Journal of Indonesian Economy and Business
Volume 27, Number 1, 2012, 1 – 18

THE TRANSFER PROBLEM IN INDONESIA AND POLICY RESPONSES[1]

Amri Anjas Asmara

Fixed Income and Derivative Trading Division
Indonesia Stock Exchange (IDX)
(a_anjas_a@yahoo.co.id)

ABSTRACT

This paper examines the implications of, and policy responses to the transfer problem phenomenon, which is the interaction between surging capital inflows and real exchange rate. In particular, this paper identifies three episodes of large net private capital inflow to Indonesia during 1995 - 2010. Episodes of large capital inflows are often associated with real exchange rate appreciations. In turn, these conditions could undermine economic competitiveness in terms of price.

This paper adopts theoretical framework that leads to test the long-run co-movements of real exchange rates and capital inflows. This long run relationship is modeled on the cointegration framework. The Full-Modified Ordinary Least Square (FMOLS) is used to provide optimal estimates of cointegration regressions, dealing with endogeneity and serial correlation effect in the regressors that result from the existence of the cointegrating relationships.

Controlling for relative output levels, degree of openness, and the terms of trade, time series empirical evidence presented evidence supporting the existence of a significant transfer problem in Indonesia. Moreover, using disaggregated measure of inflows, this paper finds that portfolio investment has the most significant impact on REER appreciation in Indonesia.

A comprehensive assessment of various policy responses to the transfer problem leads to two major conclusions. First, the problematic relationship between REER apreciation and capital inflows would be more moderate in which the authorities exercised counter-cyclical fiscal. It means that greater fiscal restraint would also help ease pressures for real appreciation of the exchange rate. Second, aggressive sterilization could be the first line of defense against REER apreciation during surge of capital inflows.

Keywords: *Transfer Problem, Real Effective Exchange Rate, Capital Inflows, Cointegration, Full-Modified Ordinary Least Squared (FMOLS)*

[1] This article has been awarded as the 2nd winner of JIEB's Best Paper Award 2011.

INTRODUCTION

The dynamics of capital inflows to emerging economies showed a dramatic pattern in the last two decades, especially after the global financial crisis 2008. Throughout 2010, capital inflows, being dominated by private capital, have reached US$ 908 billion. Based on the forecasts of the Institute of International Finance (IIF), this value will continue to increase to US$ 960 billion in 2011 and US$ 1,009 trillion in 2012.

Large surge in capital inflows are essential for emerging economies. They help capital move to where it is most productive, provide countries with low savings rates to obtain financing for productive investments, and facilitate financial development. Yet, these flows shed some light on the "transfer problem". The transfer problem refers to the interaction between surge capital flows and Real Effective Exchange Rate (REER). The transfer problem has played a central role in the models of "new open-economy macroeconomic" that highlights the role of capital flows as a state variable that can generate persistent effects (Obstfeld and Rogoff, 1995).

Some related literature showed that the implications of the transfer problem lead to a REER appreciation. This happened because a rise in capital inflows increases real wages, which in turn bring out a rise in domestic demand and hence in prices of non-tradable goods relative to tradable goods that are exogenously priced (Bakardzhieva *et al.* 2010). Since the REER is generally defined as the value of domestic prices of non-tradable goods relative to prices of tradable goods, a rise in the relative price of non-tradable goods corresponds to a REER appreciation (Bakardzhieva *et al.* 2010).

If the REER appreciation continues and exceeds the support capability of fundamental factors, then this condition could undermine economic competitiveness in terms of price[2] In turn, this condition leads a detrimental effect on export performance. Considering its negative effect, significant REER appreciation could create major problems for macroeconomic management.

This paper reviews the implication of transfer problem phenomena in Indonesia during 1995 to 2010. In this spirit, this paper proposes a comprehensive analysis of the transfer problem by disentangling the components of capital inflows, that is foreign direct investment (FDI), portfolio investment, and other investments. This analysis could identify which capital inflows lead to the most significant appreciation of the REER and thus, undermine competitivenes.

The implications of transfer problem raise important policy challenges. Emerging economies have responded to the large capital inflows in variety of policies. Hence, this paper is also provide an extensive discussion about certain policies to reduce problematic relationship between the large surge of capital inflows and the REER in Indonesia. In order to identify which policy is effective, this paper uses a wide set of quantitative indicators to describe policies regarding the exchange rate intervention, sterilization, and the fiscal stance.

The methodologies used in this paper follow recent developments in time series econometrics and thus incorporate cointegration analysis. The decision to use single cointegration equation frameworks is based on the existence of the long run relationship

[2] The real effective exchange rate (REER) is the one of measure of the country's economic competitiveness (Lipschitz, 1991; Marsh, 1994). Since the REER implicitly compares the nominal exchange rate with the purchasing power parity rate, it measures the degree of currency misalignment based on the purchasing power parity assumption. Under-valuation enhances and overvaluation reduces the international competitiveness of domestic producers (Siggel, 2007).

between capital inflows and REER[3]. Then, the Full-Modified Ordinary Least Square (FMOLS) is used to examine that cointegration relationships. FMOLS approach provides optimal estimates of cointegration regressions. In order to achieve asymptotic efficiency, this approach applies semi-parametric corrections to deal with endogeneity and serial correlation effect in the regressors that result from the existence of a cointegrating relationships (Hye *et al.* 2009).

This paper presented evidence supporting the existence of a significant transfer problem. Even controlling for relative output levels, degree of openness and the terms of trade, time series empirical evidence suggests the existence of a long-run relation between capital inflows and REER in Indonesia. Moreover, according to the theoretical model, aggregated capital inflows affect the REER apreciation through its effect on the terms of trade. These finding confirm the contention of related literature that capital flows could tend undermine competitivenes. When disaggregating the capital inflows into foreign direct investments, portfolio investments, and other invesment, the paper finds that portfolio investment has the most significant impact on REER appreciation in Indonesia. On one other hand, FDI seems to have no positive impact on REER appreciation, other to competitivenes.

In the study of the effectiveness of policy responses, this paper shows the REER apreciation would be more moderate when countercyclical fiscal policy were exercised. It means that greater fiscal restraint would also help ease pressures for real appreciation of the exchange rate. In addition, aggressive sterilization could be the first line of defense against REER apreciation during surge of capital inflows.

[3] Indication of the long run relationship between REER and capital inflows in this paper is justified by the non stationary of some explanatory variables.

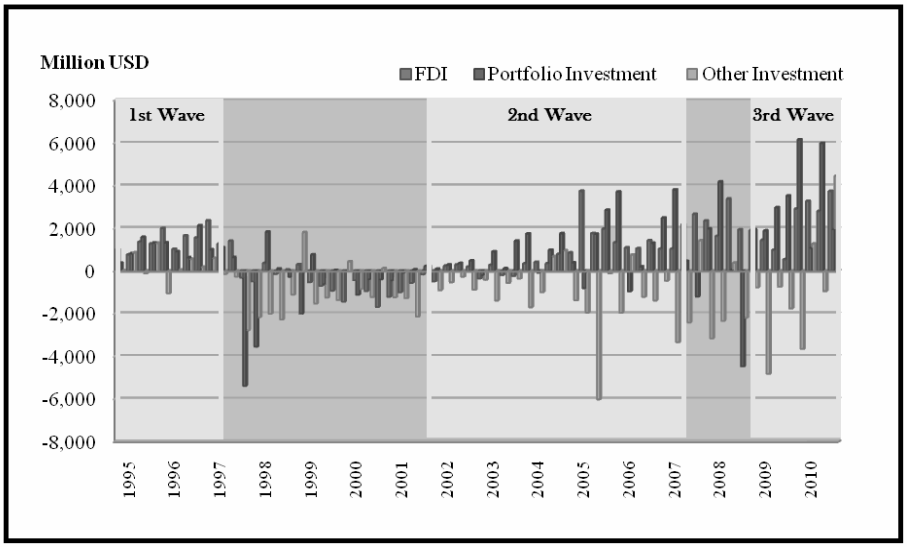
The rest of this paper is organize as follows. Section II presents the basic stylized facts of capital inflows in Indonesia. Section III presents theoretical framework of the transfer problem. Section IV discusses describes the data and the appropriateness of the FMOLS approach. Section V presents the empirical results, and Section VI concludes.

CAPITAL INFLOWS IN INDONESIA: BASIC STYLIZED FACTS

Capital flows to Indonesia have rebounded strongly since the end of the global crisis 2008. The value of capital flows to Indonesia during 2010 was about US$ 29.08 billion. That value, which is the largest value since the last two decades, was dominated by the portfolio investment (US$ 15.7 billion) and foreign direct investment (US$ 12.7 billion) respectively.

Prior to the current rebound, there have been two waves of large inflows over the past two decades. As showed by figure 1, the first began in the early 1990s and ended abruptly with the 1997−1998 Asian Crisis, and the second started in the early 2000s and again ended abruptly with the global financial crisis in 2008.

Goeltom (2007) explained that the brisk rate of capital inflows, especially during the first episode of surge capital inflows, was, on the one hand, driven by the pressing need for development funds and, on the other, encouraged by financial liberalisation. Other internal factors attracting foreign capital to Indonesia are stable macroeconomic conditions and high interest rate differential. On the external side, Indonesia's capital inflows were encouraged by the downward trend in international interest rates at the beginning of 1990. Another external factor was the rapid expansion in the number of investment institutions, such as mutual funds, that invested heavily in developing countries in pursuit of long-term profits and diversification of risks.



Source: Bank Indonesia (1995-2010)

Figure 1. Capital Inflows in Indonesia 1995-2010

Since the post-crisis, the dominance of other investment inflows (external debt, loan repayment) in the 1990s was somewhat eroded by FDI and portfolio investment flows after 2000. Post-crisis portfolio investment inflow was initially recorded in 2002. Although FDI inflows started to grow in 2004 and remained more or less on a positive trend, capital inflows are still dominated by portfolio (and other) investment flows. Sharp deficits in other investment in 2005 (USD 10.4 billion) were due to increase in asset holdings by the private sector in foreign countries, particularly in the second and third quarters of 2005 (Goeltom, 2007). Similar movements have been recorded in July–August 2007, with the increasing of asset holdings by the private sector from USD 486 to USD 2.6 billion.

After the global financial crisis 2008, number of capital inflows in Indonesia has increased rapidly. The main factors that attract global investors to place their capital in Indonesia are the higher rate of return, the improvement of global investor risk appetite, and the decreased of risk factors. Throughout 2010, the accumulation of net capital flows reached USD 29.08 billion. This value is the largest since two last decades, with the portfolio investment as the biggest component.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

1. Theory of Transfer Problem

The transfer problem is one of the classic questions in international economics, brought to the fore by the debate in the 1920s between Keynes (1929) and Ohlin (1929) on the impact of German war reparations (Lane and Milesi-Ferretti, 2004). Large surge in capital inflows during the past two decades have led to a resurgence of interest in this topic, in view of the central prediction that the transfer problem associated with loss of competitiveness.

The "transfer problem" refers to the impact of capital flows on the domestic economy, which is mainly observed through changes in the REER (Lane and Milesi-Ferretti, 2004; Combes *et al.* 2010). The Salter (1959), Swan (1960), Corden (1960), and Dornbusch (1974) paradigm serves as the

theoretical underpinning to test empirically the incidence of capital flows on the REER in emerging economies. The model explains how a surge in capital flows would generate an appreciation of the REER (Corbo and Fisher, 1995). A rise in capital flows increases real wages, which in turn bring out a rise in domestic demand and hence in prices of non-tradable goods relative to tradable goods that are exogenously priced. Since the REER is generally defined as the value of domestic prices of non-tradable goods relative to prices of tradable goods, a rise in the relative price of non-tradable goods corresponds to a real exchange appreciation (Bakardzhieva *et al.* 2010).

Lane and Milesi-Ferretti (2004) developed a simple intertemporal optimizing model of the transfer problems, in which an endogenous relative price of non-tradables goods is the mechanism linking capital flows and the real exchange rate. They considered a small open economy model that links the real effective exchange rate to the net capital inflows, plus some control variables.

For simplicity, they assumed the output of the tradable sector is an endowment $Y\tau$ that sells on world markets at the export price P_T^x in units of the imported tradable consumption good[4]. Domestic consumption of the export good is zero. Labor is supplied to a competitive non-tradable sector.

Agent j has the objective function as follows:

$$Vj = \sum_{j=0}^{\infty} \beta^1 \left(\frac{\sigma}{\sigma - 1} C_1^{\sigma - \frac{1}{\sigma}} - \frac{K}{2} l_{Nt}^2 \right) \qquad (1)$$

where β □ (0,1) and σ, K > 0. The second term in parentheses in the function V_j captures the disutility of work effort, where l_{Nt} is the amount of labor supplied to the non-tradable sector. The consumption index $C_{t\,\mathrm{I}}$ aggregates consumption of tradable and non-tradable goods:

$$C_i = \left[\gamma^{\frac{1}{\theta}} C_{T1}^{\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} C_{Nt}^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}} \qquad (2)$$

Where θ is the constant elasticity of substitution between tradable and non-tradable goods.

The agent can invest in an international real bond, denominated in units of the import good. The agent *j* faced the budget constraint. The flow budget constraint is given by equation below:

$$B_{t+1=}(1+r)B_t + w_t l_{Nt} + P_{Tt}^x y_t - P_t C_t \qquad (3)$$

where B_t denotes real bonds (in units of the tradable good) that pay off a real return *r*, which is given exogenously.

The nominal wage is w_t, and the consumption price index is given by equation below:

$$P_i = [\gamma + (1-\gamma) P_{Nt}^{1-\theta}]^{\frac{1}{1-\theta}} \qquad (4)$$

where P_{Nt} is the price of the non-tradable good.

The real exchange rate is defined as the ratio of the domestic to the foreign CPI, where the foreign price level is fixed at unity.

$$REER_t \equiv \frac{P_t}{P_t^*} P_t \qquad (5)$$

The CPI-based real exchange rate is mechanically independent of the terms of trade[5]. In this model, the terms of trade may influence the real exchange rate indirectly only, through a

[4] By this definition, P_T^x is the terms of trade (the ratio of export prices to import prices).

[5] Comparing the expressions for the CPI- and WPI-based real exchange rates, Lane *et al.* (2004) explained that capital inflows would have a larger unconditional effect on the CPI-based than on the WPI-based real exchange rate because the assumption is that the terms of trade are exogenously determined.

wealth effect on the relative price of non-tradables goods.

The production function in the non-tradable sector is linear in labor,

$$y_{Nt} = l_{Nt} \tag{6}$$

the nominal price of the non-tradable good is just equal to the wage:

$$P_{Nt} = w_t \tag{7}$$

In the first-order conditions, Lane and Milesi-Ferretti (2004) assumed β (1+*r*) = 1, which rules out the desire to borrow and lend in the steady state. Optimal consumption and work effort decisions generate the relationship below:

$$\frac{C_{T_{t+1}}}{C_{T_t}} = \left(\frac{P_t}{P_{t+1}}\right)^{\sigma-\theta} \tag{8}$$

Lane and Milesi-Ferretti (2004) also defined the equation (8) as the Euler equation governing consumption dynamics. The dependence of consumption growth on the sequence of relative prices is the "consumption-based real interest rate" effect. If the aggregate price level relative to the price of tradable goods is low relative to its future value, this encourages present over future consumption, as the consumption-based real interest rate is lower.

However, it also encourages substitution from tradable to non-tradable goods. The former effect dominates if the intertemporal elasticity of substitution σ, is greater that the intratemporal elasticity of substitution θ, and conversely (Lane and Milesi-Ferretti, 2004).

The link between consumption of non-tradable and tradable goods is expressed by equation below:

$$\frac{C_{N_t}}{C_{T_t}} = \frac{1-\gamma}{\gamma}(P_{Nt})^{-\theta} \tag{9}$$

In the equation (9), the elasticity of substitution is parameterized by θ. If the relative price is unity, then the relative consumption of non-tradable goods is decreasing in the parameter γ.

The equilibrium supply of non-tradable goods is given by equation (10) below. The higher is the consumption index C, the lower is the level of production, as agents increase leisure in line with consumption of other goods.

$$y_{Nt} = \frac{1}{K} C_t^{-\frac{1}{\sigma}} \frac{P_{Nt}}{Pt} \tag{10}$$

In the steady-state analysis, Lane and Milesi-Ferretti (2004) considered a benchmark steady state in which all variables are constant. In this state, they assumed the stock of net foreign assets is zero. The endowment of the tradable good is normalized so that the relative price of nontradable goods in terms of tradable goods P_N is unity. They also assumed the terms of trade is unity ($P_T^x = 1$). In this symmetric equilibrium, the steady-state production and consumption of non-tradable and tradable goods are given by

$$Y_N = C_N = \left(\frac{1}{K}\right)^{\frac{\sigma}{\sigma}+1} (1-\gamma)^{\frac{1}{1+\sigma}} \tag{11}$$

$$C_T = Y_T = \frac{\gamma}{1-\gamma} Y_N \tag{12}$$

From equation (11), production of the non-tradable good will be higher, the less taxing is work effort (the smaller is K) and the larger is the weight 1-γ placed on consumption of non-tradable goods in the utility function (Lane and Milesi-Ferretti, 2004).

They next took a linear approximation around this benchmark, to derive the impact of steady-state variation in net capital inflows (*B*), tradable output (Y_T), and the terms of trade (P_T^x). Let denote percentage changes relative to the benchmark steady state, so that

$$\widetilde{C}_T = r\widetilde{B} + \widetilde{Y}_T + \widetilde{P}_T^x \quad (13)$$

Where $\widetilde{B} \equiv \frac{d_B}{C_{T0}}$. Three factors drive steady-state consumption of tradables that is (1) net capital inflows, (2) the level of the tradable output endowment, and (3) the terms of trade (Lane and Milesi-Ferretti, 2004). Steady-state variations in production and consumption of non-tradables are derived by taking linear approximations to equations (8)–(10) in the neighborhood of the steady state defined by (11) and (12):

$$\widetilde{Y}_N = \widetilde{C}_N = \widetilde{C}_T - \theta\widetilde{P}_N \quad (14)$$

$$\widetilde{Y}_N = \widetilde{C}_N = \frac{(\sigma-\theta)_\gamma}{1+\sigma}\widetilde{P}_N \quad (15)$$

Combining equations (13)–(15), they obtained an expression for the relative price of non-tradables:

$$\widetilde{P}_N = \frac{1+\sigma}{(1-\gamma)\theta+(\gamma+\theta)\sigma}(r\widetilde{B} + \widetilde{Y}_T + \widetilde{P}_T^x) \quad (16)$$

The equation (16) is expressed in log levels as follows

$$\log(P_N) = \Omega + \frac{\lambda r}{\gamma}\frac{B}{Y_0} + \lambda\log(Y_T) + \lambda\log(P_T^x) \quad (17)$$

Where Ω is a constant,

$$\lambda \equiv \frac{1+\sigma}{[(1-\gamma)\theta+(\gamma+\theta)\sigma]}, \text{ and } Y_0 \equiv C_0 .$$

The log-level equation is derived as a Taylor approximation around the benchmark steady state.

According to equation (17), the relative price of nontradables is increasing in the level of net capital inflows, in the level of (tradable) output, and in the terms of trade. In this way, any factor that raises consumption of tradables also exerts a positive wealth effect that reduces the labor supply to the non-tradable sector, leading to a increase in the relative price of non-tradables and hence a real appreciation (Lane and Milesi-Ferretti, 2004). Finally, they derive the variation in the real exchange rate by

$$\widetilde{REER} = \widetilde{P} = (1-\gamma)\widetilde{P}_N \quad (18)$$

or, in log levels,

$$\log(REER) = (1-\gamma)\log(P_N) = (1-\gamma)\Omega + \frac{(1-\gamma)\lambda r}{\gamma}\frac{B}{Y_0} + (1-\gamma)\lambda\log(Y_T) + (1-\gamma)\lambda\log(P_T^x) = \alpha + \beta_1\frac{B}{Y_0} + \beta_2\log(Y_T) + \beta_3\log(P_T^x) \quad (19)$$

where $\beta_1, \beta_2, \beta_3 > 0$. In this setup, the real exchange rate is just a monotonic transformation of the relative price of nontradables[6]. Finally, equation (19) forms the basic of empirical analysis for transfer problem phenomenon.

2 Compositions of Capital Inflows

Standard international classifications split capital inflows into the three abroad categories namely foreign diret investment (FDI), portfolio investment and other investment (Hoggarth and Sterne, 1997). Foreign direct investment occurs when a non-resident acquires a stake of at least 10% in a domestic enterprise (or if it increases that stake).

Portfolio investment includes purchases of securities and equity shareholdings. It also includes financial derivatives. Other investments include non-tradable investment (e.g

[6] The level of output should be understood to be measured relative to output overseas. A global tradable output increase would increase the relative price of nontradables in all countries, leaving the real exchange rate unchanged. In the empirics, relative GDP per capita is employed as a proxy for relative levels of tradable output (Y_T), because sectoral output data are not available for a broad range of countries (Lane and Milesi-Ferretti, 2004).

loan and deposits, trade credit and payment arrears on outstanding debt).

Inflows used for investment are often seen as preferable those used for consumption. According to this perspective, FDI may be attractive as there is often a direct link between the inflow of financial capital, new plant, and machinery. It is associated with increased domestic capital formation. Furthermore, it often brings foreign management skills, thus fostering higher productivity and export growth (Hoggarth and Sterne, 1997). In other hand, portfolio investment into equities provides useful risk diversification. There is evidence that increased foreign investment in equities can lift the rate of domestic fixed capital formation for several years (Committee on the Global Financial System, 2009).

Related to the discussion of the policy, the composition of capital flows, however, matters for monetary policy and for the management of liquidity. Capital flow composition matters for monetary policy because some forms of capital flow are more sensitive to the central bank's policy rates than others . At one end of the spectrum, short-term capital flows are typically very sensitive to domestic short-term rates (given exchange rate expectations). Capital flow composition matters for the management of liquidity because the maturity or duration structure will influence the choice of instruments for sterilization (Bank for International Settlement, 2009).

3 Capital Flows and REER Nexus: Related Literature

There are several literatures on the interactions between capital inflows and REER. These literatures studied across countries, regions, and econometric methodologies. Hence, these studies provide mixed results. Using aggregated measure of capital inflows, Obstfeld and Rogoff (1995; 1996) estimated a cross-sectional bivariate regression of the real exchange rate on net capital flows in fifteen industrial countries. They obtained a significantly positive coefficient, around unity, between the capital inflows on REER on real exchange rates.

Broner *et al.* (1997) estimated real exchange rate cointegrating regressions for the largest Latin American countries. According to their theoretical model, net capital inflows affects the real exchange rate through its effect on the terms of trade. Their findings suggest a statistically significant relation between REER and net capital inflows for some but not all the countries in their sample.

Lane and Milesi-Ferretti (2004) used cross-country data on real exchange rates and constructed data set on countries' net foreign assets to shed new light on the question of the relationship between net foreign assets and the real exchange rate. They found strong cross-sectional correlations between changes in real exchange rates and changes in net foreign assets, in both industrial and developing countries. Moreover, they showed that the magnitude of the effect of net foreign assets varies systematically with the way the real exchange rate is measured, and that it is larger for the CPI-based than for the WPI-based real effective exchange rate.

More recently, Cardarelli, *et al.* (2009) examined the macroeconomic implications and policy responses to surges in private capital inflows across a large group of emerging and advanced economies. In particular, they identified 109 episodes of large net private capital inflows to 52 countries over 1987–2007. They found that episodes of large capital inflows are often associated with real exchange rate appreciations.

With respect to time series analysis, Faruqee (1995) estimated REER equations for the United States and Japan, including in the cointegrating vector the real exchange rate, the terms of trade, the CPI-to-WPI ratio, and net capital inflows (as a fraction of GDP). He found a positive and significant impact of net capital inflows on real exchange rates.

Using disaggregated measure of capital inflows, Athukorala and Rajapatirana (2003) examine the impact of foreign direct investment (FDI), portfolio investment and other investment in a study of countries in Latin America and South and East Asia. They found that non-FDI capital flows lead to real exchange rate appreciation (to a far greater degree in Latin America than in East Asia), while FDI tends to depreciate the real exchange rate. More recently, Bakardhzieva *et al.* (2010) investigated the implication of capital inflows on real exchange rate behavior by comparing the impact of six types of flows. They used sample of 57 developing countries. The results revealed that portfolio investments, foreign borrowing, aid, and income lead to real exchange rate appreciation, while remittances have disparate effects across regions. Foreign direct investments have no effect on the real exchange rate.

On a different way, Elbadawi and Soto (1994) disaggregate capital flows for the case of Chile into four components: short term capital flows, long-term capital flows, portfolio investment, and foreign direct investment. They found that short-term capital flows and portfolio investment have no effect on the equilibrium real exchange rate, but long-term capital flows and foreign direct investment have a significant appreciating effect. Combes *et al.* (2010) applied the pooled mean group estimator that allows short run heterogeneity while imposing long run homogeneity on the REER determination across countries. The results showed that whatever their institutional status, public or private, aggregated capital inflows are positively correlated with appreciation of the REER. Among private flows, portfolio investment has the highest appreciation effect- almost seven times that of FDI or bank loans.

EMPIRICAL ANALYSIS

1. Data

Due to data limitations, the sample period of this paper is quarterly time series data along 1995 - 2010. Most of macroeconomic and financial series are taken from the IMF's International Financial Statistics and Bank for International Settlement's Statistics Report. We supplement that with data from various other sources, including the IMF's World Economic Outlook and Bank Indonesia's periodically monetary policy review.

2. Methodology

2.1 Econometric Methodology

As a theoretical framework to guide the empirical work, this paper uses basic empirical model of transfer problem as follows:

$$\log(REER) = \alpha + \beta_1 \frac{B}{Y_0} + \beta_2 \log(Y_T) + \beta_3 \log(P_T^x) \quad (20)$$

Since the capital flows consist of three components, which are foreign direct investment (FDI), portfolio investments and other investments, this paper then attempts to modify the equation (20) by decomposing the capital flows into its components. Thus, the model of the transfer problem is given by equation (21) below:

$$\log(REER) = \alpha + \delta_1 \frac{B_1}{Y_0} + \delta_2 \frac{B_2}{Y_0} + \delta_3 \frac{B_3}{Y_0} + \beta_1 \log(Y_T) + \beta_2 \log(P_T^x) \quad (21)$$

Where B_1, B_2, B_3 is net FDI, portfolio investment and other investment, respectively. Moreover, this paper also compiles several control variables and selected policy variables.

Several theoretical approaches predict that real appreciations should be associated with accumulation of net capital inflows in the long run (Lane and Milesi-Ferretti, 2004). Econometrically speaking, the long run relationship between these variables should be modeled on the cointegration framework.

Engle and Granger (1987) propose a two-step approach to cointegration. The first step entails the estimation of the long-run (static) equation, subsequently, testing the stationarity of the estimated residuals through an unit root test. In the second step, the estimated residual, which integrated on the degree of level or I(0), would be compiled in the error correction model (ECM).

In order to provide an optimal to provide optimal estimates of cointegration regressions, the ECM equation would be estimated by the Full-Modified Ordinary Least Squared (FMOLS). Basically, FMOLS was originally designed first time by Philips and Hansen (1990) and allows for both deterministic and stochastic regressors. This technique employs kernal estimators of the nuisance parameters that affect the asymptotic distribution of the OLS estimator. In order to achieve asymptotic efficiency, this technique modifies least squares to account for serial correlation effects and test for the endogeneity in the regressors that result from the existence of a cointegrating relationships (Maddala and Kim, 1998: 161).

Assuming that most of variables are I(1) and co-integrated and the residual is supposed to be I(0), the equilibrium error correction representation of the FMOLS model is given by equation (22) below:

$$\begin{aligned}\Delta \text{Ln}(\text{REER})_t = {} & \beta 1 + \alpha_1(\text{FDI})_t + \alpha_2(\text{Port})_t + \\ & \alpha_3(\text{Debt})_t + \delta_1 \Delta \text{Ln}(\text{OPEN})_t + \\ & \delta_2 \Delta \text{Ln}(\text{PROD})_t + \delta_4 \Delta \text{Ln}(\text{TOT})_t + \\ & \delta_5 Policy_t + \phi EC_t + \varepsilon_t \end{aligned} \quad (22)$$

Where Δ is the first difference operator, t refers to time period, *Ln* denotes logarithm, $REER_t$ is the the real effective exchange rate, FDI_t is net foreign direct investment, $PORT_t$ is net portfolio investment, *DEBTt* is net other investment, $OPEN_t$ is degree of openness, $PROD_t$ is the productivity gap, TOT_t is the terms of trade, the term $POLICY_t$ corresponds to the variable of policy options, EC_t is the speed of adjustment coefficient of the self-correcting term and ε_t is the error term.

The REER in the analysis is a CPI-based real effective exchange rate, defined as a weighted geometric mean of the bilateral nominal exchange rate and consumer price indices. An increase in the REER indicates an appreciation, and hence a potential loss of competitiveness.

The components of capital inflows consist of FDI, portfolio investment, and other investments. They appear in the financial account of the balance of payments. In this paper, they are defined as a percentage of gross domestic products (GDP).

Open describes the degree of trade openness. The main proxy for OPEN is the ratio of the sum of exports and imports to GDP. The degree of trade openness is considered as an indicator of trade liberalization, so an improvement in openness should lead to a depreciation of the real exchange rate.

The productivity gap, which is the growth in the real per capita GDP, represented technological progress. It used as a proxy for the potential Balassa-Samuelson effect. Balassa (1964) and Samuelson (1964) noted that differences in technological progress could affect REERs. Since technological progress is more likely to take place in the tradable relative to the non-tradable sector of an economy, the increase in productivity in the tradable sector raises wages in that sector, requiring that relative prices of non-tradable goods increase.

Terms of Trade (TOT) measures the relative price of exports to imports and captures the influence of external demand and supply factors in the tradables sector. An improvement contributes to increases in real wages and thus allows inter-sector shifts in mobile factors of production to the tradables sector. This condition will lead to real exchange rate appreciation. There are both income and substitution effects. The income effect of an improvement in terms of trade is that more is spent on all products, resulting in higher prices of non-tradables, causing appreciation in the real exchange rate. The substitution effect leads to a decrease in prices of imported goods and services, falling demand for non-tradables, hence depreciation of the REER.

2.2 Quantitative Indicators of Policy Options

Inflow surges, however, require an appropriate policy responses because they can lead to excessive appreciation and may thus have detrimental effects on the external competitiveness of the recipient economies (Corden, 1994; Lartey, 2007). These policies focus to ease problematic relationship between the large surge of inflows and the REER. In particular, this paper uses a set of quantitative indicators to examine effectiveness of several policies namely the exchange rate intervention, sterilization, and the fiscal policy. Hence, the next section will discuss how each of these indicators are developed.

2.2.1. Exchange Rate Intervention

A key policy decision for countries facing large capital inflows is to what extent pressures for the currency to appreciate should be resisted (Lipschitz *et al.* 2005; Driver *et al.* 2005). This often prompts policymakers to adopt a set of policy ranging from outright currency appreciation to intervention in foreign currency markets.

The resistance index is built by using the Exchange Market Pressure (EMP) index. Firstly, this paper scales the first component of the EMP by its standard deviation. This EMP measure is a combination of movements in the exchange rate and international reserves (Bayoumi and Eichengreen, 1998). The EMP index is defined as follows:

$$EMP_t = \frac{1}{\sigma_{\Delta\%er_t}}\Delta\%er_t + \frac{1}{\sigma_{\Delta res_t}}\Delta res_t \quad (23)$$

Using the EMP index described above, this paper scale the component of the EMP by its standard deviation $(\Delta\%er_t / \sigma\Delta\%er_t)$. Then, this component is divided by the EMP index itself. Finally, this ratio is subtracted from unity yielding resistance to exchange market pressures index (resistance index) as follows:

$$\text{Resistance Index}_t = 1 - \left[\left(\frac{\Delta\%er_t}{\sigma_{\Delta\%er_t}}\right) \Big/ EMP_t\right]$$

$$= \left[\left(\frac{\Delta\%res_t}{\sigma_{\Delta\%res_t}}\right) \Big/ EMP_t\right] \quad (24)$$

As explained by Cardarelli, *et al.* (2009), the raw index is standardized so that it is bounded by the unit interval[7]. When the index is equal to 0, it means that no resistance is made to exchange market pressures: Either the exchange rate is allowed to float freely, or a "leaning with the wind" policy is followed that exacerbates the exogenous pressures on the exchange rate, rather than relieving them. When the index is equal to 1, it means that the maximum amount of resistance is attempted: Either the exchange rate is prevented from moving at all, or extreme forms of a "leaning against the wind" policy are followed that make the exchange rate move in the opposite direction to which it would have occurred in the absence of intervention.

[7] Specifically, if the raw index is negative or zero is given the value of 0; if it's between 0 and 0.25 is given the value of 0.2; if it's between 0.25 and 0.5 is given the value of 0.4; if it's between 0.5 and 0.75 is given the value of 0.6; if it's between 0.75 and 1, is given the value of 0.8; if it's 1 or above is given the value of 1.

2.2.2 Sterilization

Sterilization is broadly defined as the monetary operation through which a rise in net foreign assets is offset by a decrease in net domestic assets, thereby keeping the monetary base constant. To analyze the effectiveness of sterilization, this paper uses an alternative sterilization index that captures the extent to which the monetary authorities attempt to insulate domestic liquidity from foreign exchange market intervention.

Specifically, following Carlson and Hernandez (2002), the sterilization index is measured by the ratio of broad money changes to net foreign assets ($\Delta M2/ \Delta NFA$). This index measures the degree to which the monetary authorities contracted domestic credit to offset the expansion of monetary base associated with the accumulation of foreign reserves.

2.2.3 Fiscal Policy

Another instrument available to mitigate the effects of capital flow surges on aggregate demand and the real exchange rate is countercyclical fiscal policy. Countercyclical fiscal policy is manifested by reducing government expenditure. Since most of government expenditures are used for non-tradable goods and services, this expenditure reduction policy would also help ease pressures for real appreciation of the exchange rate (Goeltom, 2007).

Following Gavin and Perotti (1997), Braun (2001), Dixon (2003), Lane (2003), Calderon and Schmidt-Hebbel (2003), and Cardarelli *et al.* (2009), this paper uses the real non-interest government expenditure growth to measure stance of fiscal policy. This measure of fiscal policy is useful for at least three reasons (Cardarelli *et al.* 2009). First, because the concept of policy cyclicality is important to the extent that it can help guide actual policy, it makes sense to define policy cyclicality in terms of actual instruments rather than outcomes. Second, although both government spending and tax rates can gauge the cyclical stance of fiscal policy, there is no systematic data on tax rates. Third, considering fiscal variables as a proportion of GDP, could yield misleading results because the cyclical stance of fiscal policy may be dominated by the cyclical behavior of output (Reinhart and Vegh, 2004).

INTERPRETATION OF THE RESULTS

1. The Empirical Result of Transfer Problem in Indonesia

Most modern econometric analysis starts by assessing the properties of the variables, namely the order of integration of the each series. This is usually done through the use of unit root test such as Augmented Dicky-Fuller (ADF) test, Philip-Perron (PP) test, Kwiatkowski-Phillips-Schmidt and Schin (KPSS) test, and Ng-Perron test. Hence, using two unit root tests, which are ADF and PP test, this paper investigates the degree of integration of concerned variables during the period 1995:1-2010:4.

As showed by table 1, the results of unit root test reveal that most of variables included in the model are non-stationary at the degree of level. However, the first differences of these variables are stationary under the test. Hence, this paper concludes that most explanatory variables are integrated of order 1 or I(1). In addition, the residual is integrated on the variables are integrated on the degree of level or I(0).

Since most of variables are found to be non-stationary at the degree of level, and the residual stationary at the degree of level, cointegration analysis should be undertaken. This paper achieves this need by using Phillips and Hansen (1990) Full Modified Ordinary Least Squares (FMOLS). Table 2 reports the results of regressing the real effective exchange rate on inflows of foreign direct investment, portfolio investment and other types of inflows, as well as the controls productivity, degree of openness and term of trade (TOT).

Table 1. Unit Root Test

Variabel	Augmented Dickey-Fuller Test		Philips-Perron (PP) Test	
	Level I(0)	1st Difference I(1)	Level I(0)	1st Difference I(1)
REER Apreciation	-3.15	-5.69	-1.98	-5.51
	{0.10}	*{0.00}**	*{0.59}*	*{0.00}**
Cumulative Capital Flows	-2.35	12.46	-3.81	
	{0.15}	*{0.00}**	*{0.00}***	
FDI	-3.09	-10.64	-2.98	-10.97
	{0.11}	*{0.00}**	*{0.14}*	*{0.00}**
Portfolio Investment (PORT)	-7.34		-6.06	-
	*{0.00}**		*{0.00}**	
Other Investment (DEBT)	-7.63		-6.02	-
	*{0.00}**		*{0.00}**	
Openness (OPEN)	-2.93	-8.61	-2.94	-9.07
	{0.15}	*{0.00}**	*{0.15}*	*{0.00}**
Productivity (PROD)	-1.30	-1.30	-1.30	-7.77
	{0.87}	*{0.87}*	*{0.87}*	*{0.00}**
Term of Trade (TOT)	-2.50	-9.77	-2.32	-11.38
	{0.32}	*{0.00}**	*{0.41}*	*{0.00}**
Real Gov. Expenditure Growth	-7.49		-7.53	
	*{0.00}**		*{0.00}**	
Resistance Index	-1.00	-14.07	-1.42	-40.32
	{0.28}	*{0.00}**	*{0.14}*	*{0.00}**
Sterilization Index	-18.85		-16.25	
	*{0.00}**		*{0.00}**	
Residual	-7.797		-7.801	
	{0.00}*		{0.00}*	

Note: *, ** and *** referes to stationary condition at the levels of significance of 1%, 5% and 10% respectively.

Using aggregated measure, the regression I, as showed by table 2, shows that capital inflows have a positive impact on REER appreciation, which means that an increase in those inflows will lead to the appreciation of REER. Positive and strongly significant long-run relation between the cumulative capital inflows and the REER appreciation provide support for the existence of a powerful transfer problem.

Using disaggregated measure, the regression II shows that portfolio investment and other investment have lead to REER appreciation in Indonesia. As showed by table 2, similar patterns have been recorded in the model III, IV and V when the portfolio investments have the highest appreciation effect, followed by other investments. Portfolio investments have positive significant impact with the large coefficients, which the average value of this coefficient is about 261,57. Meanwhile, other investments have a positive impact. An explanation could be that other investments are used more directed to government consumption, mainly in the non-tradable sector.

Table 2. FMOLS Regression Results

Dependent Variable: REER Apreciation	FMOLS Models				
	I	II	III	IV	V
Constant	32.247	34.880	33.401	21.030	16.258
	*{0.021}***	*{0.011}***	*{0.012}***	*{0.109}*	*{0.208}*
Cumulative Capital Flows	127.202	-	-	-	-
	{0.000}*				
FDI	-	-0.687	-1.133	-12.989	-22.431
		{0.990}	*{0.983}*	*{0.801}*	*{0.646}*
Portfolio Investment (PORT)	-	273.046	280.513	251.853	240.874
		*{0.000}**	*{0.000}**	*{0.000}**	*{0.000}**
Other Investment (DEBT)	-	77.258	94.698	68.775	57.913
		*{0.044}***	*{0.014}***	*{0.054}****	*{0.125}*
LagREER	0.797	0.826	0.802	0.810	0.774
	*{0.000}**	*{0.000}**	*{0.000}**	*{0.000}**	*{0.000}**
Openess (OPEN)	-5.588	-0.055	-13.791	-1.115	-16.927
	{0.620}	*{0.995}*	*{0.263}*	*{0.911}*	*{0.135}*
Productivity (PROD)	-9.04E-07	-1.02E-06	-7.49E-07	2.15E-07	8.29E-07
	{0.348}	*{0.290}*	*{0.427}*	*{0.822}*	*{0.391}*
TOT	-0.038	-0.110	-0.068	-0.038	-0.003
	{0.681}	*{0.248}*	*{0.465}*	*{0.674}*	*{0.971}*
EC	20.774	26.645	24.925	27.784	29.556
	*{0.025}***	*{0.004}**	*{0.000}**	*{0.002}***	*{0.001}**
Real Gov. Expenditure Growth	-	-	0.007	-	0.006
			*{0.013}***		*{0.020}***
Sterilization Index	-	-	-	-0.106	-0.094
				*{0.001}**	*{0.013}***
Resistance Index	-	-	-	-	3.302
					{0.131}
Observations	64	64	64	64	64
Adjusted R-Squared	0.837	0.865	0.870	0.871	0.877

Robust *p* values in parentheses; *, ** and *** referes to levels of significanceof 1%, 5% and 10% respectively.

While other types of capital inflows appear to appreciate the real exchange rate significantly, the evidence for FDI shows that FDI is the only exception as it seems to have a negative effect on REER appreciation in Indonesia. As showed by the model II, III, IV and V, FDI has negative non-significant impact to the appreciation of REER. An explanation for this finding often brought forward is that FDI inflows are typically concentrated in the tradable goods sector and will thus have a weaker impact on the relative prices of tradable and non-tradable goods. Finally, this result indicates that FDI did not harm competitiveness in Indonesia.

When analyzing the control variables, trade openness, productivity and terms of trade have negative non-significant impact to REER apreciation. Trade openness has negative impact to REER apreciation. Thus, an increase the degree of Indonesia trade openness, or an increase in the degree of international trade liberalisation and a reduction in trade barriers, ensures a growth in imports and in the current account deficit. As a consequence, more foreign currency is needed to back up an increase in imports, which will lead to a depreciation of the domestic currency. Meanwhile, terms of trade has negative impact to REER apreciation, which indicates that the subtitution effect associated with the term of trade is stronger than the income effect. The substitution effect leads to a decrease in prices of imported goods and services, falling demand for nontradables, hence depreciation of the REER.

Surprisingly, the Balassa-Samuelson effect, captured by relative GDP per capita, is negative non significant to REER apreciation. It might indicate that the technological progress Indonesia is more likely to take place in the non-tradable sectors of an economy. Hence, the productivity grows faster in non-tradable than in tradable sectors. The speed of the adjustment, reflected by the coefficient of EC, is significant. It ensures the convergence process to the long-run relation between capital inflows and REER apreciation.

2. The Policy Responses in Indonesia

To measure the effectiveness of the policy response of the transfer problem, this paper uses several quantitative measures. The results is summarized by table 2. Real government expenditure growth has significant positive impact to REER apreciation. The marginal impact of real government expenditure growth on REER apreciation is 0.007. This result indicated that countercyclical fiscal policy in the form of slower growth in government expenditure is again strongly associated with lower real appreciation.

Countercyclical fiscal policy can reduce the impact of portfolio inflows by contracting domestic demand. Since most government expenditures are used for non-tradable goods and services, this expenditure reduction policy can put downward pressure on the relative price of non-tradables and relieve the appreciation pressure on the real exchange rate.

However, the policy authority should be very careful in implementing countercyclical fiscal policy. This policy is subject to long decision lags, compared with very volatile and unpredictable capital inflows. For example, by the time the countercyclical fiscal is implemented, the surge in capital flows may have subsided. In this case, the countercyclical fiscal can actually worsen the situation. Hence, several literature reveal that countercyclical fiscal is not usually used for fine-tuning capital inflows but rather as medium-term strategy.

Although its adjustment involves several lags, countercyclical fiscal policy is an effective means, especially when the large capital inflows are driven by higher yields and when the domestic economy is facing the risk of overheating. In this condition, thightening fiscal policy can reduce appreciation pressures as well as create space for more active monetary policy.

Moreover, as showed by the model IV on the table 2, sterilization policy has negative impact to the REER apreciation. The coefficient denoted this impact is 0.106 and statistically significant at 1% level. It indicates that the effort of central bank, to sterilize the monetary impact of intervention through open market operations is effective to dampen REER apreciation.

Basically, sterilization is effective as a temporary smoothing device to counter reversible speculative flows. Hence, in the presence of strong external inflows, Indonesia could use sterilized foreign currency market intervention to neutralize appreciation pressures on the exchange rate. Yet, the sterilization often has important effect on domestic asset markets. The domestic interest rate will be higher than otherwise. With inflows into the domestic bond markets, interest rates will tend to fall but sterilization will at least partially offset the drop. Thus, any gap between foreign and domestic interest rates will persist, encouraging capital inflows to continue.

In the perspective of optimal mix policy, the countercyclical fiscal creates space for aggresive sterilization as the first line of defense against short term REER apreciation. This mix policy can also reduce, at least, the pressure from other investment influencing the REER appreciation. As showed by the model V on the table 2, significant sterilization impact and countercyclical fiscal made the impact of other investments through REER apreeciation tends to become non-significant.

In addition, although the coefficient value is non significant, the exchange rate intervention has positive impact to dampen REER apreciation. This result indicates that the efforts to resist nominal exchange rate appreciation through intervention were generally able to moderate real appreciation in the face of a persistent surge in capital inflows.

CONCLUSION

The analysis of the relation between REER and disaggregated capital inflows seems to have received little attention so far. This paper examination of these relationships on the transfer problem framework and draw insightful policy implications. The results show how each component of capital inflows affects the REER in varying magnitude. The effects seem to depend on how resources are used.

When analyzing the interactions between each component of capital inflows to the REER apreciation, the result showed that portfolio and other investment tends to have a positive impact on REER. It indicates that an increase in those inflows will lead to the appreciation of REER and to a possible loss of competitiveness. The results for FDI is highly interesting as it clearly points toward no positive impact on REER appreciation in Indonesia.

This paper has assessed the effectiveness of the several policies reducing REER apreciation. An appropriate policy response depends not only on an understanding of the underlying causes of capital flows, but also knowledge of their likely impact on the economy. Using a quantitative measure of several policies, this paper finds two major conclusions. First, while politically difficult, adjusting fiscal policy would have the special benefit of helping to slow growth of REER apreciation. In this way, adjusting fiscal policy in the form of slower growth in government expenditure is again strongly associated with lower real appreciation. Second, aggressive sterilization could be the first line of defense against REER apreciation during surges capital inflows.

REFERENCES

Aron, J., Elbadawi, and B. Kahn, 1998. "Determinants of the REER in South Africa". *Working Papers Series,* 98-16, Centre for the Study of African Economies, University of Oxford.

Athukorala, P.C., and S. Rajapatirana, 2003. "Capital Flows and the REER: A Comparative Study of Asia and Latin America". *The World Economy*, 26(4), 613-637.

Bakardzhieva, D., S. B. Naceur, and B. Kamar, 2010. "The Impact of Capital and Foreign Exchange Flows on the Competitiveness of Developing Countries". *IMF Working Paper*, 10/154.

Cardarelli, R., S. Elekdag, and M. A. Kose, 2009. "Capital Inflows: Macroeconomic Implications and Policy Responses". *IMF Working Paper*, No. 09/40.

Combes, J. Louis, T. Kinda, and P. Plane, 2010. "Capital Flows and their Impact on the Real Effective Exchange Rate". University of Auvergne: Centre d'Etudes et de Recherches sur le Développement International, CERDI-CNRS, 65.

Committee on the Global Financial System, 2009. "Capital flows and Emerging Market Economies". *Committee on the Global Financial System Paper*, No. 33.

Edwards, S., 1989. "Real Exchange Rates in the Developing Countries: Concepts and Measurement". N*BER Working Paper*, 2950.

Elbadawi, I., and R. Soto, 1994. "Capital Flows and Long Term Equilibrium Real Exchange Rates in Chile". *World Bank Working Paper,* WPS 1306.

Engle, R.F and C.W.J Granger, 1987. "Co-integration and Error Correction: Representation, Estimation and Testing". *Econometrica*, 55 (2), 251-276.

Goeltom, M., 2007. "Capital flows in Indonesia: Challenges and Policy Responses". *Bank for International Settlement Working Paper*, No. 44.

Hoggart, and Sterne, 1997. "Capital Flows: Cause, Consequences, and Policy Responses", in: Gray, Simon, eds., *Handbook of Central Banking*. London: Bank of England.

Hye, Q.M.A., S.K.A. Wasti, N. Khatoon, and K. Imran, 2009. "Relationship between Stock Prices, Exchange Rate and Demand for Money in Pakistan". University of Karachi: Middle Eastern Finance and Economics.

Lane, P. R., and G. M. Milesi-Ferretti, 2004. "The Transfer Problem Revisited: Net Foreign Assets And Real Exchange Rates". *The Review of Economics and Statistics*, 86 (4), 841-857.

Lartey, E. K., 2007. "Capital Inflows and the Real Exchange Rate: An Empirical Study of Sub-Saharan Africa". *The Journal of International Trade & Economic Development*, 16 (3), 337–57.

Lipschitz, L., and D. McDonald, 1991. "Real Exchange Rates and Competitiveness: A Clarification of Concepts, and Some Measurements for Europe". *IMF Working Paper*, No. 91/25.

Martins, P. M. G., 2009. "Do Capital Inflows Hinder Competitiveness?: The Real Exchange Rate in Ethiopia". *Credit Research Paper*, No. 10/07.

Nwachukwu, J., 2008. "Foreign Capital Inflows, Economic Policies and the Real Exchange Rate in Sub-Saharan Africa: Is There an Interaction Effect?". *Brooks World Poverty Institute Working Paper*, No. 25.

Opoku-Afari, M., O. Morrissey, and T. Lloyd, 2004. "Real Exchange Response to Capital Inflows: A Dynamic Analysis for Ghana". *CREDIT Research Paper*, 04/12

Ostry, J. D., A. R. Ghosh, K. Habermeier, L. Laeven, M. Chamon, M. S. Qureshi, and A. Kokenyne, 2011. "Managing Capital Inflows: What Tools to Use?". *IMF Staff Discussion Note*, SDN/11/06

Phillips, P. and B. Hansen, 1990. "Statistical Inference in Instrumental Variables Regression with I (1) Processes". *Review of Economic Studies*, 57, 99-125.

Pradhan, M., R. Balakhrisnan, R. Baqir, G. Heenan, S. Nowak, C. Oner, and S. Panth, 2011. "Policy Responses to Capital Flows in Emerging Markets". I*MF Staff Discussion Note*, SDN/11/10

Saborowski, C., 2009. "Capital Inflows and the Real Exchange Rate: Can Financial Development Cure the Dutch Disease?". *IMF Working Paper*, No. 09/20

Suttle, P., R. Koepke, and E. Tiftik, 2011. "Capital Flows to Emerging Market Economies". *Institute of International Finance Note*.