short term flows over time which is another (time varying) indication of the distinction made in $H4$ and $H8$.

As noted, many writers treat capital flow volatility and sudden stop as synonymous, e.g. Jeanne and Rancière (2011), Jeanne and Korinek (2010), Calvo *et al*. (2008), Caballero (2003). Via random-effects probit regressions I analyse the interrelationship between sudden stop probabilities and capital flow volatilities given the volumes of capital flows (i.e. controlling for the real levels in billions of 2010 USD). It is hypothesized that the probability of sudden stop in an external funding component is positively (negatively) related to the volatility (volume) of that component.

[Table 6]

The results from estimations of the variants of Equation (1) are in Table 6. Under each specification, dependent variable is a binary indicator for the corresponding capital flow component designating whether the outcome is a sudden stop in that component during the matching year. Volume refers to per capita real forms of

[20] Similar and alternative definitions could be found in Bordo *et al*. (2010), Cavallo and Frankel (2008), Honig (2008), Hutchinson and Noy (2006).

[21] Of the similar nature, frequency of sign changes in capital flows are given in Table 6.4 in Lipsey (1999) and the number of sudden stops presented in the first tables in Honig (2008), Hutchinson and Noy (2006) and in Figure 1 of Cavallo and Frankel (2008).

the series and volatility stands for 3-year rolling standard deviations of the same series. There are two columns per component reporting the estimates derived from two different model specifications. The first controls for own volume and volatility nearby unreported constant and time dummies and the second includes volumes and volatilities of the other components with unreported constant and time dummies as well to allow for potential cross linkages. The results under all these specifications suggest that, for any type of international financing, volatility exacerbates the likelihood of a sudden stop whereas volume mitigates it. The inverse relationship implies that the more uncertainty muffles the realization and prospect of a flow component the more likely is that the inflow of that component will experience an abrupt cessation. Conversely, sudden stop probability reducing impact of the volume reveals the fact that as the investors and creditors enlarge their exposure by increasing asset purchases and lending they become automatically more committed to a certain market destination which makes them more unlikely to retreat from that market all of a sudden. These findings attest to the critical role played by stably increased inflow of foreign funding in avoiding or at least alleviating financial crashes. Volatility of EQUITY increases sudden stop probability of DEBT while volume decreases it.

10. Conclusion

The conventional wisdom and the predictions of the information-based trade-off model of Goldstein and Razin (2006) are comparatively investigated with reference to behavioural aspects of four major components of capital flows. Using annual time series data for the period 1970-2014 for 24 emerging economies, I analyse volatility, persistence, predictability, correlation, comovement (or contagion risk) and sudden stop (reversibility) patterns of equity flows (foreign direct investment (FDI) and foreign portfolio equity investment (FPEI)), debt flows (long-term debt flows (LTDEBT) and short-term debt flows (STDEBT)), long term flows (FDI and LTDEBT) and short term flows (FPEI and STDEBT) through appropriate statistical and econometric techniques.

I show that, besides a maturity oriented (i.e. long term–short term) polarity, a structural (i.e. equity–debt) dichotomy is noticeable in that equity flows (FDI and FPEI) are less volatile and persistent, more predictable and less susceptible to sudden stops than debt flows (LTDEBT and STDEBT). Conventional perception that short-term financial flows (STDEBT and FPEI) are more volatile than long-term financial flows (LTDEBT and FDI) is not supported in my data. Nonetheless, there is evidence that correlations and risks of contagion are stronger within the pairs of long-term capital flows (FDI and LTDEBT) and debt flows (LTDEBT and STDEBT) than within the short-term capital flows (FPEI and STDEBT) and equity flows (FDI and FPEI) pairs. Thus, my findings lend support to majority of the hypotheses from the information-based trade-off model. They are also consistent with the majority of the hypotheses from the conventional theory. Finally, I confirm that all funding components reveal some permanence, as conjectured by Bacchetta and van Wincoop (2000).

Considering results for the individual hypotheses, it is concluded that the conventional claim in the first hypothesis—that the long-term capital flows are less volatile than the short-term capital flows—is empirically vague. The information-based trade-off model version of this hypothesis (i.e. the fifth hypothesis)—arguing that equity flows have lower volatility than debt flows—is plainly verified. Process modelling and forecasting results demonstrate that there is partly maturity and structure distinction among the flow components in terms of persistence and predictability, backing the second and the sixth hypothesis in part. Furthermore, the correlation and comovement hypotheses (that long-term flows are more strongly correlated and comoving than short-term

flows, $H3$, and that debt (equity) flows are weakly (strongly) correlated and comoving, $H7$) are also partly confirmed. I provide the last, but not least, evidence on the reversibility profiles of global fund flows. The finding is that not only short-term funds are more susceptible to sudden stops than long-term funds (Hypothesis 4) but also is foreign lending more reversible than foreign equity (Hypothesis 8).

I return to comment on the questions posed in the literature review starting with the last one. It is shown that there are indeed systematic differences across funding components. The increase in equity-type of inflows is characterized to be part of a long-run trend (given EQUITY is detected to be more stable, less persistent, more predictable, less comoving and less reversible) that offer greater diversification and better risk sharing opportunities not only for foreign financiers but also for domestic fundraisers. Being less promising on these terms and although having longer memory, debt flows seem to be rather short run phenomena that could reverse suddenly. These findings are in line with the continuous-time stochastic model of Obstfeld (1994) who proposes that an *ever-increasing* (i.e. strongly trended) international portfolio allocation is associated with the greater diversification—pooling portfolios intertemporally with global assets—which in turn leads to substantial risk reduction. Sørensen *et al*. (2007) provide similar evidence. My results also suggest that international investors are more likely to chase short-run capital gains and immediate yields on lending, whereas they take long horizon and show commitment in making portfolio equity and direct investments.

As empirically found, it is possible to see a 'debt vs. equity' approach in the recent literature where (from an emerging market perspective) equity-like financing is viewed as more favourable than debt financing. Aghion *et al*. (2004) posit that debt flows are largely procyclical and, when excessive, they can magnify the adverse impacts of shocks on economic growth. Under the presence of default risk and financial constraints, high external leverage may lead to appreciations and fluctuations in the real exchange rate (i.e. the transfer problem) which in turn propel fluctuations in the price of the country-specific factor. Considerable liquidation and restructuring costs from large-scale bankruptcies that resulted from amplified volatility of firms' cash flows could destabilize the aggregate economy and eventually engender prolonged periods of slumps. They contend, on the other hand, that FDI (and equity capital that has informational advantages) characterized as a substitute for domestic investment (i.e. perfectly free and infinitely elastic) may well be regarded as a countercyclical source that ultimately stabilizes the economy. Moreover, in the absence of restrictions, foreign portfolio and direct equity financing provide a less costly alternative (Neumann, 2003) and offer better risk sharing opportunities (Stulz, 1999) by reducing the cost of capital (Henry, 2003) and the size of distortionary effects of the transfer problem (Lane and Milesi-Ferretti, 2004).

Foreign over-borrowing is more likely to give rise to a debt overhang problem both at firm (Myers, 1977) and country level (Krugman, 1988), either directly or indirectly through facilitating domestic over-lending. Firm level debt overhang that entails risk shifting reduces efficiency and results in underinvestment.[22] At the country level, Aguiar *et al*. (2009) show that, under the limited commitment and impatience of the government, sovereign debt overhang amplifies investment cycles and leads to instability of the aggregate income.[23] On the other hand, over-indebtedness is an integral element of a Fisherian debt-deflation cycle which is held

[22] Shleifer and Vishny (1992), Manso (2008), Moyen (2007), Aivazian *et al*. (2005), Hennessy (2004).

[23] Although investment effect of the country level debt overhang is documented to be ambiguous, the actual service of the debt is found to crowd out investment. See Bulow and Rogoff (1990), Warner (1992), in particular, Cohen (1993).

responsible for generating financial and economic crises.[24] Among the three factors that can make financial collapse possible, as Krugman (1999) highlights, two (high leverage and large foreign currency debt relative to exports) are obviously related to debt funding. Empirically supporting this critique, Frankel and Wei (2005) indicate that while the ratio of short-term debt to international reserves increases the probability of a crash, combined with inflation within their regression tree analysis, a high ratio of external debt to GDP would also place a country in jeopardy.

From the equity funding side, however, again Frankel and Wei (2005) show that the ratio of FDI and portfolio equity to gross foreign liabilities decreases the chance of a crisis. Besides bringing positive externalities of financial globalization such as managerial and technological expertise, foreign equity investments are estimated to induce investment and boost economic growth (Kose *et al*., 2009). Finally, Allen (2001) argues that the buffer role of equity capital might mitigate the detrimental effects of possible future debt overhang and agency problems and attenuate the probability of deadweight costs-creating bankruptcies.

In the light of these arguments and mindful of some negative features (identified above) of global equity flows, as being inclined to contagion and speculation, I suggest that emerging countries—while wisely and vigilantly managing debt financing—should prioritize equity financing.[25]

[24] See Fisher (1933), McKinnon and Pill (1998), Schneider and Tornell (2004), Mendoza (2010).

[25] For identical recommendations please refer to Eichengreen (2000), Cardoso and Dornbusch (1989).

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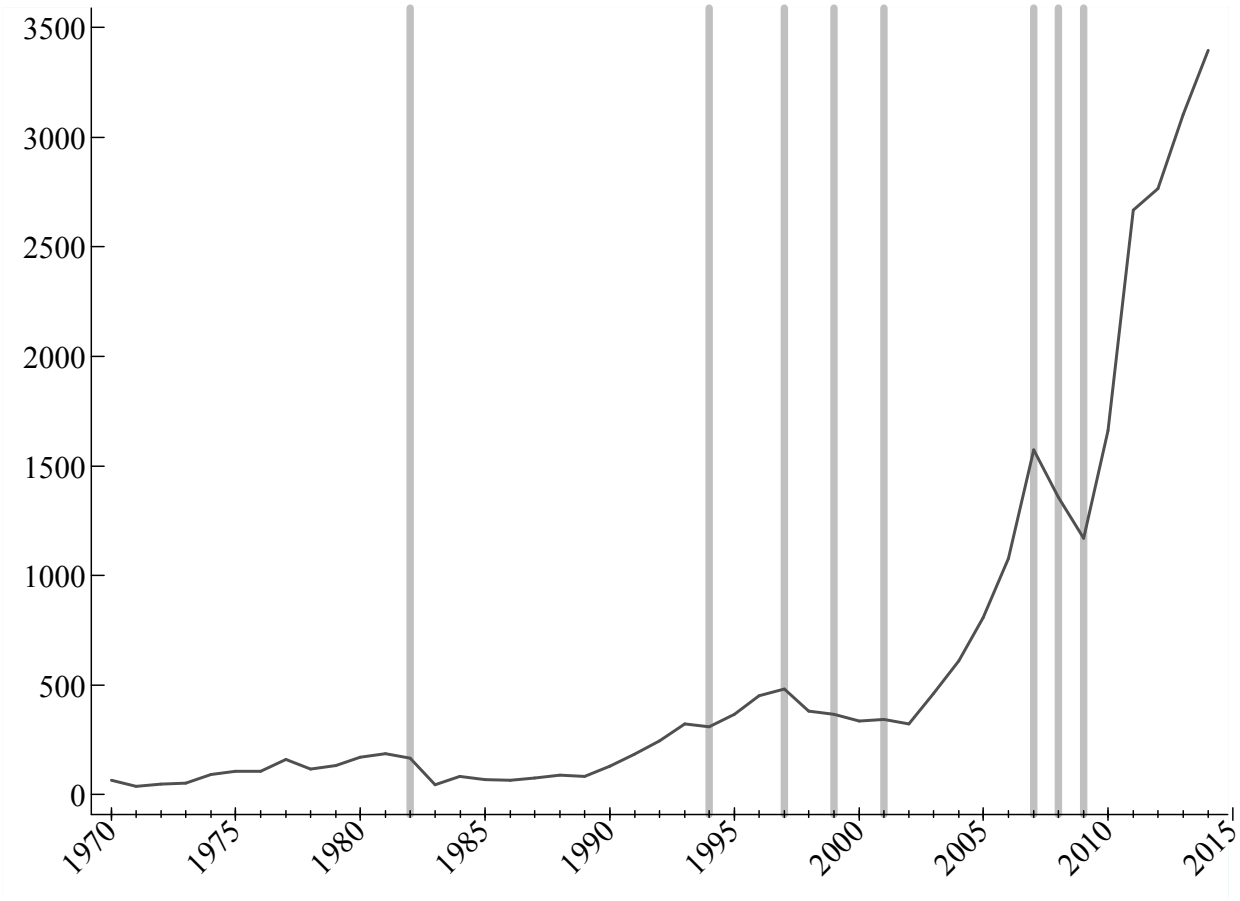


Figure 1. Total capital inflows to emerging markets (1970-2014, Billions of 2010 USD).

Note: Vertical grey lines correspond to the years (1982, 1994, 1997, 1999, 2001, 2007, 2008 and 2009) of currency and financial crises in different countries.

Table 1. Data summary (1970-2014, Billions of 2010 USD).

Component	Sample Size	Mean	Median	Min	Max	Total
Basic						
FDI	45	7.03	2.55	0.34	25.59	316.55
FPEI	40	2.13	1.03	-0.76	8.14	85.08
LTDEBT	45	11.81	4.93	1.34	83.32	531.23
STDEBT	45	4.88	1.76	-1.97	32.03	219.47
Structured						
EQUITY	45	8.60	3.36	0.13	32.04	386.87
DEBT	45	16.26	6.13	1.05	110.94	731.55
LTERM	45	18.40	7.27	1.37	107.57	827.98
STERM	45	6.45	2.24	-1.60	37.92	290.44

Note: FDI denotes foreign direct investment, FPEI stands for foreign portfolio equity investment, LTDEBT refers to long term debt and STDEBT represents short term debt. Structured flows are that EQUITY is the sum of FDI and FPEI, DEBT is the sum of LTDEBT and STDEBT, LTERM (long term) is the sum of FDI and LTDEBT and STERM (short term) is the sum of FPEI and STDEBT. The number of observations for the available annual data is given under the third column (Sample Size). Data come from the World Development Indicators (WDI), Joint External Debt Hub (JEDH), International Debt Statistics (IDS) databases of the World Bank and International Financial Statistics (IFS) database of the IMF.

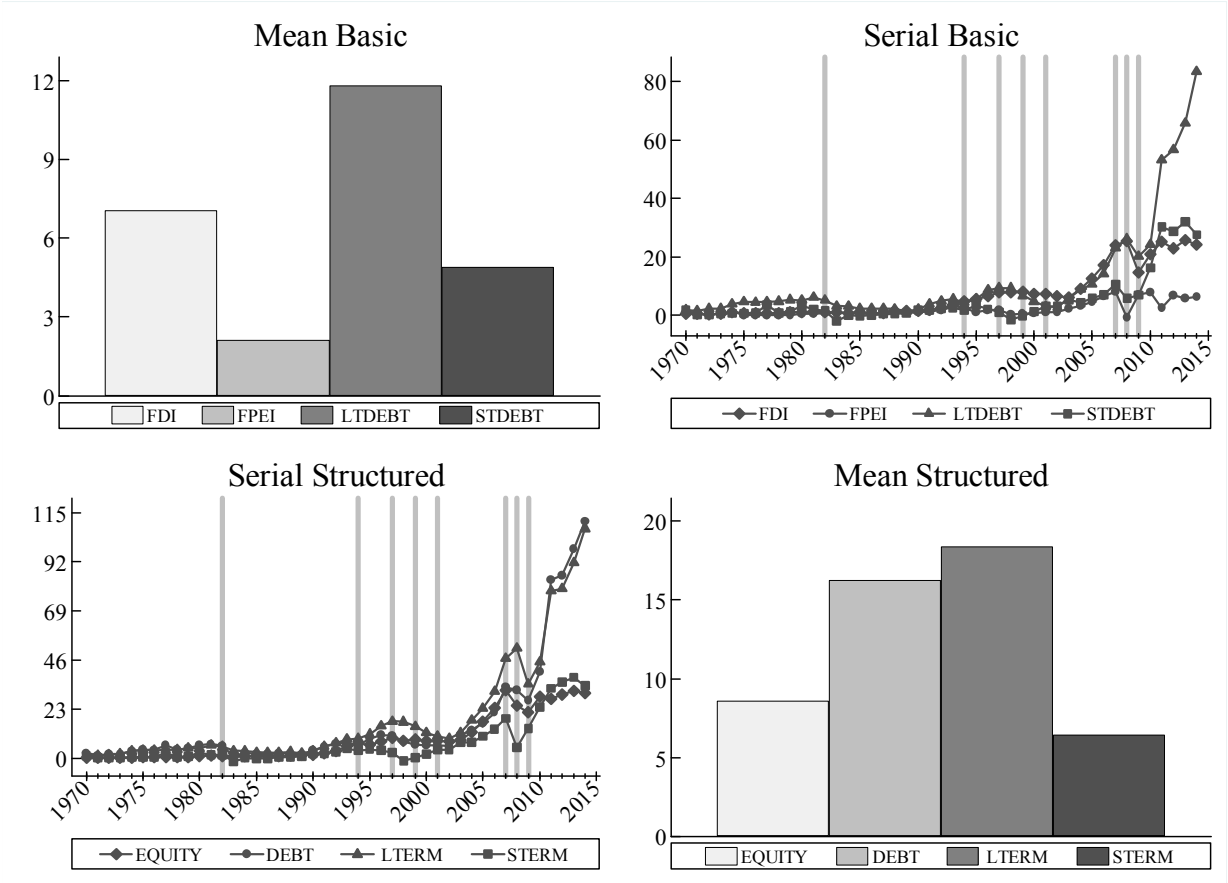


Figure 2. Capital inflows to emerging markets by component (1970-2014, Billions of 2010 USD).

Note: See notes to Figure 1 and Table 1.

Table 2. Volatility measures and tests for structured capital flow components.

Component	Standard deviation	Coef. of variation	Brown-Forsythe variance equality tests					
			EQUITY		DEBT		LTERM	
			Stat	*p*-value	Stat	*p*-value	Stat	*p*-value
Unfiltered								
EQUITY	10.54	1.23						
DEBT	26.45	1.63	1.64	0.20				
LTERM	25.79	1.40	3.58	0.06	0.16	0.69		
STERM	10.41	1.61	0.90	0.35	2.98	0.09	5.55	0.02
Filtered								
EQUITY	1.61	-2.85e+16						
DEBT	3.93	-7.59e+16	3.50	0.06				
LTERM	3.89	4.51e+17	4.62	0.03	0.03	0.86		
STERM	2.31	1.34e+17	2.43	0.12	0.71	0.40	1.16	0.28

Note: Brown-Forsythe variance equality test evaluates the null hypothesis that the variances of paired capital flow components are equal against the alternative of different variances. See also notes to Table 1.

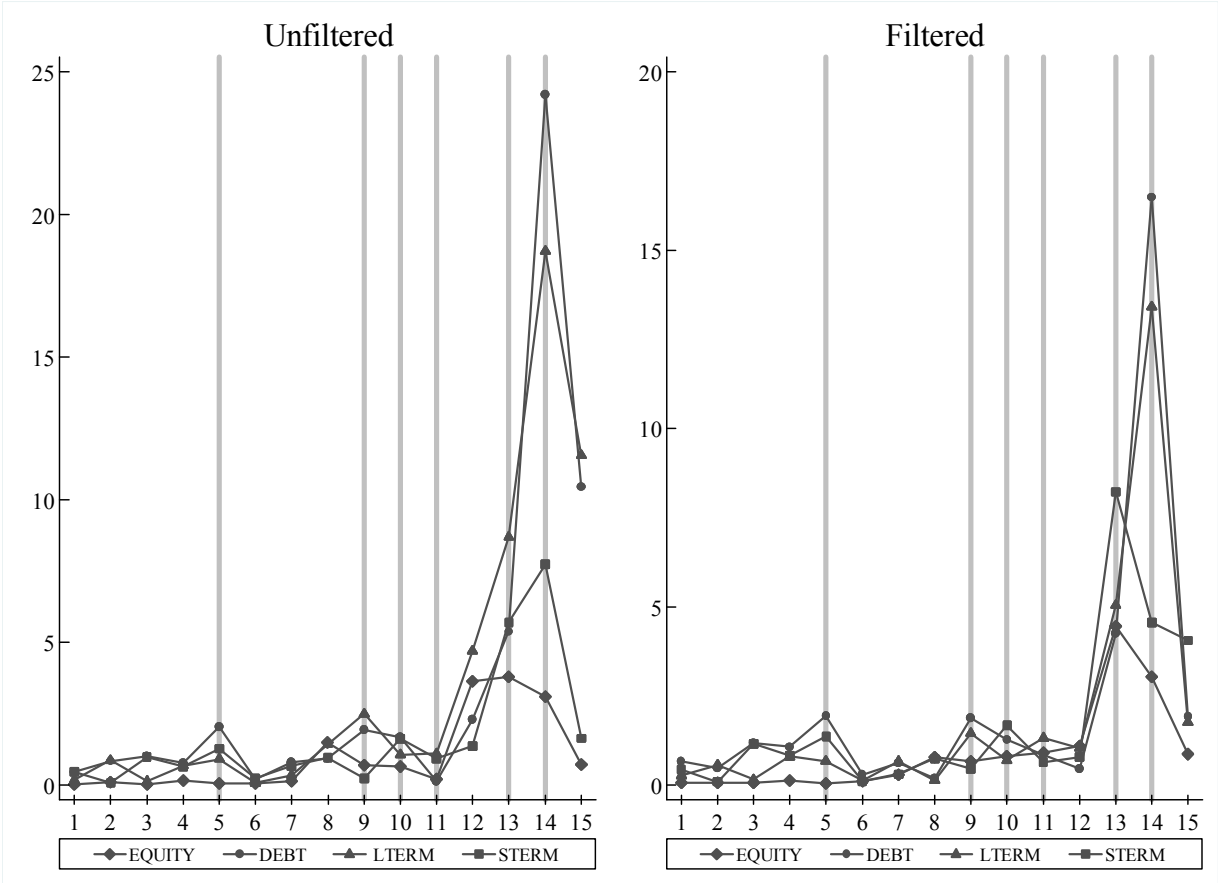


Figure 3. Volatility of structured capital flow components over time.

Note: Numbers on the horizontal axis are 3-year sub-periods. See notes to Figure 2 as well.

Table 3. Data generating processes (DGP) and forecasting for structured capital flow components.

Series	DGPs and model diagnostics				Forecast evaluation	
	DGP	Period	*q*-stat	*p*-value	MAPE	TIC
EQUITY	ARIMA(1,1,1)	2	2.94	0.09	62.33	0.11
DEBT	ARIMA(2,2,1)	6	0.98	0.32	842.83	0.83
LTERM	ARIMA(2,2,1)	8	1.84	0.18	429.33	0.77
STERM	ARIMA(1,1,1)	3	1.14	0.29	2927.72	0.24

Note: Each autoregressive integrated moving average (ARIMA) model is estimated via nonlinear least squares (NLS) by applying a Marquardt NLS algorithm to the transformed equation. Note that the NLS estimates are asymptotically equivalent to maximum likelihood (ML) estimates and are asymptotically efficient. Numbers in parentheses respectively show the order of auto-regression (AR), integration (I), and moving average (MA). Period indicates the number of years during which impulse responses to a one-time shock in the innovation (a one standard deviation shock using the standard error of the regression for the estimated equation and taking account of innovation uncertainty) stand above 0.50 in absolute values. Although it is a common measure for residual persistence in the series, the 'period' statistic has a different meaning for stationary and unit root processes. For stationary processes, it shows the number of periods that the level remains above 0.50; whereas for unit root processes, it shows the number of periods that the growth rate remains above 0.50 following a unit shock. Under *q*-stat given are *p*-values from the Q statistic of serial correlation test for the model errors. A *p*-value greater than 0.10 validates the specification fitted in the sense that there is no serial correlation left uncontrolled in the residuals. Mean absolute percentage error (MAPE) and Theil inequality coefficient (TIC) are scale invariant indicators employed to evaluate dynamic forecasting performance of each component.

Table 4. Pairwise correlations and principal components, 1970-2014.

Series	Pairwise correlations				First principal component proportions			
	FDI	FPEI	LTDEBT	STDEBT	FDI	FPEI	LTDEBT	ALL
FDI	1.00				1.00			
FPEI	0.32	1.00			0.66	1.00		
	(0.00)							0.51
LTDEBT	0.15	-0.04	1.00		0.57	0.52	1.00	
	(0.00)	(0.29)						
STDEBT	0.33	0.05	0.91	1.00	0.67	0.52	0.96	
	(0.00)	(0.23)	(0.00)					

Note: ALL refers to the group of the four components altogether. *p*-values in parentheses. First principal components are the percentage proportions of total variance explained by the first principal components (i.e. factors common to all variables in a set of time series) which are the unit-length linear combinations of the original variables with maximum variance.

Table 5. Frequency of sudden stops.

Series	Observations	Sudden stop frequencies			
	1970-2014	1970-2014	1970-1984	1985-1999	2000-2014
EQUITY	1080	143	69	36	38
DEBT	1080	343	73	131	139
LTERM	1080	195	68	66	61
STERM	1080	476	114	180	182

Note: Sudden stop is defined as abrupt cessation, drop or reversal of capital flows. Quantitatively, a decrease in a certain type of foreign financing of at least 50% from the previous year is identified as an incidence of sudden stop. Frequency is the number of sudden stops (country, year) in the capital flow component under consideration during the corresponding time period.

Table 6. Random-effects probit estimations of sudden Stops (Annual panel data, 1970-2014).

	EQUITY (1)	EQUITY (2)	DEBT (1)	DEBT (2)	LTERM (1)	LTERM (2)	STERM (1)	STERM (2)
EQUITY	-0.0840***	-0.0856***		-0.0091*		0.0048		0.0142***
Volume	(0.015)	(0.017)		(0.005)		(0.011)		(0.004)
EQUITY	0.0035	0.0143		0.0995***		0.0483		0.0246
Volatility	(0.004)	(0.051)		(0.037)		(0.045)		(0.037)
DEBT		0.0142	-0.0173***	-0.0279***		-0.0678***		0.0043
Volume		(0.010)	(0.003)	(0.006)		(0.013)		(0.003)
DEBT		0.0507	0.0034***	0.0547		0.0590		-0.0112
Volatility		(0.055)	(0.001)	(0.042)		(0.051)		(0.041)
LTERM		-0.0148		0.0139**	-0.0774***	-0.0478***		0.0000
Volume		(0.013)		(0.006)	(0.011)	(0.015)		(.)
LTERM		-0.0538		-0.0735	0.0031**	-0.0742		-0.0330
Volatility		(0.066)		(0.050)	(0.001)	(0.060)		(0.049)
STERM		0.0000		0.0000		0.0000	-0.0391***	-0.0614***
Volume		(.)		(.)		(.)	(0.006)	(0.009)
STERM		-0.0435		-0.0796		-0.0485	0.0133***	0.0976*
Volatility		(0.071)		(0.056)		(0.066)	(0.002)	(0.055)
Observations	1080	1080	1080	1080	1080	1080	1080	1080
Countries	24	24	24	24	24	24	24	24

Note: Under each specification, dependent variable is a binary indicator for the corresponding capital flow component designating whether the outcome is a sudden stop in that component during the matching year. Volume refers to original (unfiltered) per capita real capital flow series and volatility refers to 3-year rolling standard deviations of the structured series. Unreported constant and time dummies (period fixed effects) are included in all regressions. (.) means omission due to collinearity. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. See notes to Table 5 as well.

Appendix

Table A1. Sample emerging countries.

Argentina	China	Hungary	Mexico	Philippines	South Africa
Brazil	Colombia	India	Morocco	Poland	Thailand
Bulgaria	Ecuador	Indonesia	Pakistan	Romania	Tunisia
Chile	Egypt	Malaysia	Peru	Russia	Turkey

Table A2. Unit root tests for structured capital flow components.

Test Type	EQUITY		DEBT		LTERM		STERM	
	Stat	*p*-value	Stat	*p*-value	Stat	*p*-value	Stat	*p*-value
Level								
ADF$_{\mu,\tau}$	-1.61	0.77	4.49	1.00	-0.33	0.99	-1.09	0.92
PP$_{\mu,\tau}$	-1.61	0.77	2.97	1.00	2.87	1.00	-0.84	0.95
KPSS$_{\mu,\tau}$	0.20	0.22	0.18	0.22	0.19	0.22	0.19	0.22
1st Difference								
ADF$_{\mu,\tau}$	-5.95	0.00	1.47	1.00	-1.37	0.85	-6.61	0.00
PP$_{\mu,\tau}$	-5.96	0.00	-5.62	0.00	-5.72	0.00	-7.49	0.00
KPSS$_{\mu,\tau}$	0.04	0.22	0.18	0.22	0.14	0.22	0.21	0.22
2nd Difference								
ADF$_{\mu,\tau}$			-9.33	0.00	-8.99	0.00		
PP$_{\mu,\tau}$			-22.88	0.00	-20.94	0.00		
KPSS$_{\mu,\tau}$			0.18	0.22	0.50	0.22		

Note: Augmented Dickey-Fuller (ADF, 1979), Phillips-Perron (PP, 1988), Kwiatkowski, Phillips, Schmidt, and Shin (KPSS, 1992) are the alternative tools for testing a series (or the first or second difference of the series) for the presence of a unit root. Subscripts τ and μ indicate whether a time trend and a constant term are included in the test specification.

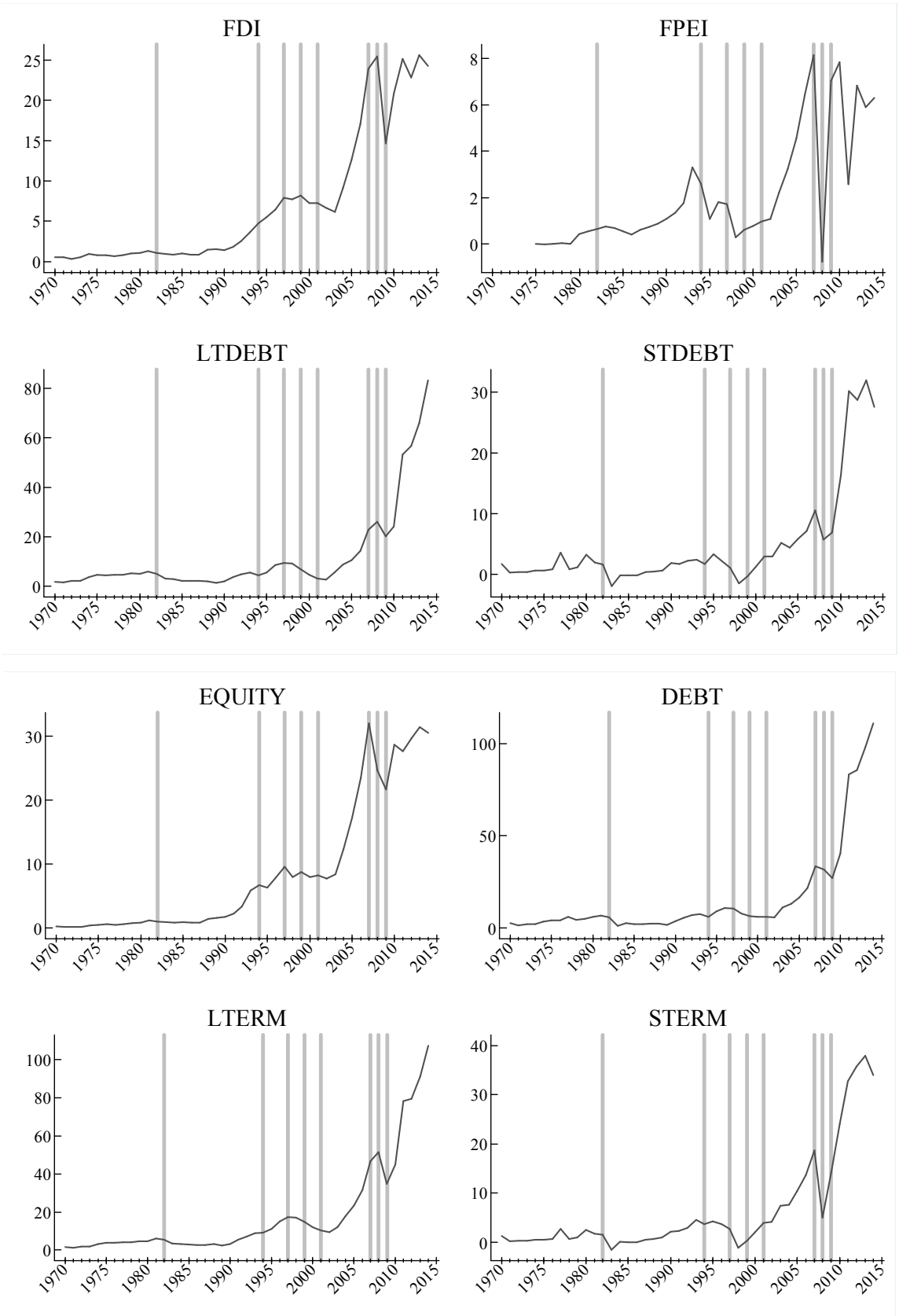
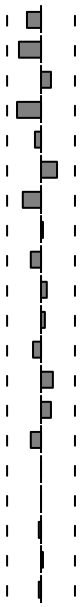
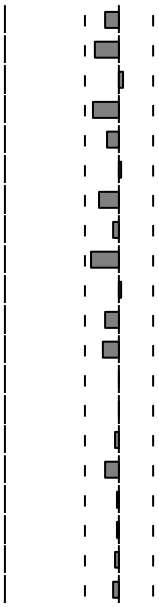
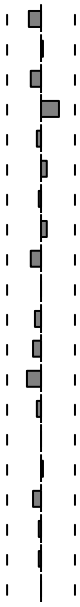
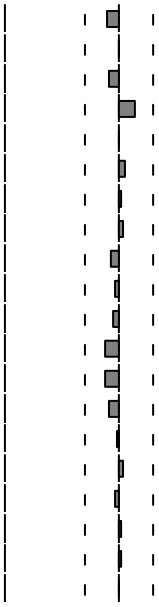


Figure A1. Time series plots of basic and structured capital flow components (1970-2014, billions of 2010 USD).

EQUITY

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.130	-0.130	0.7932	
		2	-0.189	-0.209	2.5099	
		3	0.094	0.039	2.9437	0.086
		4	-0.208	-0.242	5.1337	0.077
		5	-0.065	-0.114	5.3519	0.148
		6	0.132	0.009	6.2847	0.179
		7	-0.164	-0.183	7.7605	0.170
		8	0.015	-0.057	7.7727	0.255
		9	-0.095	-0.260	8.2952	0.307
		10	0.053	0.014	8.4625	0.390
		11	0.040	-0.123	8.5589	0.479
		12	-0.072	-0.144	8.8911	0.542
		13	0.108	-0.004	9.6483	0.562
		14	0.087	0.004	10.163	0.602
		15	-0.088	-0.032	10.704	0.636
		16	0.008	-0.120	10.709	0.709
		17	0.003	-0.015	10.709	0.773
		18	-0.012	-0.012	10.721	0.826
		19	0.016	-0.029	10.742	0.870
		20	-0.023	-0.059	10.788	0.903

DEBT

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.105	-0.105	0.5077	
		2	0.017	0.006	0.5214	
		3	-0.097	-0.096	0.9755	0.323
		4	0.167	0.150	2.3586	0.307
		5	-0.030	0.001	2.4058	0.493
		6	0.065	0.055	2.6302	0.621
		7	-0.019	0.021	2.6490	0.754
		8	0.064	0.039	2.8737	0.825
		9	-0.086	-0.066	3.2960	0.856
		10	-0.004	-0.037	3.2970	0.914
		11	-0.063	-0.063	3.5386	0.939
		12	-0.079	-0.128	3.9260	0.951
		13	-0.118	-0.128	4.8190	0.940
		14	-0.044	-0.088	4.9456	0.960
		15	-0.006	-0.017	4.9485	0.976
		16	0.021	0.033	4.9793	0.986
		17	-0.080	-0.034	5.4511	0.988
		18	-0.008	0.013	5.4567	0.993
		19	-0.011	0.016	5.4672	0.996
		20	-0.002	-0.006	5.4676	0.998

LTERM

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.024	0.024	0.0262	
		2	-0.128	-0.129	0.8023	
		3	0.147	0.156	1.8409	0.175
		4	-0.143	-0.178	2.8594	0.239
		5	-0.112	-0.057	3.5017	0.321
		6	0.057	-0.001	3.6719	0.452
		7	0.071	0.099	3.9434	0.558
		8	0.012	0.012	3.9519	0.683
		9	0.022	0.008	3.9794	0.782
		10	-0.013	-0.036	3.9893	0.858
		11	-0.095	-0.069	4.5387	0.873
		12	-0.102	-0.093	5.1906	0.878
		13	-0.112	-0.126	5.9936	0.874
		14	-0.041	-0.049	6.1081	0.911
		15	0.016	-0.017	6.1265	0.941
		16	-0.010	-0.033	6.1338	0.963
		17	-0.009	-0.043	6.1395	0.977
		18	-0.003	-0.025	6.1404	0.987
		19	-0.022	-0.006	6.1795	0.992
		20	0.014	0.038	6.1956	0.995

STERM

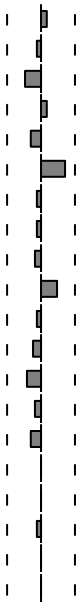
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.047	0.047	0.1022	
		2	-0.025	-0.027	0.1322	
		3	-0.143	-0.141	1.1448	0.285
		4	0.061	0.075	1.3353	0.513
		5	-0.096	-0.112	1.8089	0.613
		6	0.219	0.222	4.3614	0.359
		7	-0.034	-0.057	4.4229	0.490
		8	-0.025	-0.038	4.4583	0.615
		9	-0.064	0.011	4.6976	0.697
		10	0.135	0.089	5.7773	0.672
		11	-0.046	-0.024	5.9096	0.749
		12	-0.077	-0.134	6.2840	0.791
		13	-0.123	-0.072	7.2659	0.777
		14	-0.062	-0.079	7.5227	0.821
		15	-0.084	-0.071	8.0116	0.843
		16	0.005	-0.068	8.0136	0.889
		17	-0.002	-0.012	8.0139	0.923
		18	-0.045	-0.034	8.1732	0.944
		19	-0.004	0.033	8.1746	0.963
		20	-0.002	-0.020	8.1749	0.976

Figure A2. Q-Statistics and correlograms for DGPs of structured capital flow components.