International capital flows and investment volatility in selected sub-Saharan African countries

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Abstract

The study examines the impact of foreign capital flows on investment volatility in emerging and frontier market economies in sub-Saharan Africa. In particular, the study attempts to answer the question of whether different components of foreign capital inflows explain investment volatility. Theory suggests that increased cross-border capital mobility increases investment volatility due to the possibility of substituting foreign for domestic investments. Empirical literature does not, however, provide any clear evidence in support of this theory. By using the dynamic panel data analysis, this study tests the hypothesis that increased capital flows increases investment volatility and the study established that international capital flows reduce investment volatility.

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1. Introduction

The increase in international capital flows, accompanied by a series of economic crisis in the past three decades, has given rise to concerns about the impact of the flows on national economies (Reinhart and Rogoff, 2009). This, in turn, has led to an intensive debate, among academics and policymakers, about the impact of international financial integration. An important feature of the ensuing debate is how the increased capital flows affects investment volatility (Calderon and Schmidt-Hebbel, 2008; Pallage and Rebe, 2003).

It is hypothesized by Backus et al. (1992), Razin and Rose (1994) and Hirata et al. (2004) that increased cross-border capital flows enhances substitution possibilities between domestic and foreign investments, and hence, increase investment volatility.

Razin and Rose, also contend that the impact of international capital mobility on investment volatility depends on the persistence of productivity shocks. Studies, including Razin and Rose (1994), Denizer et al. (2000), Grenade (2004) and Hirata et al. (2004), have examined the impact of international capital flows on investment volatility. However, these studies do not provide any clear evidence on the link between capital flows and investment volatility.

To the best of our knowledge, the relationship between foreign capital flows and investment volatility in sub-Saharan Africa is yet to be explored. Also, studies that examine the impacts of types of foreign capital flows on investment volatility are yet to be identified.

This study seeks to test the hypothesis that higher levels of international capital flows lead to an increase in investment volatility, using a panel data of selected sub-Saharan African countries. ¹ The study, further, examines the impacts of the types of capital flows on investment volatility in sub-Saharan Africa. Unlike Hirata et al. (2004), this study explains the time dynamics

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¹ The selected countries are South Africa, Nigeria, Botswana, Ghana, Kenya, Mauritius, Mozambique, Namibia, Zambia, Uganda, Tanzania, Seychelles and Cape Verde. These countries have, to an extent, developed and deregulated their domestic financial markets, reduced restrictions on external capital flows and offered competitive investment environments to attract investments. One of the key objectives for these initiatives is the attraction of greater foreign capital flows (International Monetary Fund, 2008).
of investment volatility, using the dynamic panel regression analysis strategy.

The rest of the paper is organised as follows. Section 2 reviews literature on the relationship between international capital flows and investment volatility, as well as other determinants of investment volatility. Section 3 presents the hypothesis; the source of data used for the study, and provides definitions and measures of the chosen variable, as well as the estimation method for the study. The results for investment volatility are presented and discussed in Section 4. Finally, Section 5 summarises the findings of the research and concludes the discussion.

2. Literature review

2.1. International capital flows and investment volatility

Theoretical literature, including the works of Backus et al. (1992) and Hirata et al. (2004), predict that international financial integration should increase investment volatility. When restrictions on cross-border capital flows are reduced, the possibilities of substituting foreign for domestic investments increase, which in turn leads to an increase in investment volatility.

Razin and Rose (1994), however, argue that the impact of increased capital mobility on investment volatility is also determined by the nature of the underlying productivity shocks. If shocks are persistent and country-specific, increase capital mobility would heighten investment volatility. Conversely, when shocks are common across countries, the impact of increased capital mobility on investment volatility would be ambiguous. When shocks to productivity are transitory and common across countries, the easing of restrictions on cross-border capital flows would not affect investment spending, because of the resultant changes to international interest rates. Razin and Rose show that the impact of transitory shocks on investment behaviour is marginal, because a non-persistent shock does not lead to a significant change in the expected discounted sum of future profits. In the case of an irreversible investment, a transitory shock may not have any impact on investment.

Related empirical studies, including Razin and Rose (1994), Hirata et al. (2004), Grenade (2004) and Denizer et al. (2000) do not provide conclusive evidence on the relationship between international capital flows and investment volatility. In a panel study for 133 countries, Razin and Rose (1994) used the augmented Dickey–Fuller unit root test to examine shocks and identified a high degree of persistence in shocks which are also common across countries. By using the instrumental variables model, Razin and Rose did not find the level of capital mobility to be significantly correlated with investment volatility.

Studies that identified a negative relationship between financial integration and investment volatility include Hirata et al. (2004) for MENA countries and Denizer et al. (2000) for a panel of 70 countries. Grenade (2004) also conducted a study for the Eastern Caribbean Currency Union (ECCU) but identified financial integration to be associated with rising investment volatility.

To the best our knowledge, the impact of the types of foreign capital flows on investment volatility is yet to be explored. Also, studies that investigate the determinants of investment volatility in sub-Saharan Africa are yet to be identified.

2.2. Other determinants of investment volatility

A number of other important factors explaining investment volatility have been identified in previous studies which examined macroeconomic volatility. These factors include output growth, domestic financial depth, inflation volatility and quality of institution and are discussed below.

2.2.1. Output growth

Dasgupta and Ratha (2000) and Hernandez et al. (2001) contend that a fast-growing economy is likely to create a congenial environment for higher future earnings and hence higher rates of returns, in addition to reduced risk of investments. This, in turn, leads to the attraction of greater investments and the achievement of more stable rates of investments. Empirical studies, including Ahmed et al. (2005), show that higher output growth in previous periods indicate improved growth prospects, which in turn, leads to more investment flows.

2.2.2. Domestic financial depth

According to Calderon and Schmidt-Hebbel (2008), one of the mechanisms by which agents diversify risk and smooth shocks is accessing credit from the domestic financial market. Deep financial markets make credit available for direct investments and offer investors with funds needed to meet their short and long term needs. Studies, including Denizer et al. (2002) and Easterly et al. (2001), identified deep financial markets to lead to lower macroeconomic volatility. Mileva (2008a,b) also confirm the hypothesis that domestic financial depth increases the rate of investment.

2.2.3. Inflation volatility

Another factor that leads to higher investment volatility is macroeconomic instability, usually measured in the context of inflation volatility. Literature, including Agosin and Mayer (2000) and Grenade (2004), indicate that high and volatile inflation increases the uncertainty of investments and heightens risk of long-term investments.

2.2.4. Political instability and institution

Political instability is also noted to have adverse effects on investments. Alfaro et al. (2003) hypothesise that a favourable political climate, as well as strong government institutions create an incentive for investments. Von Furstenberg (1998) and Vo (2005) also indicate that a secure institutional foundation is a very important pre-requisite for attracting investments. In cases of political instability, investors become reluctant to spend large amounts of resources on fixed investments. Several studies that investigated the determinants of both domestic and foreign investments have largely disregarded the impact of political and institutional variables. Calderon and Schmidt-Hebbel (2008) identified political risk to be strongly correlated with output volatility. To the best of our knowledge, the impact of political
climate and institutions on investment volatility is yet to be explored.

3. Methodology

3.1. Hypothesis

The following is our basic working hypothesis drawn from a survey of theory and empirical literature: Increased inflow of foreign capital increases investment volatility.

3.2. Data sources

Annual data for thirteen emerging and frontier market economies in sub-Saharan Africa covering a period of 35 years (from 1975 to 2009) was collected and analysed using a dynamic panel regression analysis. These economies used in the study (see footnote 2) have become increasingly open to international capital flows, and are reasonably integrated with international financial markets.

Data on gross domestic investment, gross domestic output, output growth, domestic credit ratio and inflation were obtained from the World Bank’s World Development Indicators 2010. Annual data on foreign capital inflows, including foreign direct investment, loans and portfolio investment inflows were obtained from the International Monetary Fund’s International Financial Statistics and Balance of Payments Statistics. Data for the weighted conflict index for the political environment and the size and quality of legislature was obtained from the Databanks International.

3.3. Variables of choice

Based on a review of existing literature, this part of the study provides definitions and measurements of the variables chosen for the study as follows:

3.3.1. Investment volatility

Most of empirical studies have computed volatility by using the standard deviation over a rolling window; say three-to-five year rolling averages. A large number of alternative measures have also been based on the standard deviation measure around a simple time trend. However, these measures have shortcomings. One of the limitations with the use of this measure is the loss of observations at the beginning of the sample. Another limitation is that volatility measures, such as standard deviation and the coefficient of variation, are deemed to overemphasize variability in non-trending series. The squaring of the values of these volatility measures also has a tendency to worsen the problem of outliers (Canova, 1998; Offut and Blandford, 1986). Literature, including Nelson (1992), identifies the simple ARCH and related models as the most appropriate for assessing overtime changes in volatility.

To account for the time dynamics of volatility, this study estimates volatility by using the GARCH (1, 1) model as follows:

\[
I_t = X_t \rho + \epsilon_t
\]

where \(I_t\) is the gross capital formation, \(X_t\) is a vector of exogenous or pre-determined variables which includes a one-period lag dependent variable, one-period lag output growth, interest rate and foreign direct investments. Eq. (1) is a mean equation for investment, based on the neoclassical assumption that the desired level of capital stock is a positive function of the expected growth of the difference between actual output and the full-capacity output. Consistent with the modifications by Agosin and Mayer (2000), the equation also assumes that foreign investments form part of the total investments of a country and may have an influence on domestic investments in the recipient country. The use of one-period lag output growth rate in the mean equation reflects the investment accelerator effect and assumes adaptive expectation by postulating that expected output growth depends on output growth in the previous period.

The notation \(\sigma_t^2\) is the variance of the disturbance term from the mean equation (Eq. (1)); \(\mu\) is the mean; \(\epsilon_{t-1}^2\) is the one-period lag of the squared residual from the mean equation which indicates news about volatility from the previous period; and \(\sigma_{t-1}^2\) is last period’s forecast variance.

The model was estimated for individual countries. The advantage of individual country regressions is that it allows heterogeneity in the estimated coefficients. The sum of the coefficients, \(\alpha_1 + \beta_1\), is a measure of volatility persistence. For a well-specified variance function, the sum of the coefficients must be less than 1.

3.3.2. Foreign capital flows

Foreign capital flows is made up of foreign direct investment, foreign debt flows and portfolio equity flows. These are expressed as shares of total GDP, and reflect a quantity-based measure of international financial integration. Backus et al. (1992), Razin and Rose (1994) and Hirata et al. (2004) hypothesise that increased cross-border capital flows heighten investment volatility.

3.3.3. Domestic financial depth

Domestic financial depth is measured as the share of domestic credit to private sector in total GDP and reflects availability of domestic credit to finance investment. It is hypothesised by Kose et al. (2006) that deeper financial markets reduce investment volatility.

3.3.4. Political climate and institution

Political climate and institution are proxied by the weighted conflict index and quality of legislature obtained from the Data-Banks International. Alfaro et al. postulate that stable political climate and strong institutions creates incentives for reduced uncertainty in investments.

3.3.5. Inflation volatility

Inflation volatility is measured as the ratio of standard deviation of quarterly consumer price index inflation to its mean value over a four-quarter (a one-year) window. Prasad et al. (2003) hypothesise that stable macroeconomic environment reduces...
cost of investment and leads to the attraction of greater investments.

3.4. Empirical model

Our model for estimation follows the works of Agosin and Mayer (2000), Prasad et al. (2003) and Calderon and Schmidt-Hebbel (2008) on the determinants of investment and macroeconomic volatility, and is presented as follows:

\[
\delta I_{i,t} = \eta_i + k_1 \delta I_{i,t-1} + k_2 FKI_{i,t-1} + k_3 G_{i,t-1} + k_4 \delta^{INF}_{i,t-1} + k_5 \delta^{CD}_{i,t} + k_6 \delta^{PC}_{i,t} + \delta^{FKI}_{i,t} + \epsilon_{i,t}
\]

where: \( \delta I_{i,t} \) is investment volatility; \( FKI_{i,t-1} \) is ratio of foreign capital inflows (aggregate or disaggregated by type) to GDP lagged one-period; \( G_{i,t-1} \) is output growth lagged one-period; \( \delta^{INF}_{i,t-1} \) is inflation volatility measured as the standard deviation of the level of inflation lagged one-period; \( \delta^{CD}_{i,t} \) is domestic credit ratio, measured as the ratio of domestic credit to GDP; \( \delta^{PC}_{i,t} \) is volatility of CD measured as the standard deviation of liquidity or credit ratio; \( PC_{i,t} \) is political climate, using weighted conflict index provided by the Databanks International; \( INS_{i,t} \) is quality of institution, using a composite index for size and quality of legislature; and \( \epsilon_{i,t} \) = disturbance term.

The subscript ‘\( t \)'=1, 2, \ldots, \( N \) cross sections, and periods \( t=1, 2, \ldots, T \), with ‘\( N=13 \)’ (number of countries) and \( T=35 \) years, spanning the sample period 1975–2009. The intercepts, \( \eta_i \) denote country fixed effects that control for country specific factors that do not vary over time.

Estimation of the dynamic panel model involved use of the generalised method of moments-instrumental variables (GMM-IV) estimator.\(^2\) This corrects for potential endogeneity biases that may arise from the inclusion of the lagged dependent variable and some explanatory variables in the equation.

4. Estimation results

The first stage of the estimation exercise involved use of the GARCH (1, 1) model to estimate volatility measures for investment. The GARCH (1, 1) was fitted for each of the 13 selected countries to determine the suitability of the model as a good descriptor of the volatility of investment. The results from estimating the variance equation for investment is presented in Table 1.

The estimated coefficients of the variance equation for 10 out of the selected 13 countries were found to be significant at least at the 10% level. 9 out of the 13 countries also exhibited comparatively high coefficients estimates, whilst the parameter estimates for Uganda, Zambia and Tanzania were low – they were statistically insignificant. In order to validate the hypothesis that investment volatility increases during periods of external financial liberalization, we introduced a time dummy variable for external financial liberalization for each country in the respective variance equations. Mauritius and Mozambique are the only countries for which external and domestic financial liberalization had a significant impact on investment volatility. Investment volatility increased in Mauritius during periods of external financial liberalization, and in Mozambique during periods of domestic financial liberalization.

Literature, including Agenor et al. (2000) and Canova (1998) also shows that the size of the summed-up value of the ARCH and GARCH terms in the variance equation is a measure of persistence in volatility shocks. When the summed-up value of the coefficients of ARCH and GARCH terms is equal to unity, the suggestion is that volatility shocks die out slowly; hence could not, however, permit a wider coverage, in terms of the cross-section of countries covered.

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\(^2\) Despite its usefulness, there is a weakness with use of this kind of dynamic panel data methodology in covering a large time series and a comparatively small cross-section of countries. The weakness with this kind of approach is the possible existence of a high time series bias in the data construct. Data constraints
lower values of the summed-up terms indicate that volatility shocks die out much faster.

In 9 out of the 13 selected countries, the persistence measures were at least close to unity, indicating the persistence of an integrated GARCH phenomenon and underlines continual changes in the volatility of investment. Whilst investment volatility persistence was highest in Botswana, Cape Verde, Ghana, Kenya, Mauritius, Mozambique, Namibia, South Africa and Uganda, the level of investment volatility was least in Tanzania (Table 2).

4.1. Investment volatility

The second stage of the regression involved the estimation of the impact of external capital flows on investment volatility. Findings from the estimation results are presented in Table 3. The diagnostic tests for the GMM-IV specification indicate that the model is well specified. The new residuals for the GMM-IV specification are, at times, auto-correlated of order 1, but not auto-correlated of order 2. The Sargan test results also confirm the validity of the over-identifying restrictions and use of the instruments.

Overall, the regression results indicate that foreign direct investment inflow and foreign debt inflow, as well as the aggregated value of foreign capital inflow, lead to reduced investment volatility. Other identified key determinants of investment volatility are domestic credit volatility, political instability and inflation volatility. The regression results also provide evidence of persistence of shocks in emerging and frontier market economies of sub-Saharan Africa.

The coefficients for foreign direct investment and foreign loan inflows and aggregated foreign capital inflow in the previous period are negatively signed and statistically significant. This implies that foreign direct investment and foreign loan inflows augment domestic capital, improves the availability of finance for financing investments and, consequently, reduce investment volatilities in emerging and frontier market economies of sub-Saharan Africa.

The results confirm a priori expectations that a volatile domestic financial market contributes significantly to increased investment volatility in emerging and frontier market economies in sub-Saharan Africa. Its coefficient is positively signed and statistically significant in the first and second specifications.

Macroeconomic uncertainty is found to be an important determinant of investment volatility in emerging and frontier market economies in sub-Saharan Africa. The coefficient for inflation volatility is positively signed and statistically significant in the first specification. This suggests that macroeconomic instability, proxied by inflation volatility, creates uncertainty, increases costs and risks, and thus exacerbates the investment volatility in emerging and frontier market economies in sub-Saharan Africa.

Also, an unstable and unfavourable political climate contributes significantly to unstable investments in emerging and frontier market economies in sub-Saharan Africa. Its coefficient is positively signed and statistically significant in some specifications. This might suggest that some other factors over-ride political risk considerations when investors are making investment decisions.

Lagged output, domestic financial depth and the quality of government institution are not found to be important determinants of investment volatility in emerging and frontier market economies of sub-Saharan Africa.
5. Conclusions and recommendations

This study looked at the impact of foreign capital flows on investment volatility in emerging and frontier market economies in sub-Saharan Africa using dynamic panel (GMM-IV) estimation strategies. Overall, the study fails to accept the hypothesis that foreign capital exacerbates investment volatility. Foreign direct investment and foreign debt inflows, however, reduce investment volatility in emerging and frontier market economies in sub-Saharan Africa. Other key determinants identified in the study are stability in the domestic financial markets, inflation volatility and the political climate.

The results from the study have implications for public policy in sub-Saharan Africa. First, the ability to stabilize growth in investments requires that sub-Saharan African countries implement policies that attract greater inflow of foreign capital. In particular, the results suggest that foreign direct investments and debt inflows complement domestic investments in the emerging ad frontier market economies of sub-Saharan Africa. There need to be policy efforts aimed at achieving a stable macroeconomic and political environment through reductions in inflation volatility and political resolutions for entrenched democracy in governance. Monetary and financial policy measures that ensure stability in the provision of domestic credit to the private sector should also be pursued.

The main limitation of the study is the inability to, appropriately, capture the long term impact of foreign portfolio investment on the level of investment in emerging and frontier market economies in sub-Saharan Africa. This is because recorded data on foreign portfolio investment flows to most sub-Saharan African countries is only a new trend. In spite of these limitations, the study offers useful implications for future studies. In view of the fact that foreign loan and portfolio investment inflows influence total direct investment through their influence on domestic financial markets, future studies could focus on an econometric analysis of the impact of foreign capital flows on the development of domestic financial markets in emerging and frontier market economies in sub-Saharan Africa.

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