Introducing liability dollarization and contractionary depreciations to the IS curve

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Abstract
This paper presents a simple modification to the standard IS curve taught in undergraduate macroeconomics courses that allows capital flight to have a contractionary effect in emerging market economies. In the standard model, capital flight leads to an expansionary shift in the IS curve through an increase in net exports. While this effect is certainly present, capital flight is usually highly contractionary in emerging economies due to the presence of foreign currency debt or liability dollarization. In the presence of liability dollarization for domestic firms, a currency depreciation can lead to an investment collapse. A simple adjustment to the standard investment schedule captures this channel and allows for the possibility that capital flight yields a contractionary shift in the IS curve.

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In the basic short run open economy model taught in undergraduate intermediate macroeconomic theory courses, an episode of capital flight or a sudden stop of capital inflows is expansionary.¹ The intuition is that the reduction in inflows and/or increase in outflows and the depreciation of the domestic currency stimulate net exports which then increases output. This result, however, contradicts reality in the case of emerging market countries where sudden stops are usually contractionary.

The key feature of emerging economies that produces this different outcome is that their debt is often denominated in a foreign currency such as the dollar. The presence of liability dollarization implies that large depreciations can lead to significant reductions in net worth by inflating the domestic currency value of borrowers’ loans (De Nicoló, et al., 2005; Mishkin, 1996). The financial accelerator literature then provides a link from changes in net worth to investment. Specifically, in the presence of financial frictions such as imperfect monitoring and enforcement of contracts, a large decline in net worth can lead to a sharp rise in the cost of borrowing as poorly-collateralized firms must pay a higher premium for external funds (Bernanke and Gertler, 1995). In extreme cases, firms may face liquidity and insolvency problems that restrict their growth. Therefore, a large currency depreciation can trigger an investment collapse that can potentially dominate the traditional expansionary effect through net exports.

In fact, more recent research on the effects of exchange rate devaluations has placed greater emphasis on this financial or balance sheet channel than the traditional trade channel (c.f. Krugman, 1999; Frankel, 2005). This literature includes 3rd generation currency crisis models in

¹ Although books do not explicitly state that sudden stops are expansionary, this result is implied by the models that are used. Furthermore, textbooks do claim that exogenous depreciations and/or devaluations (which are triggered by sudden stops) are expansionary (Blanchard, 2009; Mankiw, 2010; Mishkin, 2011). Abel, Bernanke, and Croushore (2007) go so far as to claim that a rise in foreign interest rates (historically one of the main causes of sudden stops) is expansionary.
which financial factors play a primary role in the propagation of crises (Aghion et al., 2000; Céspedes et al., 2004). There is also a growing empirical literature testing the relevance of these balance sheet effects (see Galindo, Panizza and Schiantarelli, 2003 for an empirical survey). For example, Aguiar (2006) finds that Mexican firms with heavy exposure to short-term foreign currency debt before the 1994 devaluation experienced relatively low levels of post-devaluation investment. Bebczuk et al. (2006) present macro evidence of this effect using a large sample of countries during the period 1976-2003, finding that the presence of liability dollarization weakens the expansionary effect through the standard trade channel. In countries with significant dollar liabilities, including most of their developing country sample, devaluations are in fact contractionary. They also test whether the contractionary effect works through investment or consumption. They find that depreciations significantly impact investment growth but not consumption growth, concluding that investment is the main channel through which depreciation affect output.

The result found in macroeconomics textbooks that capital flight is expansionary therefore contradicts both theoretical and empirical results for emerging market economies with liability dollarization. To bridge this gap, this paper presents a very simple modification of the standard IS curve that allows for the possibility of contractionary depreciations. The key insight is that a depreciation can lead to a decline in investment if firms suffer from liability dollarization and a decline in consumption if households have borrowed in dollars. Letting $E$ represent the nominal exchange rate (foreign currency per domestic currency), then the investment function

$$I = \bar{I} - d_1 r + d_2 E$$

(1)
captures the effect of the exchange rate on investment, in addition to the standard interest rate effect. In particular, a fall in \( E \) for a given \( r \) leads to a decline in investment. As mentioned above, this effect requires some imperfection in capital markets so that investment depends on net worth, as in the financial accelerator model. Similarly, the consumption function

\[
C = \bar{C} + mpc(Y - T) - c_1 r + c_2 E
\]  

(2)

allows the exchange rate to have independent effects on consumption. Given the empirical evidence cited above that depreciations have much larger and statistically significant effects on investment, I proceed using only the modification to the investment function. But certainly both modifications allow for the possibility that a depreciation leads to a contractionary shift in the IS curve.

First consider the standard model \textit{without} the above modification. The goods market equilibrium condition is given by \( S = I + NX \) or \( S = I + CF \) where CF is net capital outflow. Although \( NX \equiv CF \) by the balance of payments identity, intermediate macroeconomics textbooks differ in whether they model \( NX \) or \( CF \). Mankiw (2010), for example, models CF in a large open economy as a function of the real interest rate (a higher domestic \( r \) reduces outflows and increases inflows as the expected return to lending domestically rises). The level of CF then pins down the level of \( NX \) by the BOP identity. In contrast, Mishkin (2011) and Abel, Bernanke, and Croushore (2007) model \( NX \) as also depending on the real interest rate, but the intuition is different. A rise in the real interest rate appreciates the domestic currency, which then reduces \( NX \). The level of \( NX \) then determines the required level of CF.
Figure 1 depicts an initial goods market equilibrium.

Figure 1

For simplicity, I assume that the initial value of NX or CF is zero so that the investment schedule and the I+NX/CF curve intersect at the original market clearing interest rate. This simplifies visually the comparative statics. An episode of capital flight or a sudden stop of capital inflows shifts the I+NX/CF curve to the right, although the story differs slightly depending on whether one is modeling NX or CF. In the latter case, capital flight directly affects the I+CF curve by shifting the CF schedule to the right. In the former case, capital flight affects I+NX indirectly, by depreciating the domestic currency in the foreign exchange market, which then increases NX and shifts I+NX to the right. In either case, the result is an expansionary shift of the IS curve, as depicted in Figure 2.
Whether one has an upward sloping LM curve or a flat interest rate target, the result is an increase in $Y$.\footnote{I have not drawn the NX/CF curve by itself, but note that because the I+NX/CF is the horizontal summation of the investment and NX/CF curves, the horizontal shift in I+NX/CF is the same as the horizontal shift in NX/CF.}

When we introduce liability dollarization, capital flight that induces a depreciation of the domestic currency has two effects on the IS curve, the one depicted in Figure 2, and a contractionary effect through the investment schedule. Consider the latter effect in isolation. With the real interest rate on the $y$-axis, a depreciation of the domestic currency (for a given interest rate) has the effect of shifting the investment schedule to the left using equation (1), leading to a contractionary shift in the IS curve, as illustrated in Figure 3.
Note that the horizontal shift in the investment schedule is equal to the horizontal shift in I+NX/CF.

Therefore, we are left with two competing effects on the IS curve. I do not suggest drawing both the shift in NX/CF and investment in the goods market at the same time, as it would undoubtedly confuse students. However, drawing two different new IS curves, one with the standard expansionary effect, and a second curve to the left that incorporates both effects is sufficient to make the point. Whether the latter IS curve is to the left of the original curve is ambiguous and depends on the relative strengths of the two effects. In countries with high degrees of liability dollarization, however, the net effect is likely to be contractionary.

An instructor may also wish to discuss the effect of liability dollarization on the slope of the IS curve and the potency of monetary policy. This discussion, however, is more complex and can easily be omitted. A decrease in the real interest rate has competing effects on the investment schedule and therefore the I+NX/CF curve. First, it has the standard effect of lowering the cost of capital and thus raising planned investment, captured by \(-d_1r\). However, it also depreciates the currency, which lowers investment through \(d_2E\). Therefore, the presence of liability dollarization steepens a downward sloping investment function by counteracting the stimulative effect of
lower interest rates.\(^3\) This implies a steeper I+NX/CF curve that in turn implies a steeper IS curve and a weaker effect of expansionary monetary policy.\(^4\) This is illustrated in Figure 4, where IS* represents the IS curve in the presence of liability dollarization.

**Figure 4**

![Diagram of IS curve](image)

**References**


\(^3\) In extreme cases, lower interest rates could in theory lower investment, with the implication that the investment schedule is positively sloped.

\(^4\) Similarly, liability dollarization makes consumption less sensitive to change in \(r\). This steepens the savings line, which steepens IS curve and again makes monetary policy less potent.


