What is the Role of International Capital Market Volatility for Growth?

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Abstract

The aim of this paper is to provide empirical findings on how the volatility of international capital flows affect economic growth. This relationship is examined for four different forms of foreign investments flows to developing countries - foreign direct investments, portfolio bond investments, portfolio equity investments and bank- and trade-related investments. The analysis is based on the assumption that there exists a mean-variance trade-off between foreign capital flows and the growth rate of a country. Cross-country regressions were used to illustrate the findings. The general result is that volatility of capital inflows are harmful to growth, in particular the volatility of debt inflows - portfolio bond investments and bank- and trade-related loans. Hence, there might be a need for governments to help develop and regulate institutions involved with foreign private debt flows, i.e. banks, securities markets, and other types of intermediary and financial firms.

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1 Introduction

With the birth of globalisation came the need to open up domestic financial markets to international competition. This resulted in a surge of capital flows to developing countries. Rapid reforms to liberalise the financial sector and to remove barriers to the entry of foreign capital proceeded to an extent without the development of institutions or practices characteristic of a matured financial market. There was a lack of effective accounting practices, appropriate supervisory rules, and a strong oversight of the banking system. In addition, many of these financial markets were not transparent. These large volumes of capital market transactions not only stimulated growth but also created a more volatile environment in these nations. Where capital flows are large, the sudden decision (fickleness) to withdraw the investment can precipitate or deepen a crisis (World Bank (2001a)).

Governments in general do not like the terms "uncertainty" and "high volatility". Country policies are usually aimed at creating stability in all sectors of the economy. This paper analyses whether the volatility of international capital flows are harmful to the growth of an economy, and hence if there is a need for governments to intervene in international capital markets to regulate and control such flows into the country.

Developing countries are particularly sensitive and vulnerable to the impacts of such capital flows, because their financial markets are not as well structured and managed as compared to matured financial markets in developed countries. As many firms in developing countries may be especially dependent on external financing, the sudden withdrawal of such financing by foreign investors can cause many to declare bankruptcy.

This paper will discuss the Fickle Investor Model (Scott and Uhlig (1999)) , which is based on the assumption of the existence of fickle investors and introduces the mean-variance trade-off between foreign investment and growth. Under the assumption that capital inflows are a scaled version of a random variable, an estimation method for the means and variances of capital inflows will be modelled.

Foreign direct investment is not commonly regarded as a capital market investment as it is a long-term resource flow. This paper will regard foreign direct investment as a part of capital market flow. Four disaggregated capital inflows will be introduced - foreign direct investment, portfolio bond investment, portfolio equity investment and bank- and trade-related investments

(loans).

A proxy for the means and variances of the various capital inflows will then be empirically estimated, followed by an analysis of the mean-variance trade-off between international capital inflows and growth with and without the inclusion of other growth regressors. A general finding is that volatility of these inflows are harmful to growth, in particular the volatility of debt flows - portfolio bond investment and bank- and trade- related loans.

To ensure the stability of international capital flows into their countries, possible policy recommendations for governments of developing countries will be made. There should in particular be more emphasis on policies that regulate debt-flows.

2 Motivation and Literature Review

This paper was motivated by the financial crises in various emerging markets in the nineties - in particular in Mexico in 1995 and East Asia in 1997-98. In 1994, several adverse economic and political developments occurred in Mexico that were instrumental in bringing about the Mexican crisis. There was a widening current account deficit to GDP, mainly financed by short term capital. There was a rapid growth of bank credit to the private sector. The balance of payments was adversely affected by the overvaluation of the Mexican Peso. Due to political uncertainties in the country, there was a drastic reduction of capital inflows into the country. These unfavourable conditions catalysed the devaluation of the Peso which precipitated the financial crisis (Treuherz, 2000).

The Asian crisis began with a massive attack on the Thai Baht and a massive outflow of foreign investments from Thailand in 1997. These events were brought about by a growing deficit in the current account as a result of the overvaluation of the Baht. In addition, Thailand had a large number of non-performing loans and a increasingly unstable banking system. Thailand had to abandon its currency peg for a free-floating exchange rate regime. This resulted in a depreciation of the Baht of almost 50% (Treuherz, 2000). The attack on the Thai Baht resulted in a chain of depreciations of other Asian countries - Indonesia, Malaysia, Philippines and South Korea, due to similar structural problems in their economies.

In the months or years leading up to the crises, capital inflows to these emerging markets surged. The ease of obtaining financing in the international markets enabled these countries to build up massive sovereign and private debt denominated in foreign currencies, most of which were unhedged (Mathieson et. al 1998). Fernández-Arias and Hausmann (2000) claim that many of these emerging countries suffered from "original sin". "Original sin" is when the country's currency cannot be used to borrow abroad, or even domestically to borrow long term. This means that firms have the choice to either borrow in US dollars and face a currency mismatch or borrow short term and face a maturity mismatch. When countries borrow unhedged in a foreign currency, severe depreciation in their exchange rates can cause firms to be unable to service their debts. Lenders and borrowers would then want to take their money out before this happens, thus precipitating a crisis.

A key difference between the Mexican and Asian crises was the nature

of capital inflows into the respective regions. Portfolio inflows dominated in Mexico and other Latin American emerging markets, whereas bank lending flows dominated in Asia. The reversal of capital flows in each case reflected these initial concentrations (International Monetary Fund (1998)). These large in- and outflows of foreign capital led to a high volatility of foreign capital flows, which could have had an adverse effect on the growth rate of these countries. Scott and Uhlig (1999) claim that there could exist some form of a mean-variance trade-off between foreign investment inflows and the growth rate of a country.

In the past decade, much research has been done with regard to the relationship between volatility and growth. Ramey and Ramey (1995) find strong empirical evidence that growth and business-cycle volatility (volatility of the growth rate) are negatively related. Dawson and Stephenson (1997) find evidence of this negative relationship between output volatility and growth in the United States. Martin and Rogers (2000) find that for developed countries, there is a robust negative relation between short-term instability (measured using either the standard deviation of growth or the standard deviation of unemployment) and growth. Imbs (2002) uses disaggregated data to investigate the link between volatility and growth. He finds that at the sectoral level, volatility is associated with higher growth, but once the sectoral data is aggregated at the country level, the link becomes negative. Pritchett (2000) provides some stylised facts about the instability and volatility of growth rates in developing countries and questions the use of econometric methods that use the panel nature of data.

Recent contributions to empirical growth regressions analyse the effects of economic policy, political and external volatility on growth. Lensink, Bo and Sterken (1999) present evidence on the effects of uncertainty on economic growth. They test 6 types of uncertainty - uncertainty with respect to the budget deficit, taxes, government consumption, export sales, real interest rate and inflation. They find that uncertainty with respect to budget deficit, taxes, and export sales are robust and negatively related to economic growth. They also find some evidence for a significant and negative effect of inflation on growth. For more work on the effects of such volatility measures on growth, see Mendoza (1994), Gavin and Hausmann (1996), Judson and Orphanides (1996), Brunetti (1998), Turnovskey and Chattopadhyay (1998) and Kneller and Young (2001).

There has not been much empirical work with respect to the focus on the effect of the volatility of international capital inflows on economic growth. One of few papers available examines the impact of foreign direct investment and the volatility of foreign direct investment on growth by Lensink and Morrissey (2001). They provide evidence that foreign direct investment has a positive effect on growth whereas the volatility of foreign direct investment has a negative impact, hence suggesting a mean-variance trade-off as hypothesised by Scott and Uhlig (1999). Lensink and Morrissey suggest that it is not the volatility of foreign direct investment that retards growth, but that such volatility captures the growth-retarding effects of unobserved variables. Foreign direct investment positively affects growth by decreasing costs of R&D through stimulating innovation (see Barro and Sala-I-Martin (1995)). The uncertainty of such inflows would result in the uncertainty of the costs of R&D, which could negatively affect the incentives to innovate. Hence the volatility of foreign direct investment may undermine investment, and thus have an adverse effect on growth. Foreign direct investment volatility may also reflect economic or political uncertainty. Such uncertainty may reflect the vulnerability of countries to negative shocks that would be detrimental to the growth of the country (Lensink and Morrissey (2000)).

A general finding of the various papers is that volatility is negatively related to growth. The aim of this paper is to find some linkage between disaggregated international capital inflow volatilities and growth. This paper assumes the existence of fickle investors and that the capital flows to developing countries have a mean-variance trade-off to growth. That is the greater the mean value of capital flows the greater the growth rate, but at the same time a high volatility could have a negative effect on growth.

3 The Fickle Investor Model

The mean-variance trade-off between foreign investment and the growth rate of a country is based on the partial equilibrium model of the economy with the existence of fickle investors by Scott and Uhlig (1999).

The model assumes that time is discrete and that in each period a continuum of agents is born, each of which lives for two periods. Agents supply each one unit of labour in the first period and have to decide if they want to become an entrepreneur or an experienced worker. If they become an entrepreneur they begin a project that will come on line in their second period of life. These projects are seen as productivity enhancing and would increase the overall productivity in the economy.

Letting $0 \leq e_t \leq 1$ represent the fraction of the population that become entrepreneurs, and γ_t the productivity of all projects in period t, it is assumed that,

$$\gamma_{t+1} = \gamma_t(1 + \psi e_t) \tag{1}$$

where ψ is a parameter which determines the growth impact of new projects. The total number of projects in operation at date t is q_t, and let δ be the probability that projects die hence,

$$q_t = (1 - \delta)q_{t-1} + e_{t-1}. \tag{2}$$

If the agents prefer to remain experienced workers and not become an entrepreneur, they will each supply ν efficiency units of labour. The total amount of efficiency units of labour available at time t is

$$n_t = 1 + \nu(1 - e_{t-1}). \tag{3}$$

Each project i hires $n_{t,i}$ units of labour to produce output

$$y_{t,i} = \gamma_t n_{t,i}^{\alpha}.$$

Each project maximises instantaneous profits,

$$d_{t,i} = \max_{n_{t,i}} \gamma_t n_{t,i}^{\alpha} - w_t n_{t,i}$$

where w_t is the wage per efficiency unit of labour at time t. Total output is then given by

$$y_t = \int_0^{q_t} y_{t,i} \; di.$$

Assuming symmetry that all firms are identical, the following optimal conditions are obtained.

$$y_t = \gamma_t q_t^{1-\alpha} n_t^{\alpha}, \tag{4}$$

which can be interpreted as the production function of the economy.

$$w_t n_t = \alpha y_t, \tag{5}$$

which is the marginal product of labour.

$$d_t q_t = (1-\alpha) y_t, \tag{6}$$

which can be interpreted as the marginal product of capital.

In addition, it is assumed that for simplicity, agents consume only in the second period of their life so they save their entire wage earnings in the first period of their life. These savings are then assumed to be invested entirely by purchasing entrepreneurial projects (by assumption, there exists no other assets that they can invest their savings in). Foreign investors are allowed to finance a certain proportion of these projects. This proportion is time varying and is the source of fickleness in the model.

Labour income is used to purchase a proportion of projects such that

$$z_t w_t = p_t q_t \tag{7}$$

where p_t is the (ex-dividend) price per project and $(z_t - 1)w_t$ are the funds provided by foreign investors. $z_t \in (0, \infty)$ is assumed to be a random but stationary process. z_t can be seen as a process with small fluctuations most of the time, interrupted by occasional sharp drops to capture a financial crisis. The fluctuations of z_t and it's variance reflect the impact of fickle investors. When $z_t \equiv 1$, then there are no foreign investors, when $z_t > 1$, foreign investors are present in the economy, and when $z_t < 1$, investors as a group are selling the projects short.

The return earned in period $t+1$ per unit invested in period t is

$$R_{t+1} = (1-\delta)\frac{d_{t+1} + p_{t+1}}{p_t}$$

where the factor $(1-\delta)$ reflects the fraction of unsuccessful projects in the diversified portfolios of investors.

To decide if they want to become an entrepreneur or remain a worker, individuals will need to compare their expected consumption in the second

period. If they become an entrepreneur, they will collect dividends d_{t+1} when old and sell the project at a price p_{t+1}. Thus consumption of an entrepreneur is

$$c_{t+1}^{(e)} = R_{t+1}w_t + d_{t+1} + p_{t+1} = R_{t+1}(w_t + \frac{p_t}{1-\delta}). \quad (8)$$

The total consumption of experienced workers is in comparison the sum of wage earnings times any returns earned:

$$c_{t+1}^{(w)} = R_{t+1}w_t + \nu w_{t+1}. \quad (9)$$

Letting $u(c)$ be the utility function for consuming when old, then the fraction of agents becoming entrepreneurs must satisfy the following condition

$$E_t[u(c_{t+1}^{(e)})] = E_t[u(c_{t+1}^{(w)})]. \quad (10)$$

The entrepreneurial risk premium is defined by π_t in the relationship

$$E_t[c_{t+1}^{(e)}] = E_t[c_{t+1}^{(w)}] + \pi_t w_{t+1} \quad (11)$$

where w_{t+1} is known at time t. This additional risk premium is to compensate the entrepreneur for taking up additional riskiness of their occupational choice compared to the safer haven of staying a worker.

The details of the analysis of the model is presented in Appendix A, only the final results are given here. The dynamics of the model are characterised by the dynamics of the number of projects q_t,

$$q_{t+1} = \frac{1}{\nu + \pi_t\alpha}((1+\nu)(1-\alpha) + \nu(1-\alpha)(1-\delta)q_t + \alpha E_t[z_{t+1}]) \quad (12)$$

and the dynamics of the fraction of the population that become entrepreneurs,

$$e_t = \frac{1}{\nu + \pi_t\alpha}((1+\nu)(1-\alpha) - (\nu+\pi_t)\alpha(1-\delta)q_t + \alpha E_t[z_{t+1}]) \quad (13)$$

3.1 The Mean-Variance Trade-Off

3.1.1 Capital Inflows and the Mean Effect

To see the relationship between the mean of foreign investments inflows and the growth rate of an economy, the steady-state growth path is calculated.

The entrepreneurial risk premium is assumed to be a constant $\bar{\pi}$ and independent of the state of the economy or its parameters. The fraction of agents becoming entrepreneurs on the steady-state growth path is as follows

$$\bar{e} = [\frac{1+\nu}{\nu}][\frac{\frac{1}{\alpha} + \frac{1}{1+\nu}E[z] - 1}{\frac{1}{\alpha} + \frac{1}{\delta} + \frac{\bar{\pi}}{\delta\nu} - 1}] \tag{14}$$

and the steady-state growth is

$$\bar{g} = \frac{\gamma_t}{\gamma_{t-1}} = 1 + \psi\bar{e}.$$

It can be seen from the steady-state paths, that $\bar{e}$ is increasing in the fraction $E[z]$ of assets held by outside investors. As the steady-state growth rate increases in $\bar{e}$, it also increases in foreign funds. In other words, with higher foreign financing, each project will be sold at a higher price, making it more attractive to become an entrepreneur, which in turn contributes positively to the growth rate of the economy.

3.1.2 Capital Inflows and the Variance Effect

The relationship between the variance of z_t and the entrepreneurial risk premium π_t will have to be analysed in order to find the link between the variance of z_t and the growth rate of the economy. Using a constant relative risk aversion utility function $u(c_t) = \frac{c_t^{1-\eta}-1}{1-\eta}$ and letting $\sigma_{t,z}$ be the variance of z_{t+1}, conditional on information up to and including date t, the risk premium can be expressed as[1],

$$\pi_t = \eta \frac{(1-\delta)\frac{q_t}{z_t} + 0.5}{(1-\delta)^2 q_{t+1}(\frac{q_t}{z_t}(\frac{1-\delta}{\alpha}(1+\nu(1-e_t)) + E_t[z_{t+1}]) + \nu q_{t+1})}\sigma_{t,z}^2 \tag{15}$$

Eq. (15) is only an implicit equation in π_t as both e_t and q_{t+1} depend in turn on π_t (refer to Eq.(12) and Eq.(13)). Combining Eq.(15) with Eqs.(12) and (13), a quadratic equation in π_t can be obtained which has exactly one economically meaningful solution, as long as $\sigma_{t,z}^2$ is not too large (refer to Scott and Uhlig (1999) for a more detailed discussion). This solution was shown to be increasing in $\sigma_{t,z}^2$, and thus decreasing in the fraction of agents becoming entrepreneurs and hence the steady-state growth rate of the economy. The greater the variance of foreign investment, the more risk-averse agents will be scared away from entrepreneurship into the safer haven

[1]The derivation of this expression can be found in Appendix A.

of employment due to the increased variance of the sale price, thus resulting in a lower number of entrepreneurial projects, and hence a lower growth rate for the economy.

3.2 Foreign Investment as a Scaled Random Variable

Under the assumption of the presence of fickle investors and that there exists a mean-variance trade-off between foreign investment inflows and the growth of a country. A scaled version of a random variable that incorporates this mean-variance trade-off will be modelled here. Let the foreign investments[2] (FI) be a scaled version of a random variable X. It is important to note that X is dependent on the investment type[3] - foreign direct investment, portfolio bond investments, portfolio equity investments, and bank- and trade- related loans. Let

$$FI = \lambda_i X, \qquad E[X] = \mu, \qquad Var[X] = \xi^2,$$

where λ_i is a scale index which is country, i specific. The mean, variance and standard deviation of FI are, E[FI] = $\lambda_i \mu$, Var[FI] = $\lambda_i^2\, \xi^2$ and SD[FI] = $\lambda_i\, \xi$ respectively. Each unit of extra FI comes with ξ extra units of fickleness.

The aim of this subsection is to estimate the λ_is. Consider a scatter plot of the standardised values of the means (on the y-axis) and standard deviations (on the x-axis) of foreign investments. That is the means divided by the standard deviation of the means and likewise the standard deviations divided by the standard deviation of these standard deviations. To estimate the line of best fit, the sum of squares of the perpendicular distances between the points and the estimated line is minimised. Refer to Figure 1 for a detailed illustration.

Let the points (a_i, b_i) represent the coordinates of the standardised standard deviation (a_i) and mean (b_i) of foreign investments for a particular country. Now consider a line of best fit through these points which is estimated by minimising the sum of squares of the perpendicular distances between the points (a_i, b_i) and the line of best fit. Let the gradient of the

[2]FI here refers to z - 1 in section 3.1.

[3]For simplicity, the random variable X will be used to introduce the model. The reader should keep in mind that different investment types would have a different random variable.

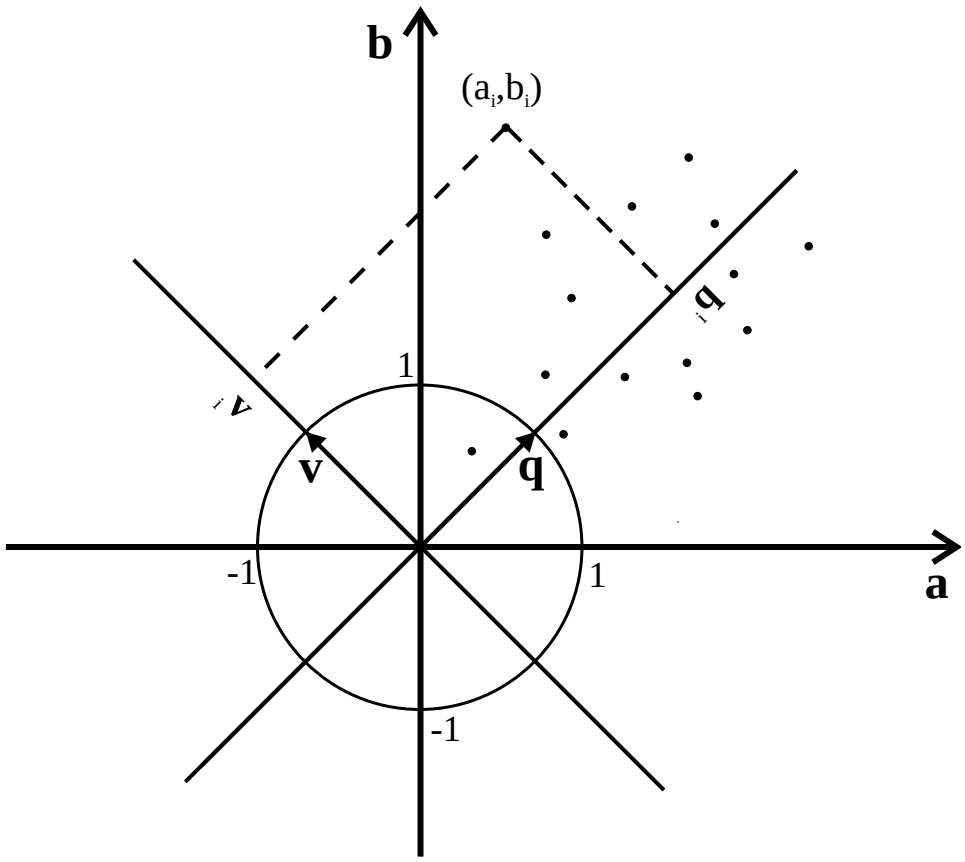

Figure 1: Graphical illustration of the estimation of λ

line be represented by a unit vector

$$q = \begin{bmatrix} q_a \\ q_b \end{bmatrix}.$$

The perpendicular distance between the point (a_i, b_i) and the line occurs at the point represented by the vector $\lambda_i q$.

The objective is to find the vector q and the scale index λ_i by minimising the following condition

$$\sum_{i=1}^{n} || \begin{bmatrix} a_i \\ b_i \end{bmatrix} - \lambda_i \begin{bmatrix} q_a \\ q_b \end{bmatrix} ||^2. \tag{16}$$

Equivalently, let the unit vector v be perpendicular to the vector q, and let $\beta_i v$ be the orthogonal projection of

$$\begin{bmatrix} a_i \\ b_i \end{bmatrix}$$

on v, where,

$$\beta_i = (v' \begin{bmatrix} a_i \\ b_i \end{bmatrix}). \tag{17}$$

The modulus of the vector $\beta_i\, v$ is equivalent to the perpendicular distance between the point (a_i, b_i) and the vector $\lambda_i\, q$. Minimising the sum of squares of all the $(\beta_i\, v)$s would be equivalent to minimising Eq. (16).

Thus, one can then find the vector v by minimising

$$\sum_{i=1}^{n} || \begin{bmatrix} \beta_i\, v \end{bmatrix} ||^2 \tag{18}$$

Substituting in Eq. (17), and using the condition that $||v_j|| = 1$, Eq. (18) becomes,

$$\sum_{i=1}^{n} (v' \begin{bmatrix} a_i \\ b_i \end{bmatrix})^2 \tag{19}$$

Eq. (19) can also be expressed as

$$\sum_{i=1}^{n} v' \begin{bmatrix} a_i \\ b_i \end{bmatrix} [a_i \;\; b_i] v = v' \Psi v \tag{20}$$

where

$$\Psi = \sum_{i=1}^{n} \begin{bmatrix} a_i \\ b_i \end{bmatrix} [a_i \;\; b_i]$$

This problem can be solved by computing the two eigenvectors v_1 and v_2 of Ψ, with corresponding eigenvalues α_1 and α_2. By letting v be the eigenvector for the smallest eigenvalue, normalised to unit length, Eq. (18) is minimised.

Eigenvectors and eigenvalues can be computed by solving the characteristic polynomial

$$\rho(\alpha_j) = det(\alpha_j I_2 - \Psi) = 0$$

for $j = 1, 2$ and then calculating v_j as the non-zero solution to

$$(\alpha_j - \Psi) v_j = 0.$$

Once the eigenvector v which corresponds to the smallest eigenvalue is obtained,

$$v = \begin{bmatrix} v_a \\ v_b \end{bmatrix},$$

an orthogonal vector q can then be easily calculated,

$$q = \begin{bmatrix} -v_b \\ v_a \end{bmatrix}.$$

The scale index λ_i can then be calculated as follows

$$\lambda_i = q' \begin{bmatrix} a_i \\ b_i \end{bmatrix} = -v_b a_i + v_a b_i.$$

Since v is a unit vector, λ_i is then the estimated scaled index that incorporates both the mean and variance of outside investment. In other words, the mean of FI is $\lambda_i \mu$ and the variance, $\lambda_i^2 \, \xi^2$.

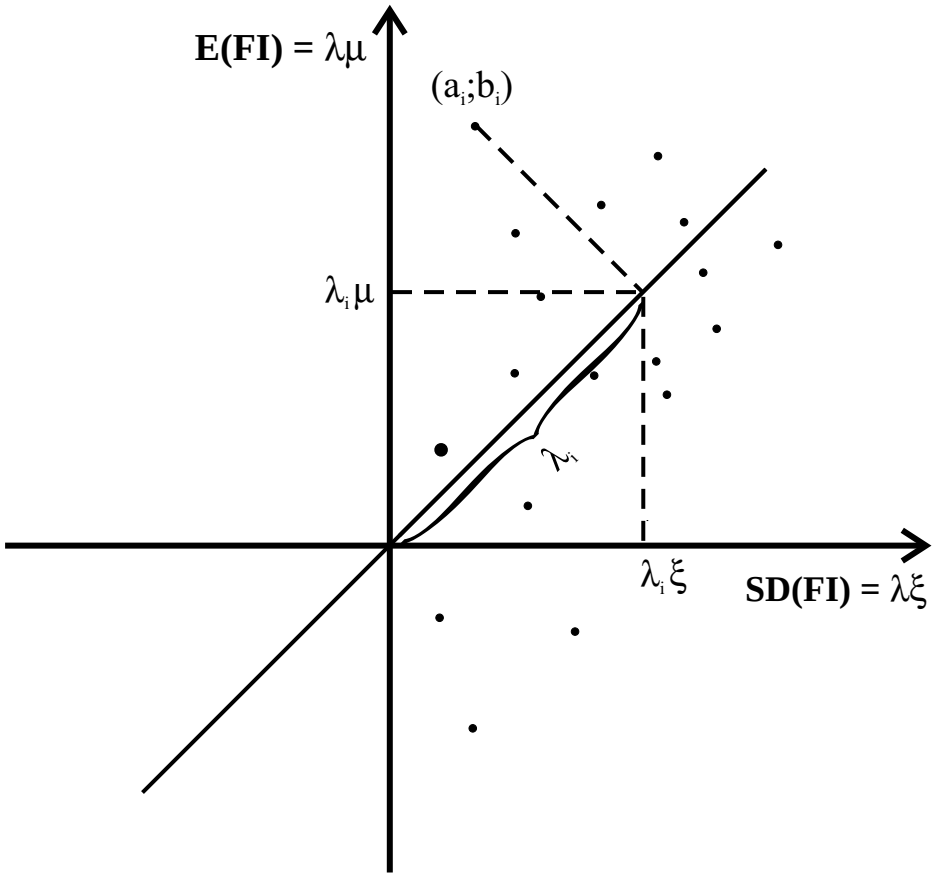

Figure 2: λ as a proxy for the mean and variance

Figure 2 displays the relationship between the λ_is to the means[4] and the standard deviations of foreign investments. Note that as each disaggregated

[4]Note that the mean μ and the standard deviation ξ cannot be equal to one.

foreign investment has a different random variable with a different mean and variance, the λ_is are investment type specific, that is a country i will have different λ_is for each different foreign investment.

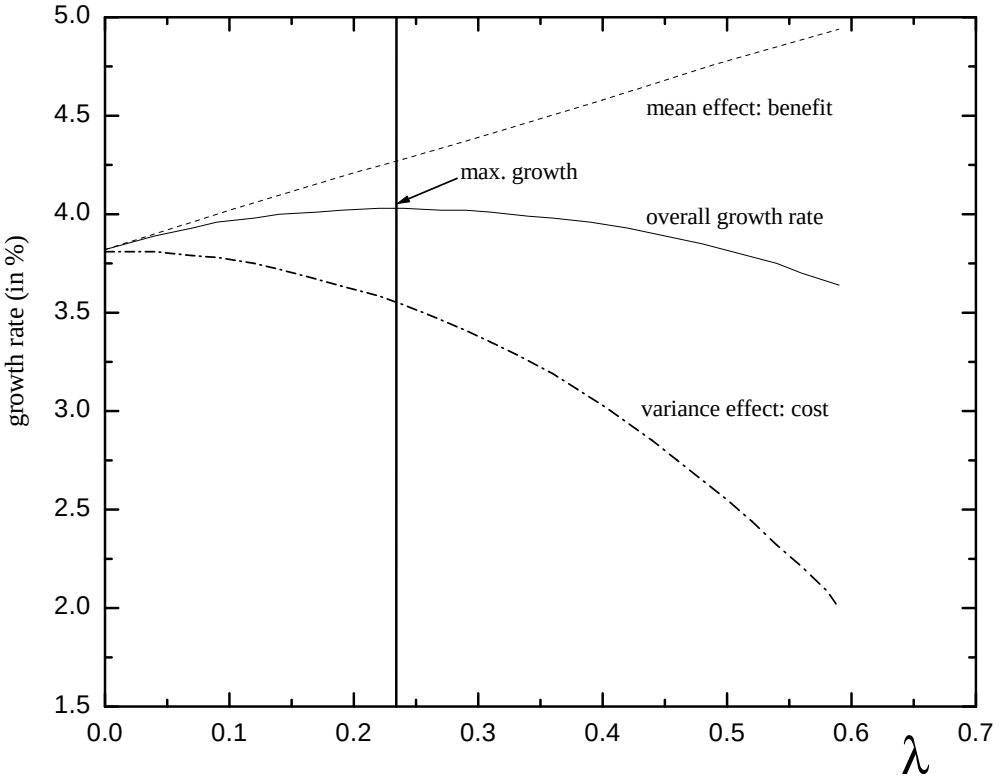

Figure 3: The mean-variance trade-off

The objective of the following sections of this paper is to find a relationship between the mean and variance of foreign investments and growth. The Fickle Investor Model hypothesises the growth rate to be an increasing linear function of the mean and a decreasing quadratic function of the variance. Since the mean is an increasing linear function in λ and the variance in λ^2, figure 3 illustrates this mean-variance trade-off between foreign investments and growth[5]. The mean-variance trade-off results in a quadratic relationship between λ and growth as depicted by the overall growth rate curve.

[5]The graph is obtained from Scott and Uhlig (1999)

4 The Data

Disaggregated net private foreign capital inflows is used test if this mean-variance trade-off does exist. By considering the individual capital flows separately, this paper will try to identify the different channels through which foreign capital flows might affect growth. The four individual investments are foreign direct investments, portfolio bond investments, portfolio equity investments and bank and trade-related lending. The major source of investment data was obtained from the World Development Indicators (WDI 2001) published by the World Bank. The following definitions for each of the flows are defined as in the WDI 2001.

Foreign direct investment consists of three components: equity investment, reinvested earnings, and short- and long-term intercompany loans between parent firms and foreign affiliates. Foreign direct investment in comparison with other types of investments, is usually made to establish a long lasting interest in or effective management control over an enterprise in another country. Investments should account for at least 10 percent of voting stock to be counted as foreign direct investment. Data on foreign direct investment was taken largely from the WDI 2001. Missing countries or values were obtained form the International Financial Statistics Yearbook (2001) published by the International Monetary Fund (IMF). This was possible because the two different data sets are identical as the World Bank obtains its foreign direct investment data from the IMF.

Portfolio investment flows include non-debt-creating portfolio equity flows (the sum of country funds, depository receipts, and direct purchases of shares by foreign investors) and portfolio debt flows (bond issues purchased by foreign investors). The volume of portfolio investment reported by the World Bank generally differs from that reported by other sources because of differences in the classification of economies, in the sources, and in the method used to adjust and disaggregate reported information. Differences in reporting arise particularly for foreign investments in local equity markets because clarity, adequate disaggregation, and comprehensive and periodic reporting are lacking in many developing economies. By contrast, capital flows through international debt and equity instruments are well recorded, and for these the differences in reporting lie primarily in the classification of economies, the exchange rates used, whether particular tranches of the transactions are included, and the treatment of certain offshore issuances. Many countries

in the sample did not have reported portfolio investment data. This could be either because the countries simply do not have foreign portfolio transactions, or that data on such portfolio transactions were not measured. For most countries, the former was the case at least until the 1990s. In the 1990s, many countries started to open up their economies to international capital.

Bank and trade-related lending covers commercial bank lending and other private credits (obtained from WDI 2001). The aggregated sum of all net private capital inflows was also obtained from the WDI 2001, and consists simply of the sum of all the four above mentioned disaggregated investment inflows.

Cross-country growth regressions were used to test the relationship between the volatility of international capital flows and growth (see Barro (1991)). The growth rates for each country were obtained by taking the mean growth rates of the real per capita GDP from 1990 to 1999 obtained from the WDI 2001. Following empirical growth regression models, the following variables were included in addition to the capital flow variables. The initial level of real GDP per capita in 1990 (GDPPC90), initial level of human capital (PRI90, proxied by the primary school enrollment rate in 1990), and the average percentage of gross domestic investment to GDP from 1990-99 (INVGDP). These variables were also obtained from the WDI 2001.

A governance indicator was obtained from Kaufmann, Kraay and Zoido-Lobatón (1999a and 1999b). The indicator used in this study was 'Rule of law (RULE)' which includes several indicators that measure the extent to which agents have confidence in and abide by the rules of society (for instance the perception of both violent and non-violent crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts). This indicator is an estimate for the years 1997-98.

The countries used in this paper are categorised by the World Bank as low-income to middle-income countries. These countries can be referred to as developing countries although it should be noted that this term does not imply that all countries in the group are experiencing similar development or that the economies have reached a preferred or final stage of development (WDI 2001). These countries were chosen to fit the description for the type of countries which Scott and Uhlig (1999) had in mind when they developed the Fickle Investors Model, which was that of a small developing country with little overseas investments but which receive large capital inflows from

developed nations. 111 developing countries will be investigated in this paper of which foreign direct investment data was available. Only 98 of these countries had available bank and trade-related investment data, 40 portfolio bond data, 41 portfolio equity data and 107 with the aggregated net private capital inflows. Due to the unavailability of the full set of growth regression variables, complete growth regressions could only be performed for 94 countries for foreign direct investment, 39 for portfolio bond investment, 30 for portfolio equity investment, 86 for bank and trade-related investments, and 91 for the aggregated sum of net private capital inflows.

5 The Estimation of the λs

Using the method described in section 3.2, this section estimates the λ_is which incorporate the mean-variance relationship of foreign capital flows. As the size of capital market flows are highly dependent on the size of each country, this paper will assume that the percentages of the various forms of capital flows to GDP are a scaled version of a random variable that is investment type specific. Each disaggregated investment type has a different random variable, hence each country will have a different scale index value (λ_i) for each foreign investment inflow.

Annual data from the period 1990-99 is used. Firstly, each of the disaggregated foreign flows, namely foreign direct investments, portfolio bond investments, portfolio equity investments and bank- and trade-related investments are expressed as a percentage of GDP. Next, sample means and standard deviations of these percentages of each of the foreign flows to GDP are calculated. Figures 4 to 7 illustrate scatter plots of the standardised standard deviations of foreign investments as a percentage of GDP on the x-axis and the standardised mean of foreign investments as a percentage of GDP on the y-axis. The estimation of the best line of fit is that which minimises the perpendicular distances between the points and the estimated line of best fit. This is illustrated in the figures for selected countries where there is a dashed line drawn perpendicular from the country point to the fitted line.

The λ_is are simply the modulus of the vector (or the length of the fitted line measured from the origin) where each country point meets the fitted line at a right angle. The λ_is can take on a negative value when the country point meets the best line of fit to the left of the origin. When this happens, the expected mean of the foreign investment is negative. This could occur when the sum of the outflows is greater than that of the inflows of foreign investments over the years 1990-99.

Figure 4 depicts the estimation of the λ_is for foreign direct investments[6] flows. It can be observed that roughly 90 percent of the countries[7] have a mean and standard deviation of FDI between 0 and 2 percent. The estimation method penalises countries that have high standard deviations but low means. Suriname is one such example.

The estimated λ_is for portfolio bond and equity investments are based

[6]See Appendix B for the definitions of each of the flows as a percentage to GDP

[7]See Appendix C for the list of country codes.

on a much smaller sample of countries as compared to the other two forms of investments. This is due to the unavailability of portfolio flow data for a large number of countries. Due to the small sample, a wider spread of the data is observed. The λ_i estimates for these flows are illustrated in Figure 5 and Figure 6. An interesting observation is that the means and standard deviations of portfolio equity flows lie almost on a straight line, that is countries with a high mean also have a high standard deviation, and vice versa.

It can be observed that in the case of bank- and trade-related investments, the estimated fitted line is highly affected by Congo which had a high volatility and a low mean (refer to Figure 7). If Congo had not been in the sample, then the line of best fit would have been much steeper. The slope of the fitted lines represent the ratio between the mean and the standard deviation of the random variable (refer to Figure 2 in section 3.2). They also affect the value of the scale index, λ_i, as the estimation of the λ_is are dependent on the line of best fit, as explained in the section 3.2. Referring again to Figure 7, imagine Congo did not exist. The line od best fit would then tilt in the direction towards St. Vincent and the Grenedines (VCT), one would then obtain a steeper slope and larger λ_i estimates for countries that were above the *initial* line of best fit. For instance, Estonia and Malta would then have a larger estimated λ_i. This shows that this estimation method of the λ_is is highly dependent on outliers.

The reason why country outliers can affect the estimation of the λ_is is because of the assumption that foreign investors have the same fickleness with respect to a particular investment type, regardless of which country they intend to invest in. In reality, the fickleness of investors are not only affected by the investment types but also by country risk. For instance, an investor would much rather invest foreign direct investments in China as compared to Congo, simply because China is politically more stable than Congo.

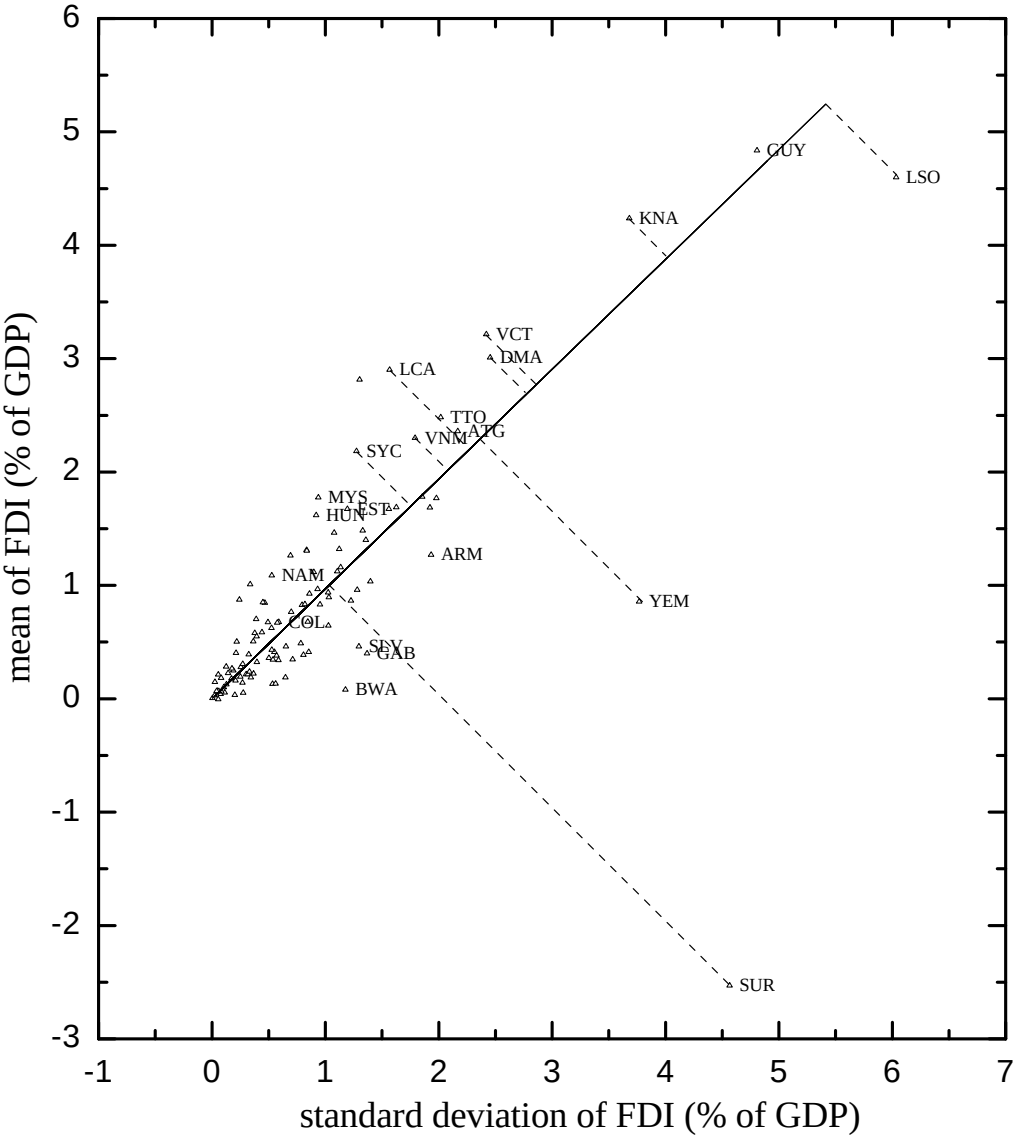

Figure 4: Estimation of λ_{FDI} (111 countries)

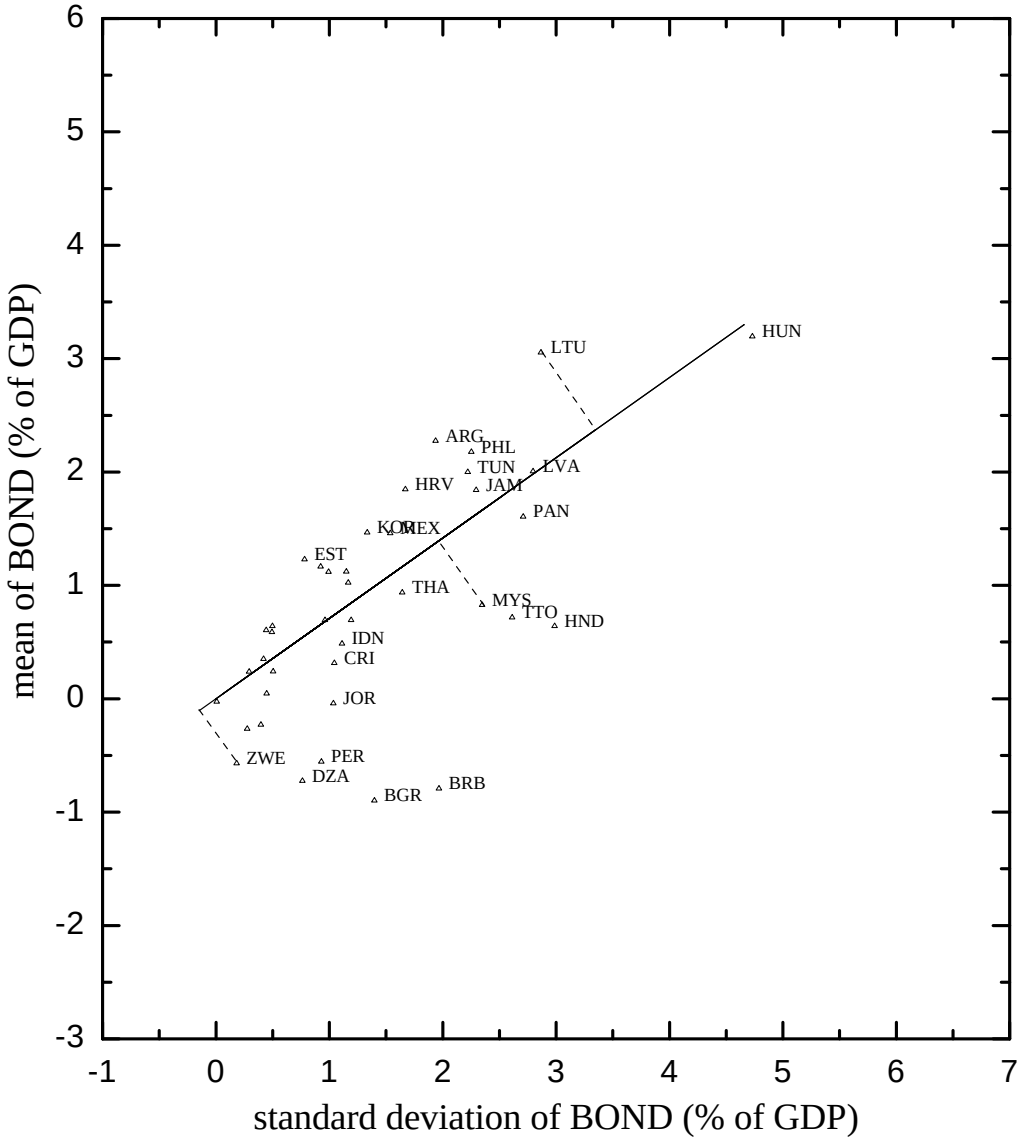

Figure 5: Estimation of λ_{BOND} (40 countries)

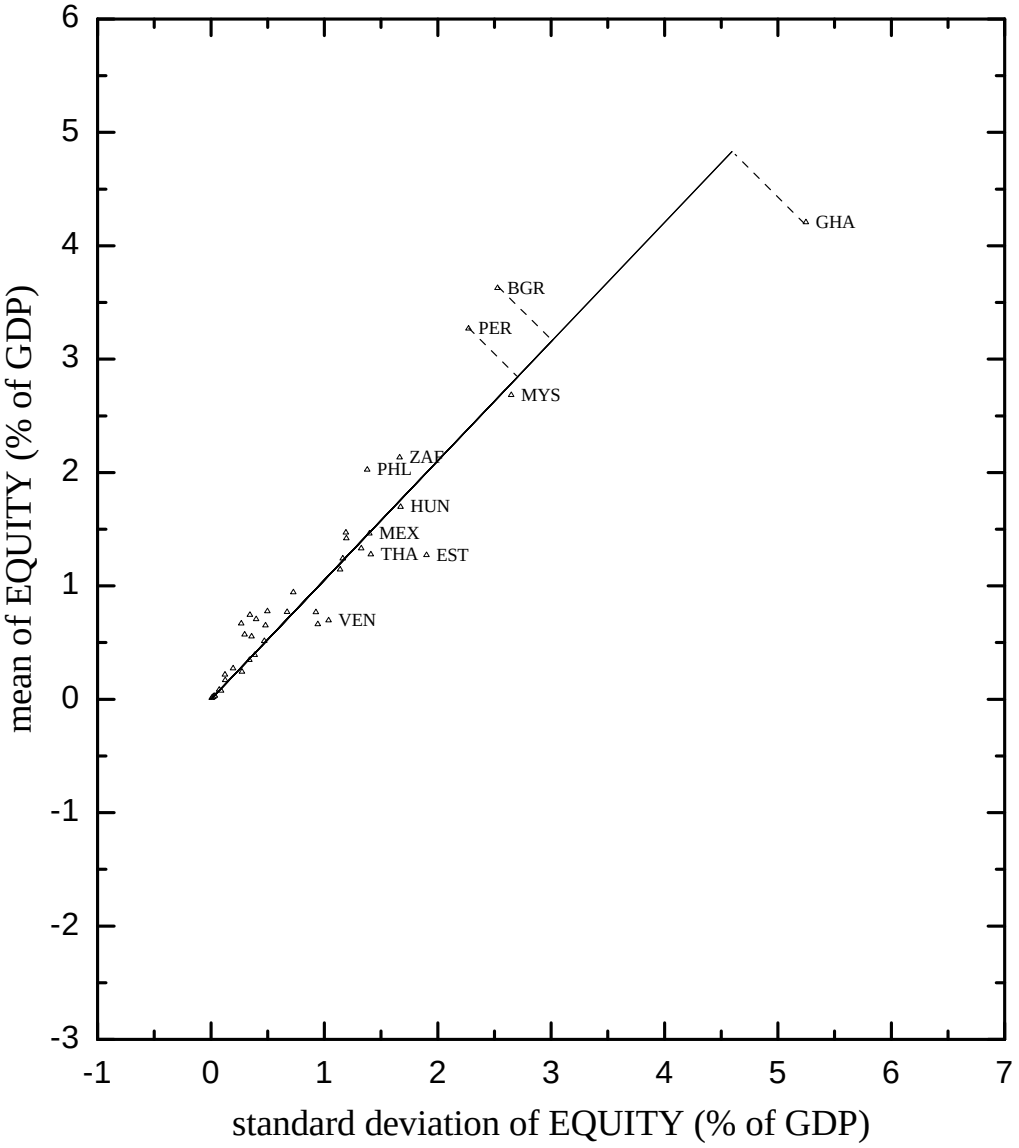

Figure 6: Estimation of λ_{EQUITY} (41 countries)

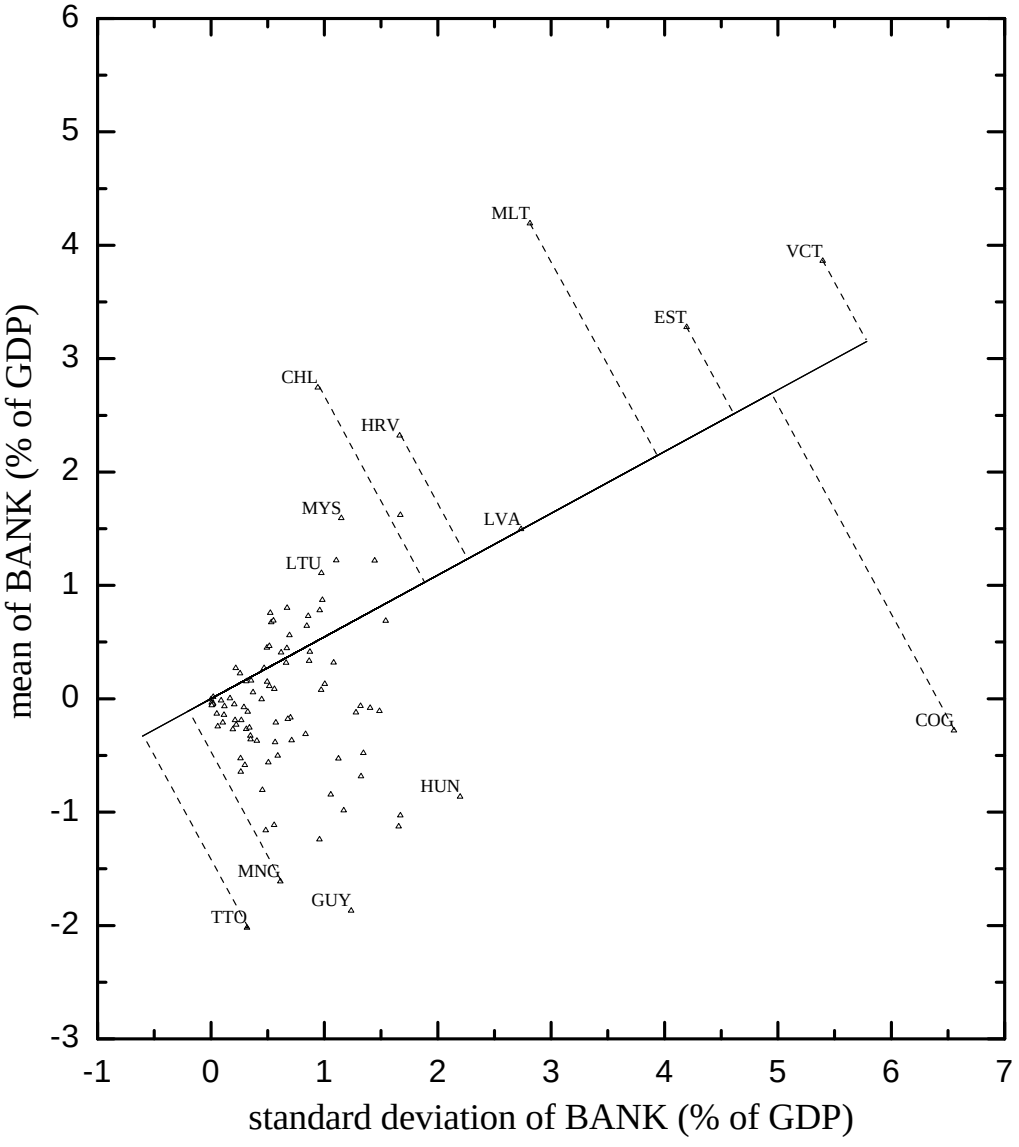

Figure 7: Estimation of λ_{BANK} (98 countries)

6 International Capital Volatility and Growth

This section presents regression results of the relationship between the volatility of foreign investments and growth. In comparison to various other papers[8] that use the standard deviation or other more sophisticated methods to measure volatility, this paper uses the sample variance of each of the capital flows as a percentage of GDP as the measure of volatility.

6.1 The Mean-Variance Effect on Growth

This subsection begins with a simple OLS regression including the various means and variances of foreign capital flows. Table 1 shows that there seems to be a significant positive effect of the mean of foreign direct investments (at the 5% level of significance) and bank- and trade-related investments (at the 1% level of significance) on growth. The mean effect of portfolio bond investments is also positive but not significant. The mean effect of portfolio equity investments is insignificantly negative. This could imply that portfolio equity investments have little effect on the growth rate of a country because they are too short-term. Volatility in general seems to be harmful for growth. The volatility of bank- and trade-related investments appears to be especially harmful to growth as there is a significant (at the 1% level of significance) negative coefficient. The volatility of foreign direct investment appears to be insignificantly positively related to growth, this result could be biased due to an endogeneity problem which will be discussed shortly.

Table 2 shows the marginal mean-variance effect after taking into consideration other effects that help promote growth. Regression 6 depicts a typical cross-country growth regression. The conditional convergence hypothesis of neoclassical growth models appears to hold. This is depicted by the negative coefficient of the initial 1990 logged GDP per capita and the positive coefficient of the initial human capital proxied by the 1990 primary school enrollment rate. In other words, a poor country tends to grow faster than a rich country, but only if the poor country's human capital exceeds the amount that typically accompanies the low levels of per capital income (Barro, 1991). Levine and Renelt (1992) found a robust, positive relationship between growth and the share of physical investment in GDP. Regression 6 captures this positive relationship between investment and growth with a

[8] Refer to the various articles on volatility and growth mentioned in section 2.

Table 1: The mean-variance effect of foreign investments on growth I

MGY	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5
CONST	0.453	1.588	2.101	1.222	0.269
	(1.509)	(3.326*)	(3.813*)	(5.433*)	(0.223)
MFDI	0.193				1.017
	(2.035**)				(1.364)
MBOND		0.395			1.027
		(0.638)			(1.196)
MEQUITY			-0.184		1.072
			(-0.205)		(0.498)
MBANK				0.688	0.166
				(2.718*)	(0.248)
$SDFDI^2$	0.002				-0.152
	(0.186)				(-1.047)
$SDOND^2$		-0.293			-0.382
		(-1.679)			(-1.295)
$SDEQUITY^2$			-0.035		-0.971
			(-0.230)		(-0.654)
$SDBANK^2$				-0.051	-0.173
				(-3.663*)	(-3.660*)
R^2	0.069598	0.043099	0.007865	0.0098818	0.402774
OBS	111	40	41	98	30

*, ** and *** denote significance at the 1%, 5% and 10% levels respectively.

Note: White's heteroskedasticity-consistent t-statistics in parenthesis.

significant positive coefficient. This positive relationship was also found in Barro (1991). Lastly, this paper includes a variable that measures the extent to which agents have confidence in and abide by the rules of society, for instance the perception of both violent and non-violent crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts (Kaufmann, Kraay and Zoido-Lobatón, (1999a and 1999b)). This variable has the expected positive significant effect on growth. All variables are significant at the 5% level.

The remaining regressions in Table 2 build on the general growth regression. Regression 7 depicts the mean-variance trade-off for foreign direct

Table 2: The mean-variance effect of foreign investments on growth II

MGY	Reg. 6	Reg. 7	Reg. 8	Reg. 9	Reg. 10
CONST	2.262	2.233	3.551	3.855	2.365
	(1.447)	(1.398)	(0.992)	(1.285)	(1.607)
LGDPPC90	-0.708	-0.734	-1.042	-1.207	-0.704
	(-2.917*)	(-2.917*)	(-2.382**)	(-3.342*)	(-2.774*)
PRI90	0.0188	0.020	0.037	0.042	0.023
	(2.140**)	(2.164**)	(1.570)	(1.182***)	(2.502**)
INVGDP	0.102	0.115	0.104	0.135	0.089
	(2.432**)	(2.733*)	(1.939***)	(2.681**)	(2.021**)
RULE	1.566	1.590	1.720	1.684	1.426
	(4.568*)	(4.512*)	(3.110*)	(3.471*)	(4.668*)
MFDI		-0.054			
		(-0.545)			
MBOND			0.122		
			(0.201)		
MEQUITY				-0.434	
				(-0.603)	
MBANK					0.343
					(1.364)
$SDFDI^2$		-0.002			
		(-0.172)			
$SDBOND^2$			-0.252		
			(-1.344)		
$SDEQUITY^2$				-0.017	
				(-0.109)	
$SDBANK^2$					-0.065
					(-2.841*)
R^2	0.316264	0.320259	0.415107	0.502425	0.373184
OBS	94	94	39	40	86

*, ** and *** denote significance at the 1%, 5% and 10% levels respectively.

Note: White's heteroskedasticity-consistent t-statistics in parenthesis.

investment flows. It seems to suggest that there does not seem to be a positive mean effect of foreign direct investment on growth, although it does suggest that uncertainty of foreign direct investment flows are harmful to growth. This effect is also depicted for portfolio equity flows (Regression 9) . The other 2 regressions (8 and 9) in the table suggest the pre-assumed mean-variance trade-off between capital flows and growth. It is interesting to point out that there is a significant (at the 1% level of significance) negative relationship between the volatility of bank- and trade-related flows and growth, this corresponds to the finding from Regression 4 in Table 1. One potential problem with these estimates is that capital flows are in principle endogenous. In fact foreign inflows are not only endogenous to the dependent variable but also to other variables in the growth regression. This implies that the OLS regression estimates are biased. Lensink and Morrisey (2001) suggest incorporating the technique of instrumental variable (IV) estimation to address this problem. This paper addresses the endogeneity problem by estimating a proxy for the mean and variance of foreign investment inflows.

6.2 The Effect of the λs on Growth

Using now the estimated λs from section 5 as proxies for the mean (λ) and variance[9] (λ^2) of the various foreign investments, regressions were again run to test for the mean-variance trade-off on growth. The advantage of these mean and variance proxies is that they are not endogenous to the growth rate of a country or other growth regressors.

Table 3 shows the general relationship between growth rates and the λs which are used here as proxies for the mean and variance of foreign investments. In comparison to Table 1, all the investment flows here seem to depict the mean-variance trade-off, although the relationship is not significant. Note that the volatility of FDI in Regression 11 is now insignificantly negatively related to growth, as compared to Regression 1 in Table 1, where the sign was positive.

Table 4 regresses the λ effects together with other growth regressors and growth. The data seems to suggest some form of the hypothesised mean-

[9]Since the flows of a particular foreign investment are some scaled version of the *same* random variable for all countries, the mean and the variance of the random variable can be ignored in the regression as they are identical for all countries. λ and λ^2 will be the proxied mean and variance of foreign investment respectively instead of $\lambda\mu$ and $\lambda^2\xi^2$.

Table 3: The λ effects on growth I

MGY	Reg. 11	Reg. 12	Reg. 13	Reg. 14	Reg. 15
CONST	0.289	1.283	1.828	0.919	-0.502
	(0.737)	(1.624)	(3.178*)	(2.970*)	(-0.393)
λ_{FDI}	0.648				0.539
	(1.536)				(0.246)
λ_{BOND}		0.524			0.921
		(0.718)			(0.904)
λ_{EQUITY}			0.325		1.859
			(0.531)		(1.421)
λ_{BANK}				0.534	0.581
				(0.922)	(0.469)
λ^2_{FDI}	-0.034				0.310
	(-0.548)				(0.415)
λ^2_{BOND}		-0.176			-0.252
		(-1.222)			(-1.881***)
λ^2_{EQUITY}			-0.088		-0.529
			(-0.906)		(-1.580)
λ^2_{BANK}				-0.111	-0.320
				(-0.989)	(-1.694)
R^2	0.062986	0.046408	0.020885	0.014587	0.344898
OBS	111	40	41	98	30

*, ** and *** denote significance at the 1%, 5% and 10% levels respectively.

Note: White's heteroskedasticity-consistent t-statistics in parenthesis.

variance trade-off for the case of all the capital flows with the exception of portfolio equity flows (refer to Regression 18). For the case of portfolio equity flows, there seems to be an insignificant negative mean effect of the capital flows to growth. This result corresponds to the results obtained in Regression 9 in Table 2.

The volatility effects alone without the inclusion of the mean effect on growth were also tested for all the flows, and it turned out that the volatility of portfolio bond and bank- and trade-related flows are especially harmful for growth. Regression 20 in Table 4 depicts the significant (at the 10 % level of significance) negative effects.

Table 4: The λ effects on growth II

MGY	Reg. 16	Reg. 17	Reg. 18	Reg. 19	Reg. 20
CONST	2.040	4.360	4.133	1.988	0.457
	(1.303)	(1.121)	(1.482)	(1.361)	(0.135)
LGDPPC90	-0.753	-1.187	-1.226	-0.627	-0.673
	(-3.082*)	(-2.482**)	(-3.480*)	(-2.452**)	(-1.791***)
PRI90	0.017	0.039	0.040	0.020	0.037
	(1.920***)	(1.657)	(1.855***)	(2.083**)	(1.498)
INVGDP	0.122	0.093	0.132	0.093	0.140
	(2.994*)	(1.605)	(2.562**)	(2.099**)	(2.857*)
RULE	1.493	1.752	1.684	1.634	1.853
	(4.408*)	(3.289*)	(3.583*)	(4.998*)	(3.269*)
λ_{FDI}	0.452				
	(0.932)				
λ_{BOND}		0.562			
		(0.780)			
λ_{EQUITY}			-0.038		
			(-0.072)		
λ_{BANK}				0.099	
				(0.177)	
λ^2_{FDI}	-0.092				
	(-1.154)				
λ^2_{BOND}		-0.187			-0.099
		(-1.347)			(-1.960***)
λ^2_{EQUITY}			-0.036		
			(-0.440)		
λ^2_{BANK}				-0.125	-0.216
				(-1.248)	(-4.622*)
R^2	0.329378	0.431777	0.503283	0.341197	0.576705
OBS	94	39	40	86	39

*, ** and *** denote significance at the 1%, 5% and 10% levels respectively.

Note: White's heteroskedasticity-consistent t-statistics in parenthesis.

6.3 The Aggregated Capital Flow Effect on Growth

The aggregated net private capital inflow effect on growth is depicted in Table 5. It shows that the aggregated effect does seem to indicate the hypothesised mean-variance trade-off. The mean and variance effect of the aggregated flows are significantly (at the 1% level of significance) positive and negative respectively as indicated in Regressions 21 and 22 in Table 5. When the λs are used in the estimation, the mean-variance effect again seems to be present, although it no longer becomes significant. When other growth accounting variables are included, the variance effect becomes significantly negatively

Table 5: The aggregate effect on growth

MGY	Reg. 21	Reg. 22	Reg. 23	Reg. 24	Reg. 25
CONST	0.028	2.131	0.0486	2.021	1.883
	(0.098)	(1.451)	(0.111)	(1.278)	(1.169)
LGDPPC		-0.825		-0.819	-0.749
		(-3.447*)		(-3.261*)	(-2.936*)
PRI		0.017		0.017	0.020
		(2.002**)		(1.885***)	(2.215**)
INVGDP		0.139		0.142	0.139
		(3.652*)		(3.508*)	(3.374*)
RULE		1.390		1.592	1.693
		(4.465*)		(4.186*)	(4.714*)
MALL	0.392	0.262			
	(5.314*)	(2.388**)			
SDALL	-0.022	-0.037			
	(-2.814*)	(-3.387*)			
LAMBDA_{ALL}			0.756	0.601	
			(1.804***)	(1.309)	
LAMBDA^2_{ALL}			-0.057	-0.151	-0.063
			(-0.980)	(-2.238**)	(-1.628)
R^2	0.158544	0.401500	0.065676	0.364911	0.352787
Obs	107	91	107	91	91

*, ** and *** denote significance at the 1%, 5% and 10% levels respectively.

Note: White's heteroskedasticity-consistent t-statistics in parenthesis.

related to the growth rate. When the mean effect is removed, the negative variance effect no longer becomes significant at the 5% level of significance, although it is very close to a 10% level of significance (refer to Regression 24 and 25 in Table 5). This could imply that there is a positive mean effect, but this positive effect does not contribute as much to growth as the negative variance effect. This indicates that the volatility of the total aggregated inflows do have a harmful effect on growth.

6.4 The Mean-Variance Trade-Off Graphically

Figures 8 to 12 depict the mean-variance trade-off on unexplained growth. The unexplained mean growth rate in the figures refer to the residuals from Regression 6 in Table 2 which depicts the general growth regression. These residuals are then regressed on a constant, λ_j, and λ_j^2, where $j =$ FDI, BOND, EQUITY, BANK, or ALL. The quadratic estimation of λ_j is meant to depict the mean-variance trade-off and illustrates the extent to which this trade-off is depicted by the data. The figures are the empirical proofs of Figure 3 in Section 3.2, which illustrated the theoretical mean-variance trade-off between foreign investment and growth.

It can be seen from Figures 9 and 11 that for the case of debt flows (i.e portfolio bond investments and bank- and trade- loans), the variance effect seems to be especially large such that the mean effect is negated at an approximate λ_j value of 1 percent for BOND and 0.5 percent for BANK.

The variance effect for equity flows (i.e. foreign direct investment and portfolio equity investments) do not seem to be that large in comparison to those of debt flows. It is interesting to note that portfolio equity flows hardly seem to have a positive mean effect.

The negative variance effects for all the flows is brought about to a large extent by outliers. For instance, Guyana and Lesotho play a big role in creating the mean-variance trade-off for the case of foreign direct investments. Without the inclusion of these two countries, the mean-variance relationship might not have been observed. Similarly, the outlier countries for the case of portfolio equity investments are Ghana and Bulgaria. Latvia, Lithuania and Hungary are the countries that bring about the negative variance effect for portfolio bond flows, and Estonia, Latvia and Congo for bank- and trade-related flows.

Note that the estimated mean-variance relationship of foreign investments

to growth is not significant[10]. This is because the quadratic negative variance effect is brought about in most cases by outliers, hence the mean-variance trade-off found in this paper is not robust.

Observing Figure 12, one can see the effects of the aggregated international capital flows on growth. The 2 outliers here are Guyana and Lesotho, which are the same outliers that were responsible for the negative variance effect for foreign direct investments. One may conclude that the high volatility of foreign direct investments were the main culprits for the high volatility in their aggregated international capital flows. Likewise the high volatility of bank- and trade-related investments in the case of Estonia was most probably responsible for their volatile aggregated international capital flows. Hence it is generally more informative to look at the disaggregated effects of international capital flows, because countries are subjected to different impacts from the various investment flows.

Table 6: Growth rates of countries before and after the financial crisis

	1996	1997	1998	1999	2000
Korea	5.5%	4.0%	-7.6%	9.7%	7.8%*
Malaysia	7.3%	4.7%	-9.5%	3.3%	5.7%*
Indonesia	6.1%	3.0%	-14.4%	-1.3%	3.1%*
Philippines	3.5%	3.0%	-2.7%	1.2%	2.2%*
Thailand	5.3%	-2.3%	-10.8%	3.4%	3.5%*
	1994	1995	1996	1997	1998
Mexico	2.6%	-7.8%	3.5%	5.2%	3.5%

Data obtained from WDI 2001 except for the year 2000.

* data obtained from http://www.worldbank.org/data/.

An additional interesting observation is that none of the emerging market economies that were affected by the financial crises during the 1990s were amongst the outliers that contributed to the negative variance effect. In other words these countries did not have high λ values and low growth rates. Table 6 shows GDP per capita growth rates of the countries before and after the financial crises took place. It can be seen that the financial crisis had only a short lived effect on the growth of the countries. Most countries managed to attain before crisis growth rates after two to three years after the crisis

[10]See Regressions 16 to 19 and 24.

occurred. Observing Figures 8 to 12 reveals that of these 6 countries, only Philippines was found to be located under the mean-variance trade-off curves for all investment flows.

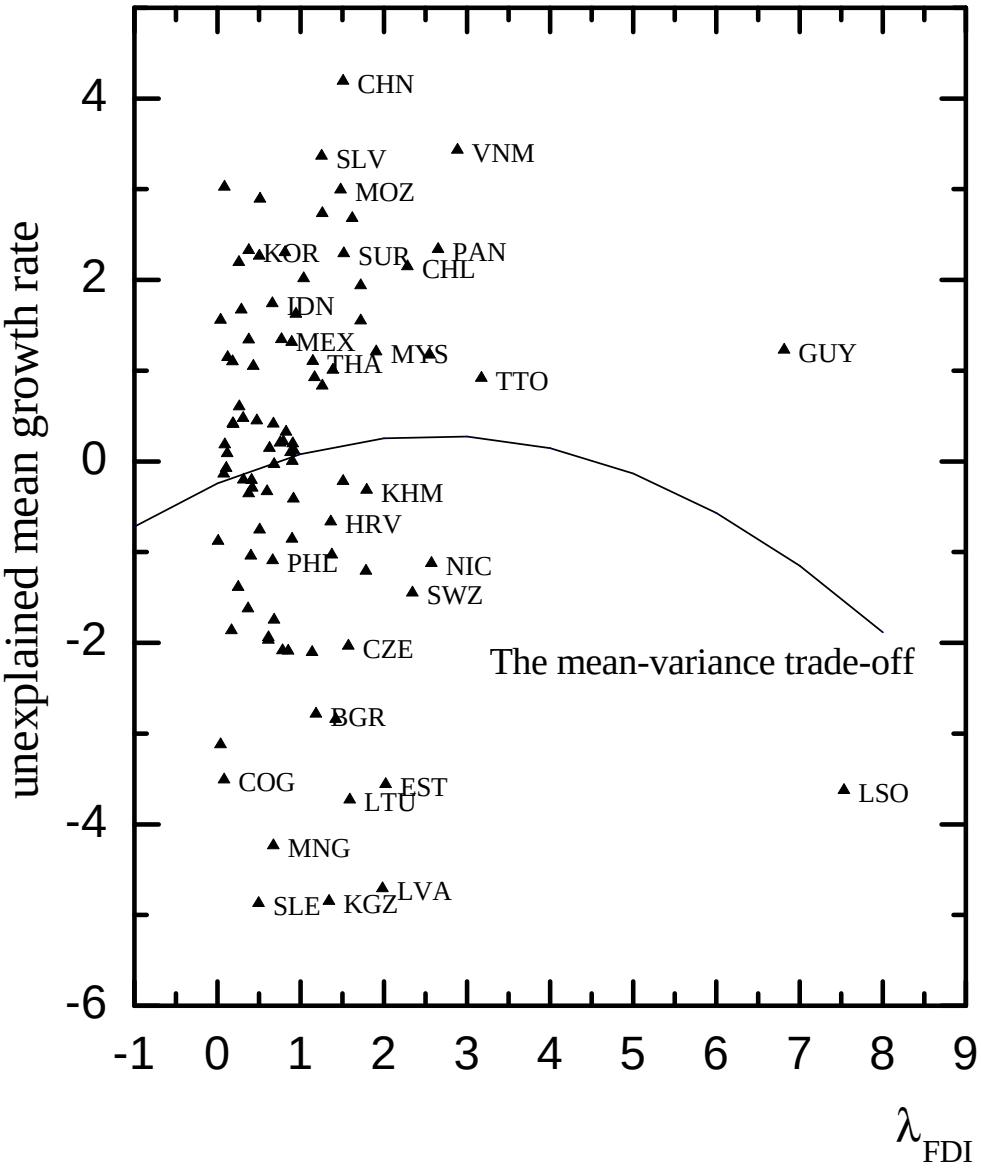

Figure 8: The mean-variance trade-off for FDI

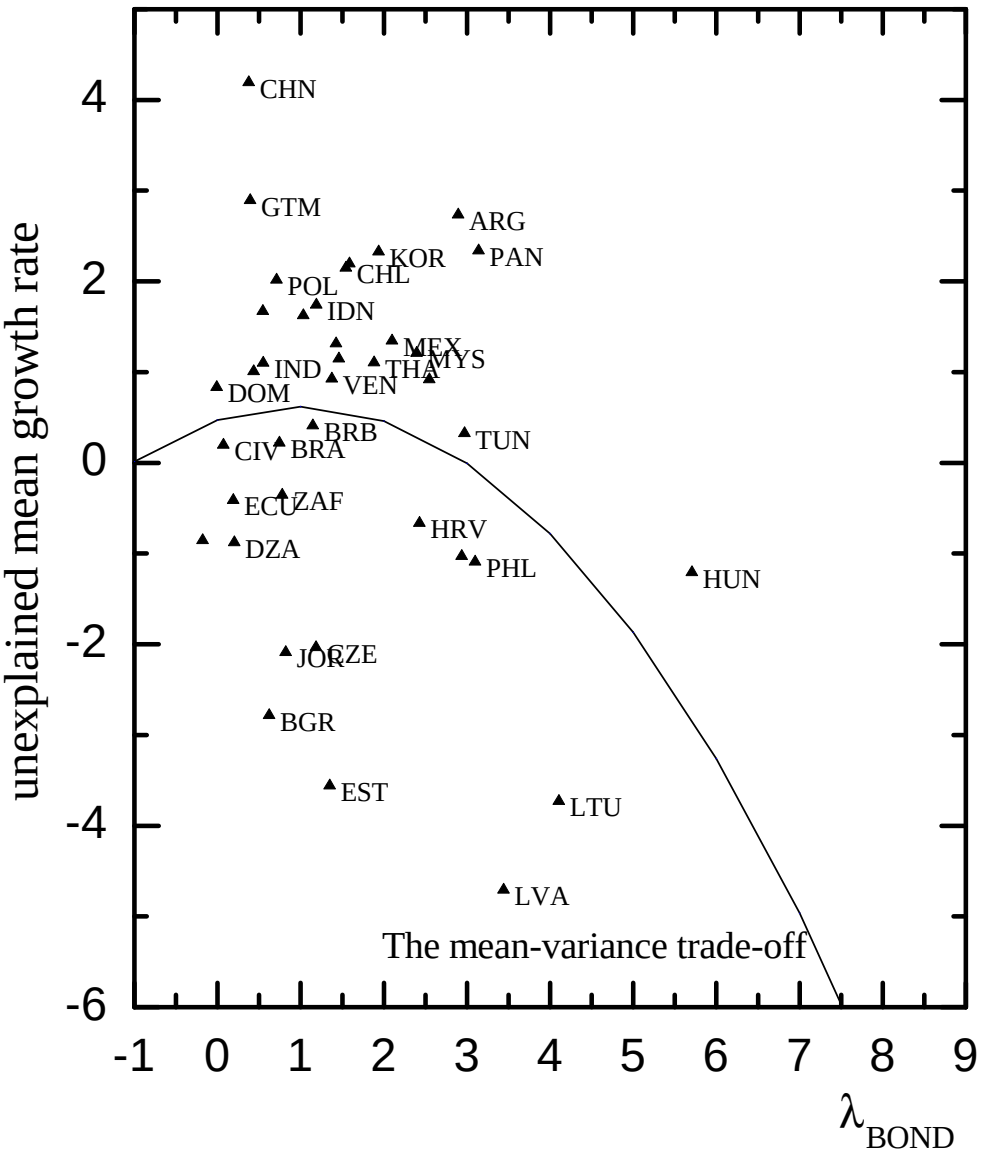

Figure 9: The mean-variance trade-off for BOND

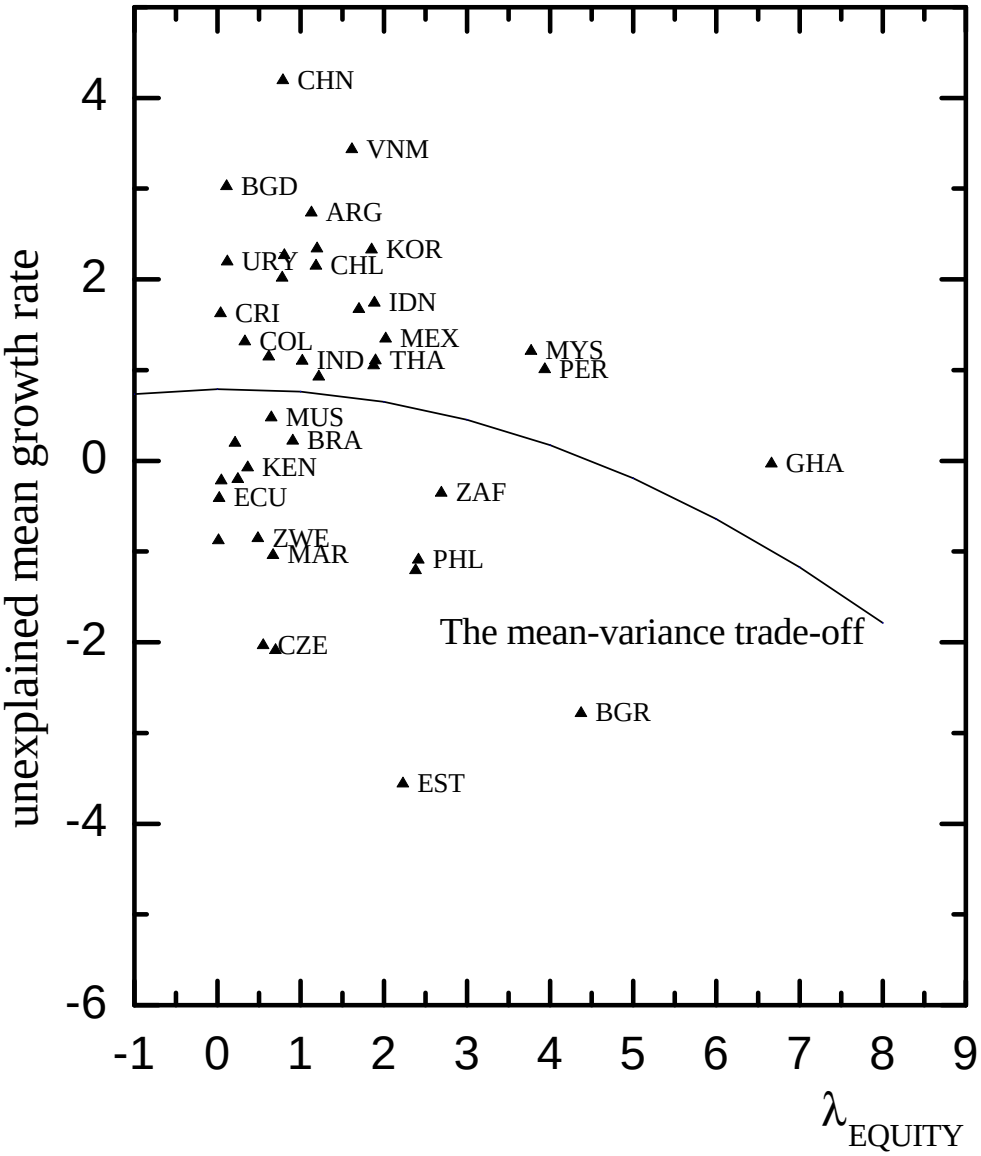

Figure 10: The mean-variance trade-off for EQUITY

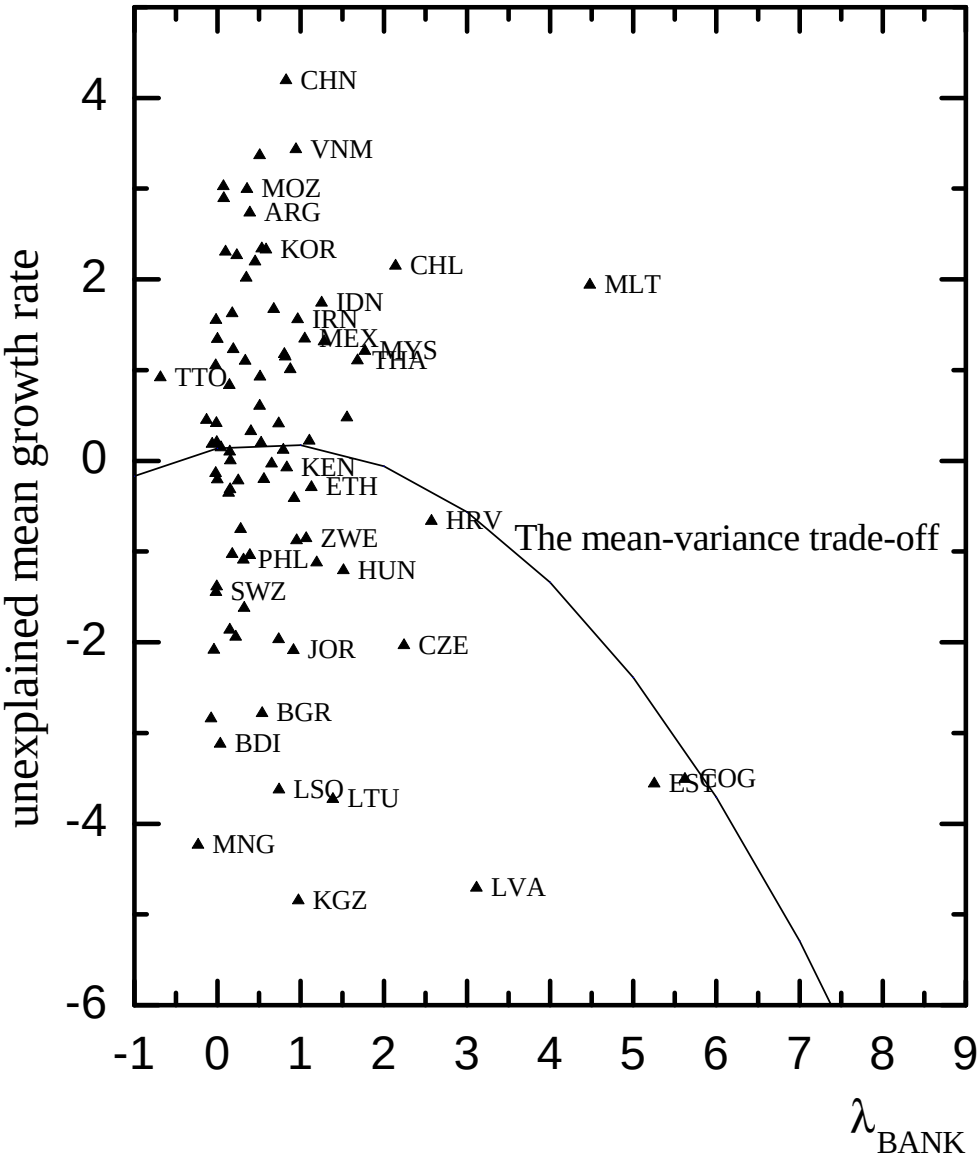

Figure 11: The mean-variance trade-off for BANK

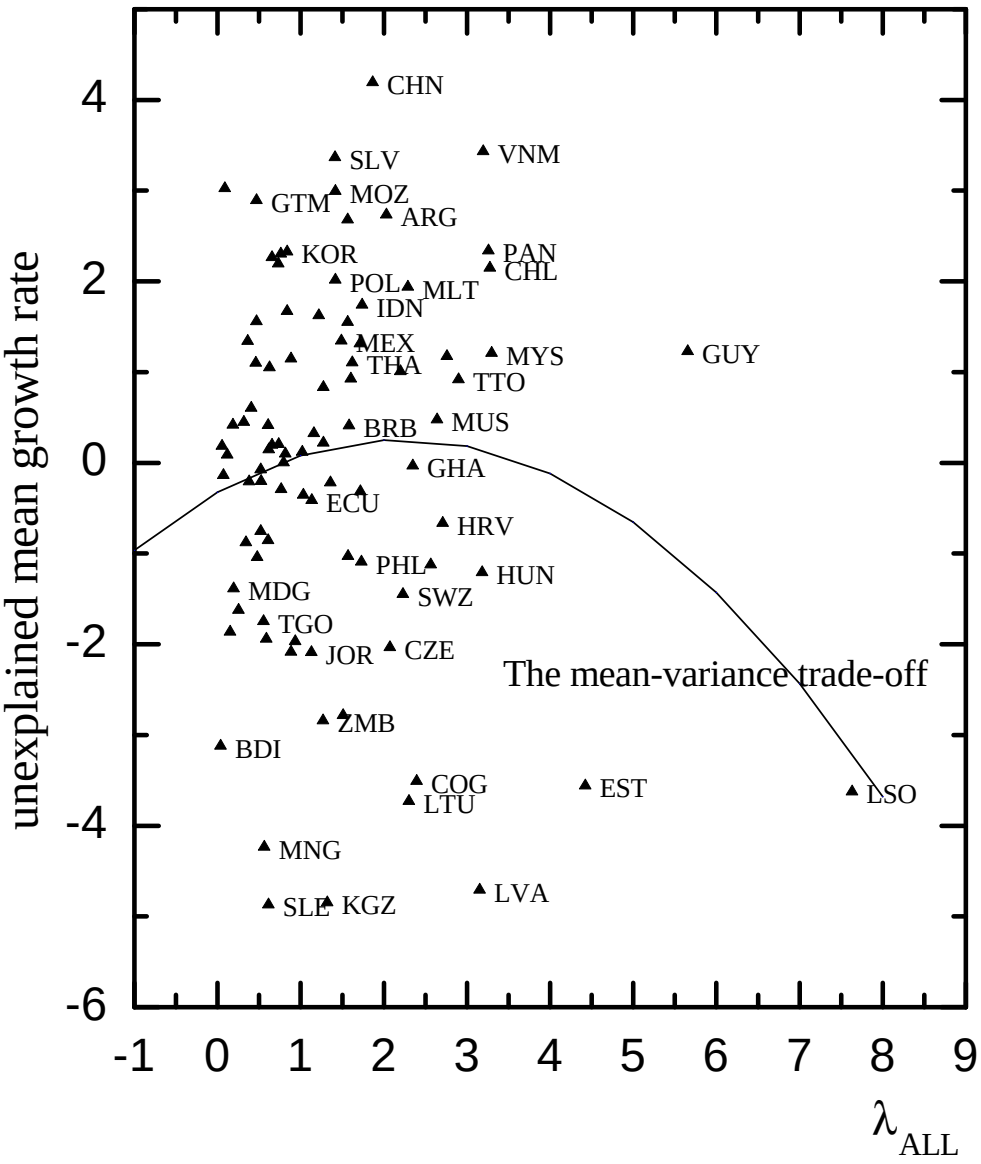

Figure 12: The mean-variance trade-off for ALL

7 Policy Suggestions

Regression results from the previous sections point in the direction that volatility is harmful for growth. Considering disaggregated capital flows this paper finds that the volatility of portfolio bond and bank and trade-related inflows are particularly harmful to growth. The volatility of aggregated inflows are also negatively related to growth.

Having found evidence that volatility is harmful to growth, should governments then intervene to ensure the stability of international capital market flows? The following are a few potential policy suggestions.

There should be more stringent supervision of the banking system. When access to international capital is relatively easy, domestic banks tend to take on greater risks in the form of an increase of their liabilities. This occurs because domestic banks borrow international funds and in turn, lend them to the domestic user of the funds. The reason why domestic banks in developing countries have such an important "middle-man" role is because direct loans from foreign banks are usually limited to only large domestic or multinational firms. Thus small- and medium-sized firms and consumers are constrained to borrow from domestic banks. To prevent domestic banks from taking on additional risk during a high capital inflow phase, it may be advisable for governments to increase the reserve requirement ratios of banks during such periods, especially in countries where supervision is poor and hard to improve in the short-run (Calvo and Reinhart (1998)). Governments could also monitor the types of loans issued by domestic banks, i.e to to check up on the performance of domestic banks' liabilities on a regular basis. In addition, governments could also set a maximum "foreign debt to reserve ratio", that is to restrict the percentage of the amount of short-term foreign loans that domestic banks take on as a percentage to the stock of their international reserves, to ensure that banks will not be in trouble when these loans mature.

Bond holders are the first in line for repayment, which are in most cases, independent of the firm's performance. In some cases, when firms are unable to repay their debts because of macroeconomic disturbances (e.g., a severe devaluation), foreign creditors are able to put pressure on the local government so as to persuade it to take up non-performing private sector loans (Calvo and Reinhart (1998)). To avoid this, governments may want to regulate the "international leverage" position of firms, that is the percentage of bonds held by foreigners relative to the assets of the firm, to ensure that the

firms will not be in trouble when foreign bond holders decide not to reinvest their investments when they have matured.

Governments have to make sure that they do not impose too much capital controls in their countries such that they deter foreign investors from wanting to invest, even if it may be on a short-term basis. In fact, they should encourage foreign investors to reinvest their loans after they have matured, such that short-term debt will not flow out of the country.

Equity investments should also not be neglected. Foreign direct investment flows are usually thought of as being a long-term investment and hence a reflection that a country is stable economically and politically. It is advisable for governments to continue with policies that attract foreign direct investments and to ensure that they remain competitive and attractive for the multinational companies to continue to have an investment interest in the country. Governments should also not only encourage portfolio equity flows, but also to ensure that a higher share is traded in the developing countries' stock markets. In fact it may be advisable for developing countries to cooperate, and create a regional or sub-regional stock market, where small stock markets can unite to pool liquidity. This would definitely attract more foreign investors, as there would be more credibility in such a regional stock market as compared to a stock market in a small country. This measure could also bring about more stability in portfolio equity flows (Griffith-Jones and Leape (2002)).

Developing countries' governments could also further improve the level, quality, frequency and availability of information on their countries. One suggestion would be to keep important players such as fund managers updated on country risks. When information is not available, market players usually have an exaggerated perception of country risks. Countries can for instance organise meetings or conferences with such market players, to improve information and knowledge on these countries (Griffith-Jones and Leape (2002)). This could lead to a less volatile financial market as players will have more information and hence better able to assess risk more realistically.

Governments can take additional precautions by holding sufficient foreign reserves or arranging access to contingent credit lines in case of the sudden withdrawal of flows from international capital markets. These can provide safeguards against crises where the long-term stability of the financial sector is not yet in place (World Bank (2001a)).

8 Conclusion

The volatility of international capital flows are generally found to be negatively related to the growth rate of a country. The mean-variance trade-off hypothesised by the Fickle Investor Model is to a certain extent supported by the data. The various international capital flows indicate a positive mean effect and a negative variance effect (although these effects are not always significant). After having accounted for other growth accounting regressors, the mean-variance effect still seems to be indicated with the exception of portfolio equity flows. It should be noted however that the results are not robust and are highly dependent on outliers.

International capital flows do not generally have an independent causal effect on growth. This is because capital flows are typically associated with other features of the economy that promote growth - and, in turn, such growth pulls in more flows (World Bank (2001a)). For instance, when a country has good corporate governance and a skilled labour force, foreign investors will be attracted to invest foreign direct investments in the country. Thus it is not surprising that the mean effect of many of the capital flows are no longer significant once other growth accounting regressors are taken into account.

Volatility on the other hand seems to have a significantly negative effect on growth even after accounting for other growth effects especially for the cases of portfolio bond investments and bank- and trade-related flows. Such debt flows to developing countries are in general easier to flow out of the country in the event of a crisis. The bulk of bank loans to developing countries are short-term loans, which foreign banks can easily withdraw (once they have matured) in times of a crisis. Bond holders have in general shorter time horizons as compared to equity holders, as equity flows, by definition do not mature and are not subject to redemption. Thus bonds and loans are more affected by "roll-over" risk as compared to equity (foreign direct investment and portfolio equity). Equity holders can withdraw their funds in a crisis, but typically only by incurring large losses on their holdings (World Bank (2001a)).

How should governments manage the volatility of capital flows? Countries need to improve their policies concerning the development of institutions and corporations that play a large role in financial markets. An infrastructure of legal rules and practice together with timely and accurate information is

required for the development of an efficient and secure financial market environment. These in turn should be supported by regulatory and supervisory arrangements that help provide incentives for financial market participants. Institutions, in particular those involved with foreign private debt flows (i.e. portfolio bond investment and bank and trade-related loans) such as banks, securities markets, and a range of other types of intermediary and financial firms need to be better developed and well regulated. As most developing markets are too small to be able to do without the benefits of access to global finance, including services from foreign financial banks, the liberalisation of the flows of international capital investments are important for the development of their countries (World Bank (2001b)). Governments should regulate but not hinder foreign investments. Countries that have not opened their capital markets have avoided crises but have also avoided the rapid economic growth that countries with open markets have enjoyed between crises (Dooley (1999)). Finally, governments must stabilise their countries economically (for instance, exchange rate, terms of trade, and inflation) and politically as such uncertainty would contribute to a lower investor confidence and hence a greater investor "fickleness".

The financial crises in the nineties that affected emerging markets in Asia and Latin America were to a large extent the result of the poor state of bank assets at the time of liberalisation (Calvo and Reinhart (1998)). The impact of the crises did not last very long in the countries because governments took quick action to "clean up" their financial markets and their banking systems. This shows that the high volatility of international capital flows may not necessarily be harmful for long-term growth, as long as governments are able to control them.

Further research on this topic can try to exploit the possibility of estimating the mean-variance effect using a scaled version of different random variables that are both investment type specific and country type specific. This random variable would be able to take into account country specific risk in addition to investment specific risk. This paper uses the assumption that foreign investors have the same degree of fickleness for every country with respect to a particular investment type, which may be too unrealistic and restrictive. Additional research on this topic can attempt other alternative testing techniques on how the volatility of disaggregated international capital flows affects growth. Non-parametric or semi-parametric regression

approaches may be more robust methods of estimation because they are not dependent on outliers.

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10 Appendix

Appendix A. Solving the Theoretical Model

The arbitrage equation for the decision as to whether to become an entrepreneur or to remain an experienced worker is Eq.(11). Substituting in Eqs.(8) and (9), one obtains

$$E_t[R_{t+1}w_t + d_{t+1} + p_{t+1}] = E_t[R_{t+1}w_t + \nu w_{t+1} + \pi_{t+1}w_{t+1}]$$

$$d_{t+1} + E_t[p_{t+1}] = (\nu + \pi_{t+1})w_{t+1}$$

Note that d_{t+1}, w_{t+1} and n_{t+1} are known at time t. Multiply with $\frac{n_{t+1}}{d_{t+1}}$ to obtain

$$n_{t+1} + E_t[\frac{n_{t+1}p_{t+1}}{d_{t+1}}] = (\nu + \pi_t)\frac{w_{t+1}n_{t+1}}{d_{t+1}}$$

Using Eqs.(3), (5), and (6), the above equation can be re-written as

$$1 + \nu(1 - e_t) + E_t[\frac{\frac{\frac{\alpha}{1-\alpha}d_{t+1}q_{t+1}}{w_{t+1}}p_{t+1}}{d_{t+1}}] = (\nu + \pi_t)E_t[\frac{\frac{\alpha}{1-\alpha}d_{t+1}q_{t+1}}{d_{t+1}}]$$

Using Eq.(7), substitute an expression for p_{t+1}

$$1 + \nu(1 - e_t) + \frac{\alpha}{1-\alpha}E_t[\frac{q_{t+1}}{w_{t+1}}\frac{z_{t+1}w_{t+1}}{q_{t+1}}] = \frac{\alpha}{1-\alpha}(\nu + \pi_t)E_t[q_{t+1}]$$

Using Eq. (2)

$$1 + \nu(1 - e_t) + \frac{\alpha}{1-\alpha}E_t[z_{t+1}] = \frac{\alpha}{1-\alpha}(\nu + \pi_t)((1 - \delta)q_t + e_t) \qquad (21)$$

Solving this equation for e_t delivers Eq.(13) and thus also Eq.(12) with Eq.(2). The steady-state condition in Eq.(14) is calculated using $\delta\bar{q} = \bar{e}$.

To derive expression (15), write Eqs.(8) and (9) as

$$c_{t+1}^{(e)} = E_t[c_{t+1}^{(w)}] + \pi_t w_{t+1} + \epsilon_{t+1,c^{(e)}},$$

$$c_{t+1}^{(e)} = E_t[c_{t+1}^{(w)}] + \epsilon_{t+1,c^{(w)}},$$

where $\epsilon_{t+1,c^{(e)}}$ and $\epsilon_{t+1,c^{(w)}}$ have mean zero, conditional on information up to and including date t. Using a constant relative risk aversion utility function

$$u(c) = \frac{c^{1-\eta} - 1}{1-\eta},$$

and taking a second-order Taylor approximation of $E_t[u(c_{t+1}^{(e)})]$ and $E_t[u(c_{t+1}^{(w)})]$,

$$E_t[\frac{(c_{t+1}^{(e)})^{1-\eta} - 1}{1-\eta}] = \frac{(E_t[c_{t+1}^{(w)}])^{1-\eta} - 1}{1-\eta} + \pi_t w_{t+1}(E_t[c_{t+1}^{(w)}])^{-\eta}$$

$$-(\eta/2)(E_t[c_{t+1}^{(w)}])^{-\eta-1}\sigma^2_{t,c^{(e)}},$$

and

$$E_t[\frac{(c_{t+1}^{(w)})^{1-\eta} - 1}{1-\eta}] = \frac{(E_t[c_{t+1}^{(w)}])^{1-\eta} - 1}{1-\eta} - (\eta/2)(E_t[c_{t+1}^{(w)}])^{-\eta-1}\sigma^2_{t,c^{(w)}},$$

where $\sigma^2_{t,c^{(e)}} = E_t[\epsilon^2_{t+1,c^{(e)}}]$ and $\sigma^2_{t,c^{(w)}} = E_t[\epsilon^2_{t+1,c^{(w)}}]$. Comparing the 2 expressions, one can obtain the following expression

$$\pi_t = \eta \frac{(\sigma^2_{t,c^{(e)}} - \sigma^2_{t,c^{(w)}})}{2w_{t+1}E_t(c_{t+1}^{(w)})}$$

Using the following expressions,

$$\epsilon_{t+1,c^{(e)}} = (w_t + \frac{p_t}{1-\delta})\epsilon_{t+1,R},$$

$$\epsilon_{t+1,c^{(w)}} = w_t\epsilon_{t+1,R},$$

where

$$\epsilon_{t+1,R} = R_{t+1} - E_t[R_{t+1}].$$

and

$$\epsilon_{t+1,R} = \frac{w_{t+1}}{p_t q_{t+1}}\epsilon_{t+1,z},$$

where

$$\epsilon_{t+1,z} = z_{t+1} - E_t[z_{t+1}],$$

one can then obtain the following expression

$$\pi_t = \eta \frac{w_{t+1}}{E_t(c_{t+1}^{(w)})}[\frac{(1-\delta)(q_t/z_t)+0.5}{(1-\delta)^2 q_{t+1}^2}]\sigma_{t,z}^2.$$

Substituting in Eq. (9), one then gets,

$$\pi_t = \eta \frac{(1-\delta)(q_t/z_t)+0.5}{(1-\delta)^2 q_{t+1}}[\frac{w_{t+1}}{E_t[R_{t+1}w_t + \nu w_{t+1}]q_{t+1}}]\sigma_{t,z}^2.$$

Using then the expression for R_{t+1},

$$\pi_t = \eta \frac{(1-\delta)(q_t/z_t)+0.5}{(1-\delta)^2 q_{t+1}}[\frac{w_{t+1}}{q_{t+1}} \frac{1}{E_t[(1-\delta)[\frac{d_{t+1}+p_{t+1}}{p_t}]w_t + \nu w_{t+1}]}]\sigma_{t,z}^2.$$

Using now Eq. (6),

$$\pi_t = \eta \frac{(1-\delta)(q_t/z_t)+0.5}{(1-\delta)^2 q_{t+1}}[\frac{w_{t+1}}{q_{t+1}} \frac{1}{\frac{(1-\delta)}{\alpha} n_{t+1}\frac{q_t}{z_t} + \frac{(1-\delta)}{\alpha} E_t[z_{t+1}]\frac{q_t}{z_t} + \nu q_{t+1}}]\sigma_{t,z}^2.$$

Simplifying, Eq. (15) is obtained.

Appendix B. Definitions

MGY = mean growth rate of real per capita GDP in current local currency during 1990-99. Source: World Development Indicators 2001

FDI = percentage of foreign direct investment to GDP. Source: World Development Indicators 2001 and International Financial Statistical Yearbook 2001

BOND = percentage of portfolio bond investment to GDP Source: World Development Indicators 2001

EQUITY = percentage of portfolio equity investment to GDP Source: World Development Indicators 2001

BANK = percentage of bank- and trade-related investment to GDP Source: World Development Indicators 2001

ALL = percentage of total net private capital inflows to GDP Source: World Development Indicators 2001

MFDI = mean of FDI between 1990-99

MBOND = mean of BOND between 1990-99

MEQUITY = mean of EQUITY between 1990-99

MBANK = mean of BANK between 1990-99

MALL = mean of ALL between 1990-99

SDFDI = standard deviation of FDI during 1990-99

SDBOND = standard deviation of BOND during 1990-99

SDEQUITY = standard deviation of EQUITY during 1990-99

SDBANK = standard deviation of BANK during 1990-99

SDALL = standard deviation of ALL during 1990-99
LGDPPC = logarithm of 1990 GDP per capital value at constant 1995 US dollars.
Source: World Development Indicators 2001

PRI90 = primary school enrollment rate in 1990
Source: World Development Indicators 2001

INVGDP = average value of the percentage of gross domestic investment to GDP
Source: World Development Indicators 2001

RULE = measures the extent to which a gents have confidence in and abide by the rules of society.
Source: Kaufmann, Kraay and Zoido-Lobatón (1999a and 1999b)

Appendix C. Country Codes

DZA-Algeria
ATG-Antigua and Barbuda
ARG-Argentina
ARM-Armenia
BGD-Bangladesh
BRB-Barbados
BLR-Belarus
BLZ-Belize
BEN-Benin
BOL-Bolivia
BWA-Botswana
BRA-Brazil
BGR-Bulgaria
BFA-Burkina Faso
BDI-Burundi
KHM-Cambodia
CMR-Cameroon
CAF-Central African Republic
TCD-Chad
CHL-Chile
CHN-China
COL-Colombia
COM-Comoros
COG-Congo, Rep.
CRI-Costa Rica
CIV-Cote d'Ivoire
HRV-Croatia
CZE-Czech Republic
DMA-Dominica
DOM-Dominican Republic
ECU-Ecuador
EGY-Egypt, Arab Rep.
SLV-El Salvador
EST-Estonia
ETH-Ethiopia
FJI-Fiji
GAB-Gabon
GMB-Gambia
GHA-Ghana
GRD-Grenada
GTM-Guatemala
GIN-Guinea
GNB-Guinea-Bissau
GUY-Guyana
HTI-Haiti
HND-Honduras
HUN-Hungary
IND-India
IDN-Indonesia
IRN-Iran, Islamic Rep.
JAM-Jamaica
JOR-Jordan
KEN-Kenya
KOR-Korea, Rep.
KGZ-Kyrgyz Republic
LAO-Lao PDR
LVA-Latvia
LSO-Lesotho
LTU-Lithuania
MKD-Macedonia, FYR
MDG-Madagascar
MWI-Malawi
MYS-Malaysia
MLI-Mali
MLT-Malta
MRT-Mauritania
MUS-Mauritius
MEX-Mexico
MNG-Mongolia
MAR-Morocco

MOZ-Mozambique
MMR-Myanmar
NAM-Namibia
NPL-Nepal
NIC-Nicaragua
NER-Niger
NGA-Nigeria
OMN-Oman
PAK-Pakistan
PAN-Panama
PRY-Paraguay
PER-Peru
PHL-Philippines
POL-Poland
RWA-Rwanda
SAU-Saudi Arabia
SEN-Senegal
SYC-Seychelles
SLE-Sierra Leone
SLB-Solomon Islands
ZAF-South Africa
LKA-Sri Lanka
KNA-St. Kitts and Nevis
LCA-St. Lucia
VCT-St. Vincent and the Grenadines
SDN-Sudan
SUR-Suriname
SWZ-Swaziland
TZA-Tanzania
THA-Thailand
TGO-Togo
TTO-Trinidad and Tobago
TUN-Tunisia
TUR-Turkey
UGA-Uganda
URY-Uruguay
VEN-Venezuela
VNM-Vietnam
YEM-Yemen, Rep.
ZMB-Zambia
ZWE-Zimbabwe