Evaluation of Exchange-Rate and Capital–Market Liberalization Regimes in the Presence of Sudden Stops

by

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Abstract

The paper challenges two established puzzles in the international macroeconomics. The first puzzle is the failure of the literature to find any systematic difference in the macroeconomic process across exchange rate regimes. The second is the absence of any empirical relation between macroeconomic performance and capital-account liberalization. We attribute the failure of the literature to address these puzzles to a fundamental flaw. We attribute the failure of the literature to a fundamental flaw of ignoring the probability of sudden stops. We develop a methodology consisting of accounting for a *latent* continuous variable indicating a crisis-prone state of the economy. The latent variable is summarized by a projected probability of a crisis due to sudden stops in international capital inflows. We apply the new methodology to a cross-country panel of 100 low and middle-income countries over three decades. Findings indicate that the effects of exchange rate regimes and liberalization regimes on macroeconomic performance go through two distinct channels: a direct channel that is captured in the traditional growth equation, and an indirect channel which influences growth through the probability of sudden stops. We further analyze how the projected probability of sudden stops affects the level of dollarization, and provide estimates for the effect of dollarization on growth.

I. INTRODUCTION

The choice of macroeconomic policies is cast traditionally in terms of the well-known policy tri-lemma. This is a way of describing succinctly a choice among three policy goals: pegging the exchange rate, keeping the capital markets open, or conducting a business-cycle stabilizing monetary policy. The tri-lemma arises because only two of these policy goals can be achieved at any point of time. Both foreign and domestic economic shocks (including policy mistakes) may move the equilibrium nominal exchange rate away from the pegged rate. If the official rate is overvalued, the defense typically requires higher interest rates and fiscal contraction to reduce the current account deficit. If the excess demand has become large, either because policy was slow to react or because the country has been hit by a strong and long-lasting shock, the required policy actions may not be viable; either for political-economic reasons or because of the damage they will inflict on the banking system or aggregate demand. Under those circumstances an attack on the exchange rate is likely to succeed. Therefore, there is a fourth policy goal: keeping the economy out of sudden stops to international capital flows, or other violent types of financial crises. The literature, however, often ignores this aspect of the policy-regime choice problem. [2]

In this paper we challenge two established puzzles in the international macroeconomics. The first puzzle is the failure of the literature to find any systematic difference in the macroeconomic process across exchange rate regimes. The second is the absence of any

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[2] The tri-lemma, of a fixed exchange rate, capital mobility, and a monetary policy dedicated to domestic goals, is traditionally regarded as the main explanation of the non-viability of pegs.

empirical relation between macroeconomic performance and capital-account liberalization. We attribute the failure of the literature to address these puzzles to a fundamental flaw. It consists of ignoring non-linearities in the effect of exchange-rate regimes, and capital-account liberalization regimes, on macroeconomic performance. Specifically, the literature ignores a *latent* crisis state of the economy, which is summarized by an estimated probability of crisis. Our analysis focuses on the evaluation exchange rate regimes and capital-market liberalization regimes, in the presence of sudden stops.

Macroeconomic theory has long recognized that there exist positive effects of an exchange-rate peg regime on macroeconomic performance. The idea is that by fixing their currencies to international moneys (the Dollar, the Euro, or the Yen), fiscally-disciplined emerging economies, could rapidly accumulate exchange reserves through export growth, are able to maintain a high saving ratio, and can provide certainty to business and profit margins to investors. Such policy environment leads to a low and stable domestic rate of interest, and thus enables the economy to retain the confidence of international investors.

However, every major international economic crisis of the past 15 years (save Brazil in 2002) has been rooted in rigid exchange rate regimes. Thus, Stanley Fischer (2001) succinctly observes that: "Each of the major international capital market-related crises since 1994--Mexico, in 1994, Thailand, Indonesia and Korea in 1997, Russia and Brazil in 1998, and Argentina and Turkey in 2000--has in some way involved a fixed or pegged exchange rate regime. At the same time, countries that did not have pegged rates--among them South Africa, Israel in 1998, Mexico in 1998, and Turkey in 1998--avoided crises of the type that afflicted emerging market countries with pegged rates."

Indeed, there has been a long-standing view that an emerging economy under a peg, with government budget imbalances, trade deficits, and the presence of free-market policies that facilitate the outflow of capital, is likely to become vulnerable to sudden stops of capital inflows; hence, to balance of payments crises. A "sudden stops" crisis often entails a financial or currency crisis, accompanied by a sharp fall in output. Capital controls could reduce contagion effects, and thereby serve to lower the risk of financial crises.[3]

Similarly, benefits of capital market liberalization come typically from three factors. Revoking capital controls could lower the cost of capital and thereby promote investment. Capital-market liberalization could turn country-specific risks into diversifiable risks. Furthermore, the efficiency of allocation of domestic capital could also be enhanced. However financial liberalization could also increase the risk of sudden stops to capital inflows which could bring about defaults and recession.[4]

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[3] For an early analytical approach to the problem of sudden stops, see Calvo (1998). Among recent papers on sudden-stops' vulnerability, and its relation to fixed exchange rate regimes, see also Calvo (2000), Calvo, Reinhart and Vegh (1995), Chang and Velasco (2000), Ghosh, Gulde and Wolf (2000), Obstfeld and Rogoff (1995) and Williamson (2000). Sharp current account reversals, which require a quick adjustment of the balance between domestic saving and investment (see Milesi Feretti and Razin (1996)), and the associated substantial depreciations, that trigger financial distress, tend to cause and to exacerbate recessions.

[4] For an historical perspective on capital controls see Voth (2004). See also Rodrik (2002) who cites Keynes: " I sympathize with those who would minimize, rather than… maximize economic entanglements between nations. Ideas, art, knowledge, hospitality and travel should be international. But let goods be homespun whenever reasonable…, and above all let finance be primarily national."

The idea, put forth in the present paper is that a fixed exchange rate, or open capital markets, could be good or could be bad for macroeconomic performance through a complex macroeconomic mechanism, working via the trade and the financial crisis channels. A fixed exchange rate regime could have negative effect on the business cycle if it generates a big increase in the probability of sudden stops, to a degree that dominates the positive effect it may have on exports, through the direct channel; and vice versa.

A related policy-evaluation issue is financial dollarization, and its effect on the macroeconomic performance. The "original sin" concept, introduced by Barry Eichengreen and Ricardo Haussman (1999), explain the consequences for emerging markets of abrupt departures from an exchange rate peg regimes due to sudden stops in capital inflows. The "original sin" concept underpins a crucial vulnerability of the economy under peg regimes. The phrase refers to the inability of a country to borrow abroad in its own currency, because no foreign creditor is willing to gamble on the potential exchange rate instability. A plausible explanation for the widespread use in dollarized debt is that countries are forced into this position because their monetary and fiscal policies lack credibility. If a country issued debt in domestic currency, it would have an incentive to inflate its way out of debt. Investors, who expect that the government will succumb to such temptation, refuse to buy domestic currency- denominated debt papers.[5] In net terms, the foreign currency liabilities of residents

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[5] Indeed, ninety seven percent of all debt, placed in international markets between 1999 and 2001, was denominated in five currencies: the US Dollar, the Euro, the Yen, the Pound Sterling and the Swiss Franc. This feature of emerging markets' borrowing in the

of developing and transition countries usually exceed their assets in foreign currencies, implying that they are exposed to exchange rate risk on their balance sheets, as well as through trade. Issues of both sovereign and corporate bonds on international markets are overwhelmingly in foreign currencies, even in the case of an advanced economy such as Korea, or a country whose exchange rate is strongly pegged to the U.S. dollar, such as Argentina in the 1990s.[6]

The organization of the paper is as follows. In section 2 we briefly survey related empirical literature. In section 3 we provide a discussion of a background theoretical framework, which can serve as guide to the empirical analysis. In section 4 we describe an econometric methodology, useful for the evaluation of policy regimes. In section 5 we describe the data. Section 6 discusses the main empirical findings concerning the role of the crisis probability in the evaluations of policy regimes. Section 7 provides an empirical analysis of the dollarization channel. In section 8 we perform several robustness tests, with an alternative classification of exchange rate regimes, sample of countries, identification strategy, policy

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international market leads to balance-sheet type of currency crises, as formalized by Krugman (2000), and Schneider and Tornell (2000).

[6] Part of this exchange rate risk can be hedged, although only (in the aggregate for a given developing country) to the limited extent that nonresidents are willing to hold local currency exposure. Large cross-holdings of foreign assets and liabilities means that the valuation channel of exchange rate adjustment has grown in importance, relative to the traditional trade balance channel. In this context, see also Lane and Milesi-Ferretti (2004), for an empirical analysis of the inter-connections between capital account openness and the exchange rate adjustment process.

dynamics, and approach to non linearities. Section 9 provides a diagrammatic exposition of the fundamental non-linear effects of the exchange rate regimes, capital openness, and dollarization, based on the estimation. Finally, section 10 provides conclusions, caveats, and extensions.

II. RELATED EMPIRICAL LITERATURE

Strikingly, the empirical literature has not been able to identify clear-cut real effects of exchange-rate regimes on the open economy. Indeed, Marianne Baxter and Alan Stockman (1989) and Robert Flood and Andy Rose (1995) find that there are no significant differences in business cycles across exchange rate regimes. A recent study Frankel and Wei (2004) explores how output lost in crises is related to various controls, including the degree of exchange rate flexibility, currency mismatch, FDI, etc. The exchange rate flexibility variable is found as not statistically significant.[7]

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[7] See however a recent study by Levy-Yeyati and Sturzenneger (2000), who find real effects of exchange-rate regime in cross-country data. Another exception is Rose (2000). In the paper, Rose uses evidence from existing currency unions in the world economy, to estimate the effect of currency unions on international trade. Rose finds that a currency union (which is an extreme form of a peg) expands bilateral trade between two average member countries by a huge proportion (200%, and more). Rose's currency union effects were reduced substantially when fixed country effects were incorporated in the analysis. Person (2001) challenged Rose's analysis, but also finds significant, albeit modest, effect of currency unions. Anderson and van Wincoop (2003) demonstrated the importance of including country fixed effects in gravity models. Although commonly estimated gravity equations generally have a very good fit to the data, they show that they are not theoretically grounded and prone to lead to biased estimation. They applied the method to solve the border puzzle. They find specifically that borders reduce bilateral national trade levels by plausible though substantial magnitudes.

Similarly, no definitive view emerges as to the aggregate effects of capital account liberalization. Eichengreen (2001) who overviews the literature, points to ambiguities in the rather complex role played by capital account liberalization; and Rodrik (1998) finds no significant statistical association between capital account openness and growth. A recent study by Prasad et al (2005) finds that it is difficult to establish a robust causal relationship between the degree of financial integration and growth performance for developing countries. [8]

III. THEORY AS GUIDE TO EMPIRICAL ANALYSIS

Paul Krugman (2000) proposes a stylized "sudden stops" model, based on the self-fulfilling expectation equilibrium (a sun-spots equilibrium), with which he attempted to make sense of the number and nature of the emerging market crises of 1997-98. Credit is constrained by the borrower's net worth, whose value is indexed to the real exchange rate, because of dollarization. The real exchange rate and aggregate investment are jointly driven by exogenous aggregate volume of exports. The model is extended in Razin and Rubinstein

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[8] A more definite view concerning positives effects of capital account liberalization on output, which is advanced by Fischer (1998), is supported by some evidence, provided by Quinn (1997). The role of preexisting policies, and of trade-account vs. capital-account sequencing, in determining the effects of capital control liberalization on growth and investment, is examined by Arteta, Eichengreen and Wyplosz (2001), Chinn and Ito (2002), and Tornell, Westermann, and Martinez (2004). A recent evaluation of this literature by Prasad *et al*. (2004) yields also inconclusive result. It shows no significant relationship between financial openness and growth in real per capita income across countries, even after controlling for a series of standard explanatory variables (initial income, initial schooling,

(continued)

(2004) to fit into a class of models with a unique equilibrium (i.e., with no sunspots). The extension builds on the recent global-games models (as in Morris and Shin (2000). The extended model posits an exogenous stochastic process for the fundamentals (e.g., aggregate export volumes) that foreign creditors estimate based on public and private information. The framework features a double guessing game by the foreign creditors, who receive noisy signals. First, each foreign creditor assesses the realized state of the domestic economy fundamentals; and, second, he/she guesses the likelihood of the credit extension-withdrawal action that all the other foreign creditors are going to take, given the signals they receive. A Rational-Expectations equilibrium of this global game is the set of self fulfilling guesses so that the level of domestic investment implicit in the credit offers must match the actual level of investment that takes place given those offers. Importantly, the equilibrium is summarized by a *unique* projected crisis probability, directly linked to the level of aggregate domestic investment. An essential feature of the equilibrium is the existence of some thresholds in the value of some synthetic index of fundamentals (e.g., aggregate export volumes) that separate "crisis states" from "no crisis states". Building on such global-games framework of crises implies that foreign creditors decide whether to keep lending to the country (be long on foreign currency) depending on whether their estimate of the fundamentals is above or below an endogenous equilibrium threshold. The position of the threshold depends: (a) on the distribution of the fundamentals; (b) on the stochastic features of the process through which information reaches foreign creditors; as well as (c) on the policy regime. See Box 1 for a

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investment-GDP ratio, political instability, and regional dummies. See also Ariyoshi et al (2000), Bhagwati (1998), Edwards (1999, 2000) and Kaplan and Rodrik (2000).

formal description of the model of sudden stops, generating abrupt tightening of a country's collateral constraint on foreign borrowing and a large discrete fall in investment spending.

[BOX 1 ABOUT HERE]

IV. ECONOMETRIC METHODOLOGY

The dependent variable is the GDP growth rate, as an indicator of macroeconomic performance. Policy-regime variables are modeled as dummy variables, capturing policy-regime switches (whether a country switches from float to peg, or whether a country is imposing capital controls). We use lagged policy-regime dummies as instruments. The state of the economy is conceived as a continuous *latent* variable, capturing the strength of the exogenous fundamentals; and indicating the "crisis-prone states of nature". When this variable moves beyond a certain threshold, there is a "crisis-prone state". The latent variable is derived via a probit model, assessing the probability of having a crisis in the current year. The probit is specified using the same policy dummies as above, plus lagged sudden stops crises, government budget deficit, initial GDP per capita, etc. In Box 2 we describe the formal econometric model. [9]

[BOX 2 ABOUT HERE]

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[9]Our approach may have some as of yet unexplored similarity to the ARCH and GARCH methods and their applications. Historically, economists viewed heteroskedasticity as largely cross sectional. But it turns out that heteroskedasticity is also pervasive in the time-series context. Episodes of volatility clustering do exist, especially around sudden stops crises.

The main goal of this methodology is to capture the non-linear effect of policy on macroeconomic outcomes, depending on the "Crisis State" of the economy, as projected by market participants.[10]

V. DATA

Our data set consists of 100 low-and middle-income countries (43 African countries, 26 Asian countries, 26 countries from Latin America and the Caribbean, and 5 European countries). The list of countries is shown in Table 1. The main source of data is the World Bank (World Development Indicators and Global Development Finance). The annual data ranges from 1971 to 2002. [11] We implement a binary index based on multiple categories of the IMF- classification of exchange rate regimes, for the broad sample with the 100

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[10] Nesting a probit estimate in a panel may raise in general issues in the distribution of the error. Often, a noisy explanatory variable may bias the standard errors in the second-stage growth regression. A bias in the standard errors exists when the latent variable, although being known to the economic agent, is, however unknown to the econometrician. This issue is mute in our case because the projected probability of the "Crisis-prone State" is the same for market participants and the econometrician. Hence, in our case the second-stage standard errors are not biased.

[11] We updated data set, originally assembled by Gian Maria Milesi-Ferretti and Assaf Razin (2000), to account for the Asian crisis in 1997.

countries. We also implement a binary index based on the different multiple categories of the Reinhart and Rogoff classification of exchange rate regimes, but only for a sub-sample of 58 countries of the 100 countries.[12] Measuring the degree of openness of trade and capital accounts is always a heroic task. Since 1950, the IMF has issued an annual publication, which tries to describe the controls that its member countries have in place on various current account capital account transactions. However, as Cooper (1999, p. 111) notes, these descriptions are very imperfect measures of the extent of restrictions, particularly in the case of the capital account:

"… Restrictions on international capital transactions … come in infinite variety. Therefore an accurate portrayal requires knowledge not only of the laws and regulations in place, but also of how they are implemented—which often requires much official discretion—and of how easily they are circumvented, either legally or illegally. The IMF reports the presence of restrictions, but not their intensity or their impact."[13] Prudential controls that have a similar effect to some capital controls, for

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[12] Reinhart and Rogoff (2004) updated the IMF official classification of exchange rate regimes prior to 1997, as described in the various issues of the IMF's Annual Report on Exchange Rate Arrangements and Exchange Rate Restrictions. The IMF empirical definition of exchange rate regimes is based on formal government statements. The Reinhart-Rogoff classification is based on an empirical algorithm, factoring in ex-post behavior. Both are not pure rule-based proxies.

[13] Capital-account openness is also measured as a binary index based of restrictions on capital account transactions, reported in the IMF Annual Report on Exchange Arrangements and Exchange Restrictions . These are rule-based, but not quantitative measures. For alternative measures, see also Edison et al (2004).

instance limits on the open foreign exchange positions that domestic institutions can

take, would also be put in place as direct controls are removed.

We measure sudden stops' crises by a large annual depreciation in the real exchange rate. In

doing so, we capture the effects of the crisis on the real side of the economy.[14] [15] Evidently,

unexpected fluctuations in the real exchange rate (rather than the nominal exchange rate) are

more likely to have significant balance-sheet effects and other real side effects. Concretely,

the sudden-stops crisis is defined by sharp changes of the real exchange rate, with a 15

percent-per-year threshold (one standard deviation in our sample).

Table 1 provides a list of countries in our broad sample. Table 2 describes the frequency of

sudden-stops crises, exchange-rate regimes, and capital-account policy switches in the broad

sample. Overall, about 22 percent of the observations are associated with sudden-stops crises;

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[14] Typically in the currency crisis literature sudden stops are measured by free falls in the nominal exchange rate. However, this does not distinguish between domestic price crises and balance-of-payments crises. In our indicator, crisis episodes do not include, therefore, countries which suffer from bouts of high inflation and currency depreciation, but with stable real exchange rates, because they do not qualify to be classified as balanced-of-payments crises. Evidently, the real exchange rate measure for crisis is strongly correlated with sharp reversals in the current-account balance. See Milesi-Ferretti and Razin (2000). See also Calvo, Izquierdo and Majia (2004) on sudden stops and real-exchange-rate fluctuations.

[15] Calvo, Izquierdo, and Mejia (2004) find that real exchange rate fluctuations coming hand in hand with sudden stops are a unique phenomenon in emerging-market economies. They use a sample of 32 developing countries, to analyze the empirical characteristics of sudden stops in capital flows and their relations to balance sheet effects. See also Bacchetta, Aghion and Banerjee (2001), Krugman (2000), Allen, Rosenberg, Keller, Sester, and Roubini (2002), and Eichengreen and Hausmann (1999). See also Bacchetta, Aghion and Banerjee (2001), Krugman (2000), Allen, Rosenberg, Keller, Sester, and Roubini (2002), and Eichengreen and Hausmann (1999).

About 1 to 4 percent of the observations in the sample indicate a float-to-peg, peg-to-float, switches to capital-controls, or switches to liberalization.

VI. EMPIRICAL FINDINGS

We now report on the estimated effects of regime switch on. We start with the effects of policy-regime switch, float to peg, peg to float, liberalization to capital controls, and capital controls to liberalization. We do so, with, and without country fixed effects. To underscore the role of the probability of sudden stops, we estimate each specification twice; that is, including and excluding the probability of a crisis. We report our findings in Table 3.

In the benchmark case where the crisis probability is absent from the growth equation, we find negligible effects of peg and liberalization policy dummies on growth; with and without fixed country effects; as expected from the traditional literature.

(i) <u>Policy-Regime Determinants of Growth</u>

Controlling for the crisis probability in the growth equation, in column (i) and (iii) of Table 3, we can see that the coefficients of the policy dummies are significant in the growth equation, with and without fixed country effects. The coefficient of the crisis probability in the growth equation is negative: barely significant without country fixed effect, but highly significant with country fixed effects.

(ii) Policy-Regime Determinants of the Probability of Crisis

In the lower panel of Table 3 one can see that the probability of crises increases with a switch to peg, and falls with the imposition of capital controls; by about the same order of magnitude (almost 30 percent). Note that the coefficients of the policy dummies in the probit equation are highly significant; both with and without country fixed effects.

(iii) Reduced-Form Marginal Effect of a Switch in the Policy Regime

Observe that both the reduced-form marginal effect of a switch to peg, and the imposition of capital controls, is small.[16] This is evidently consistent with the small coefficient of the policy dummy in the benchmark growth equation. This is also a typical finding in the traditional literature. In our case, however, the statement applies only to the *sample average*. Because the probit equation is non-linear and the growth equation is linear, for any country-specific and time specific cases, one effect may strictly dominates the other, or vice versa. The non-linearity is illustrated in section IX.

We now address some potential econometric issues.

Is there a self-selection issue? When the crisis probability is very high, a successful switch to peg can only be implemented by countries for which governments have some strong belief about the health of domestic economic fundamentals (like the case of Hong Kong during the Asian crises). Thus, the conclusion that a switch to peg is good for growth in state of very high probability of crisis may not be valid. Because it may be based on a self-selection of

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[16] The reduced-form marginal effect is calculated as follows. The coefficient of a policy dummy in the probit is multiplied by the coefficient of the crisis probability in the growth equation. The product is in turn added to the coefficient of the corresponding policy dummy in the growth equation.

countries, from a pool of countries; where the same crisis probability presumably correspond to different fundamentals. This self-selection problem does not, however, arise in our case, because we control for country fixed effects. The country fixed effects effectively capture the main characteristics of health of the country domestic economic fundamentals.

Is there endogeneity issue, concerning the crisis probability in the growth equation?

The dependency of the growth rate on crisis probability originates in effect from the country characteristics is again are captured by the exogenous country fixed effects. That is, the country fixed characteristics trigger slow growth or fast growth. At the same time they could either increase, or reduce the crisis probability. Because country-fixed effects are exogenous, the coefficient estimate of the crisis probability in the growth equation remains unbiased.

Table 4 provides some first-look results concerning the persistency of the effect of policy regimes on macroeconomic performance.[17] We distinguish between the effects of regime switch dummies and regime level dummies. This somewhat static methodology aims at capturing persistent and transitory effects of policy regimes, in a sample which does not have time series of other policy variables that enable full-fledged dynamic analysis. Main findings are:

(i) Determinants of the Projected Crisis Probability

The coefficient estimates of policy regime switches, but not of the policy regime levels, are found to be significant in the probit equation. This means that the crisis probability is

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[17] Full-fledged dynamic analysis is not undertaken due to the fact the country characteristics do not have considerable time-variation in the data.

sensitive to changes in policy regimes but not to whether the country is under peg or float, or whether the capital account is open or not.

(ii) Determinants of GDP Growth

Controlling for the crisis probability in the growth equation, the coefficient estimates of both types of the policy regime switch, as well as the two types of the policy regime level are significant in the growth equation; albeit only in the case where country fixed effects are excluded. Once we control for country fixed effects, only the coefficient estimates of the policy regime switch are significant in the growth equation. The Durbin-Watson measure of serial correlation in our regression analysis does not significantly deviates from 2, strengthening the evidence of no level effect. Do policy regime switches have persistent effects on growth? The persistency parameter (the estimated coefficient of lagged growth rate) in Table 4 is significant and its magnitude lies between 0.22 and 0.25 depending on specification. Thus, policy regime switches that have significant effect on the crisis probability have an effect on both current and future growth rates.

Thus, it is fair to conclude that in the broad sample of 100 countries, using the IMF classification of exchange rate regimes, we do not have good evidence for persistent effects of the policy dummies on growth.

VII. Financial   Dollarization

Different economies in our sample have also different levels of exposure to capital flow
volatility that can trigger unanticipated fluctuations in the real exchange rate. [18] We use the
ratio of the country's foreign currency liabilities to its money supply (FLM), as a proxy for
the country's foreign currency exposure to fluctuations in the real exchange rate. We address
the effect of policy-regime switch on dollarization, and the role of dollarization in the
macroeconomic process.

Table 6 provides estimates of the influence of policy-regime switch on dollarization. Column
(i) indicates that the policy regimes (a switch to peg, and the imposition of capital controls)
do not have a direct effect on dollarization. Column (ii) indicates a significant effect of the

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[18] The link between dollarization and exchange rate regimes is driven by several alternative
mechanisms. Reinhart, Rogoff and Savastano (2004) find that dollarization appear to
increase exchange rate pass-through. This mechanism may reinforce the claim that the "fear
of floating" is a greater problem for developing economies, with highly dollarized debt. The
role of balance sheet effects, the linkage between currency risk and country risk, and the
impact of dollarization on trade are analyzed in Levy Yeyati and Sturzenegger (2003). See
also Calvo and Reinhart (2000).

crisis probability, as a single explanatory variable, on dollarization. Column (iii) indicates that policy regimes do not directly affect dollarization, but only indirectly through the crisis probability. The latter significantly explain the dollarization. With regard to the indirect influence of policy regimes on dollarization through the effect of the regimes on the crisis probability, recall that in Table 3 we demonstrate that a switch to a peg raises and imposition of capital controls reduces the probability.

We now turn to the analysis of how dollarization influences growth. Column (i) and (ii) of Table 7 indicate that FLM, the dollarization measure, does not have any direct influence on growth, once we control for the actual realization of sudden stops' crisis. The crisis, as expected, reduces growth, and in a significant way. In column (iii) of Table 7 we introduce the *interaction* between dollarization and the realized sudden stops. The coefficient of the interaction term is negative and highly significant. This means that, although dollarization does not have an independent influence on growth, the interaction between dollarization and the *actual* crisis, tend to reduce the growth rate drastically.

This means that the following policy-regime induced mechanism may have been at work in the sample. The imposition of capital controls tend to lower the *probability* of sudden stops; and the decrease in the *probability* of sudden stops, in turn, tend to raise the level of dollarization. If a crisis *actually* occurs, then the growth rate diminished. If, however the crisis does not materialize, then growth is unaffected.

VIII. Robustness Tests

In the first set of robustness tests we address the following issues: (1) existence of serial correlation when both the policy regime switches and levels are the explanatory variables; (2) Do we need another instrument (the exclusion restriction) for identification? (3) Do the non-linear effects of the policy dummies depend on the estimated functional form of the probability of crisis? Table 7a, based on the 100 country original sample, demonstrates that serial correlation is not an issue in our sample because the Durbin Watson statistics is equal to two in all specifications. We use external foreign debt as an instrument. This variable appears in the Probit equation but not in the growth equation; see columns (ii) and (iii). In Column (ii) we use the non linear probability model and in column (iii) we use a linear probability model. Comparison the pair of columns (i) and (ii), with the pair of columns (i) and (iii), demonstrates that our findings do not depend on the functional form of the probability of crisis.

As regard to robustness concerning the exchange-rate regime classification , we switch now to the Reinhart-Rogoff classification. The alternative classification applies to only a subset of the original sample of 100 countries. Accordingly, we perform in this section a variety of robustness tests: sample-robustness, and regression-specification. Table 8 describes the frequency of currency and price crises in the sub-sample. Sudden stops' episodes appear in 65.5 percent of observations, whereas domestic-price-crisis episodes occur in 46.1 percent of the observations. Table 9 describes the frequency of switches to peg, and switches to float in the sub-sample. Both types of policy-regime switch occur in about 10 percent of the total of the sub-sample observations.

We also address the difference between domestic price crises and sudden stops crises. We observe that the literature has been dealing in the past extensively with the relation between inflation and growth. Bruno and Easterly (1998) propose a method, based on discrete high inflation crises, to look at the relationships between inflation and growth. They find that growth falls sharply during discrete high inflation crises; then growth recovers quickly after inflation falls below the threshold. Their approach, however, implies that growth is negatively affected by high inflation, above a certain threshold; but growth is not affected by inflation below the threshold. This discontinuity appears to be somewhat arbitrary. The Bruno-Easterly methodology is based on *actual* domestic price crises. Our methodology points out to the role of a laten*t* and *continuous* "crisis-prone state", estimated by a continuous crisis probability function. This means the even if the crisis does not materialize, still the crisis probability could be sufficiently big to affect the rate of growth. In this section we consider the effect of domestic price crises in addition to sudden stops' crises.

In Column (i) in Table 10 (using the Reinhart-Rogoff classification in the sub sample), is analogous to column (iv) in Table 3 (using the IMF classification in the broad sample of 100 countries). Qualitatively, the findings are similar: a switch to peg has positive coefficient, a switch to capital controls has a negative coefficient, and the crisis probability has a negative coefficient; all estimators are statistically significant. This can serves as evidence for the robustness of our methodological approach.

 In column (ii) of Table 10, the sudden stops' probability includes the effect of the domestic price crisis. Notice that the effect of the crisis probability on growth is barely significant. In

column (iii) we include two types of a projected probability of sudden stops: one which includes, and the other which excludes the effect of the price crisis. Observe that the coefficient of the latter type of projected probability is highly significant and negative. The estimated coefficient is larger in absolute value than the corresponding coefficient in column (i), Table 10. The coefficient of projected probability of sudden stops which includes the effect of price crisis, in column (iii), is however not significant. We interpret this as evidence that domestic price crisis affect growth through the sudden-stops probability channel.

IX.   FUNDAMENTAL NON-LINEARITIES

Recall that to find any systematic difference in the macroeconomic process across exchange rate regimes, the analysis has to account for *non-linearities* in the effect of balance-of-payments policy regimes on growth.

The reduced-form marginal effect of a policy-regime switch from float to peg, which incorporates both a direct and an indirect effects (which is working through the crisis probability), is plotted in Figures 1, against the projected probability. The U-shaped graph implies that in the extreme ranges, when the probability is relatively low and when the probability is relatively high, the marginal effect of the policy switch is positive. Because in these ranges of the projected probability function the regime switch does not trigger a big change in the probability, and the direct effect on growth of the regime switch dominates the indirect effect. In the intermediate range for the probability function, the reduced-form marginal effect of a policy-regime switch from float to peg is negative. Because the policy-regime switch does not generate a big marginal increase in the probability, and the indirect

effect of the regime switch dominates the direct effect. Similarly, Figure 2 demonstrates how the reduced-form marginal effect of a switch from capital controls to capital-account liberalization, which incorporates both the direct and the indirect effects, depends on the crisis probability. The U-shaped diagram implies that the marginal effect of the policy switch is positive, in the extreme ranges of the projected probability function. In contrast, in the intermediate range the marginal effect of the policy-regime is negative, because the crisis probability is very sensitive to the policy-regime switch. Figure 3 plots the reduced-form marginal growth effect of the regime switch to peg against the probability of sudden stops; with and without the imposition of capital controls. Notice capital controls transformed the U-shaped curve to downward sloping curve; except for small values of the crisis probability. Figure 4 plots the reduced-form marginal growth effect of the switch to peg, against the crisis probability, for two levels of dollarization (FLM = 0.75 and FLM = 0.1). With smaller dollarization, the U-shaped curve is flatter than with large dollariztion, indicating the dampening effect of dollarization on the probability of crisis.

X. Conclusions, Caveats and Extensions

Key results of the paper are as follows.

(1) When the probability of sudden stops is absent from the growth equation, we find that pegging and financial liberalization dummies are insignificant, confirming previous studies.

(2) Exchange rate regime dummy has a negative effect on growth, barely significant with country fixed effects, but highly significant with country fixed effects.

(3) Probability of a crisis increases with a switch to a peg, but falls with the imposition of capital controls.

(4) The reduced form marginal effects, taken on average, of switch to a peg or imposition of controls, are small.

(5) Combining a linear and a non linear model, one effect may dominate the other, or vice versa, depending on the size of the probability of a crisis for particular countries.

(6) Issue of self-selection is taken care of by country fixed effects.

(7) Policy regime switches have stronger effects than policy regime levels. Controlling for country fixed effects, only regime switches are significant.

(8) Crisis probability has significant effects on debt dollarization. Influence of policy regimes on dollarization is indirect, through their effects on crisis probability.

(9) Interaction term between dollarization and crisis probability is significantly negative for growth.

Our estimation implies that the overall effect of balance-of-payments regimes on macroeconomic performance work through the direct channel and the crisis probability channel. The latter is intrinsically non-linear. There are ranges for the set of the main explanatory variables, for which the effect of the policy regime on the likelihood of a crisis is substantial; whereas in other ranges the effect is unimportant. The reduced-form marginal effect of a policy-regime switch don growth depends on the magnitude of the probability of sudden stops crisis, and on the degree of dollarization. This means the exogenous country-specific shocks in the sample period imply that policy-makers faced different choices as regard to the desired exchange rate, and capital-account liberalization, regimes.

We list a few caveats.

The data have little time variation concerning the country- specific fiscal and monetary policies, which does not enable a full-fledged dynamic analysis. Accordingly, the econometric methodology is effectively static.

The background theory posits that optimizing agents will design their portfolio strategies based on expectations about policy rules. It is not necessary that a switch from float to peg have the same meaning in different policy and institutional environments. On the other hand, policy rules may be endogenous in an environment vulnerable to sudden stops.

To take care of the issue of the endogeneity of policy regimes we had to resort to lagged policy regime dummies, as instruments.

Indicators of capital controls used in the analysis do not distinguish controls on inflows and outflows. These two types of controls may have quite different effects on capital inflows, and therefore on the probability of sudden stops.

The IMF empirical definition of exchange rate regimes is based on formal government statements. The Reinhart-Rogoff classification is based on an empirical algorithm, clustering ex-post behavior. Both are not pure rule-based proxies, as our framework assumes.

We discuss two extensions.

It has been a well discussed view that openness to trade makes countries less vulnerable to sudden stops. Rose (2002) argues that threatened penalty of lost trade is the answer to the puzzle "why do countries seldom default on their international debt?". He offers empirical evidence that strong trade links are correlated with low default probabilities. But strong trade links are expected also to correlate with growth rates. Thus trade openness may have two reinforcing effects on growth: a direct effect on the growth process, and an indirect effect

growth through the probability of sudden stops. A useful extension is to apply our

methodology also to international - trade regimes.

An extension could consider regional spillover effects. The crisis probability may affect one

large country in the region, may have also negative effects on the growth of other countries

in the region.

Still another extension is to consider also the choice between monetary policy rules. Different

rules influence the probability of bank runs (as in Diamond and Diving (1983)), and the

probability of stock market crashes, in different ways. Proper evaluation of monetary rules

(exchange rate target, monetary aggregates target, or interest target) can internalize the effect

of these rules on the probability of financial crises; similar to our analysis of the evaluation of

balance of payments regimes.

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V.∴.EN   Theory as Guide to the Empirical Model

Assume that there are N domestic entrepreneurs, who are single mindfully engaged in wealth accumulation (save only), and N foreign creditors, who supply the credit necessary for domestic investment by the domestic entrepreneurs. Let I_t^a denote investment in capacity by an individual entrepreneur, and let the leverage in finance be specified as λ times the entrepreneur's net worth, W. Denote by y_t, F_{t-1}, and p_t, the domestic output (produced by a standard Cobb-Douglas technology with a capital input income share α), the initial debt, indexed to foreign goods, and the *real exchange rate* (the relative price of foreign goods in terms of domestic goods), respectively.A foreign lender imposes a limit on the entrepreneur borrowings, so that the investment, I_t^a, is constrained by the entrepreneur net worth and the leverage fraction:

$I_t^a \leq (1+\lambda)W_t$,

where, $W_t = \alpha y_t - p_t F_{t-1}$, is the entrepreneur's net worth.

The market clearing real exchange rate is a function of *aggregate* investment and aggregate output:

$p_t = \frac{[1-(1-\alpha)(1-\upsilon)]Y_t-(1-\upsilon)I_t}{X_t}$,

where, I=NI^a,$Y = Ny$,denote the aggregate domestic investment and aggregate output, respectively; the coefficient υ denotes the marginal propensity to import, and $\tilde{X}_t$ denotes the stochastic volume of exports, expressed in terms of foreign goods. Thus, an increase the aggregate investment spending triggers real appreciation through a "transfer problem" mechanism (see Krugman (2000).

International differences in rates of return which induce foreign creditors to extend loans to domestic entrepreneurs are given by the interest parity condition:

$(1+r_t)\frac{p_t}{p_{t+1}} \geq (1 + r*)$,

where, r and r* denote the marginal productivity of capital and the foreign interest rate, respectively. We start with perfect public information. Figure B.1 shows the existence of at most three equilibrium outcomes depending on the realization of exports, $\tilde{X}_t$. With high exports, a unique equilibrium investment is governed by the standard rate of return conditions. With low exports,because the entrepreneur is insolvent and the credit constraint is binding, there exists a unique equilibrium with zero investment . In an intermediate case there are however multiple equilibrium- investment outcomes, due to a expectations-coordination failure.

Now turn to the case of private information. A foreign creditor i receives a private signal θ_i regarding $\tilde{X}_t$;

$\theta_i = \tilde{X}_t + \varepsilon_{ti}$.

The error term ε_{ti} is assumed to be i.i.d. and uniformly distributed over $[-\varepsilon, \varepsilon]$.

An individual foreign creditor's decision whether or not to extend credit to the domestic entrepreneur crucially depends on her signal.

There exists a cut-off signal $\tilde{\theta}_i^* = X_t^* + \varepsilon_{ti}^*$, so that

$$\underset{N \tilde{~} U[0,1]}{E}[(1+r_t)\frac{p(\tilde{N}_t^*, \tilde{X}_t^*)}{p_{t+1}}] - (1+r*) = 0.$$

The marginal individual creditor, who receives a threshold signal

$$\tilde{\theta}_i^* = X_t^* + \varepsilon_{ti}^*,$$

must be indifferent between withholding, or extending the credit to the domestic entrepreneur counterpart.

Observe that in the global game the market clearing real exchange rate, p_t

,is a decreasing function of $\tilde{N}$, the number of foreign creditors who decide to lend to the domestic entrepreneurs, and a decreasing function of the fundamental which drives the equilibrium outcome, $\tilde{X}_t$.

The export threshold, $\tilde{X}_t^*$, therefore determines a *unique* equilibrium outcome which is a solution to the global game. Below the threshold $\tilde{X}_t^*$ investment is equal to zero, because all foreign investors tend to withold credit. Above the threshold $\tilde{X}_t^*$, domestic investment is driven by the *stndard* rate-of-return consideration reaching a *unique* level $\bar{I}_t$, because all foreign investors extend credit and interest parity prevails. This means that there is also a unique *probability* of a sudden stop in capital flow, denoted by G(X), where $G(.)$ is the exogenous cummulative distribution function of export volumes:

Prob $\{I_t = 0\} = G(\tilde{X}_t^*)$.

Furthermore, the associated (expected) level of aggregate investment is given by

$$(\bar{I})(1 - G(\tilde{X}_t^*)).$$

Therefore, in this model the probability of sudden stops affects directly the level of economic activity of the domestic economy.

Figure B.1

The diagram contains the following labels:

- $N.I^a$ (vertical axis)
- High Investment Equilibrium
- The 45 Degree Line
- $\overline{X}$
- $\underline{X}$
- Low Investment Equilibrium
- X^{mid}
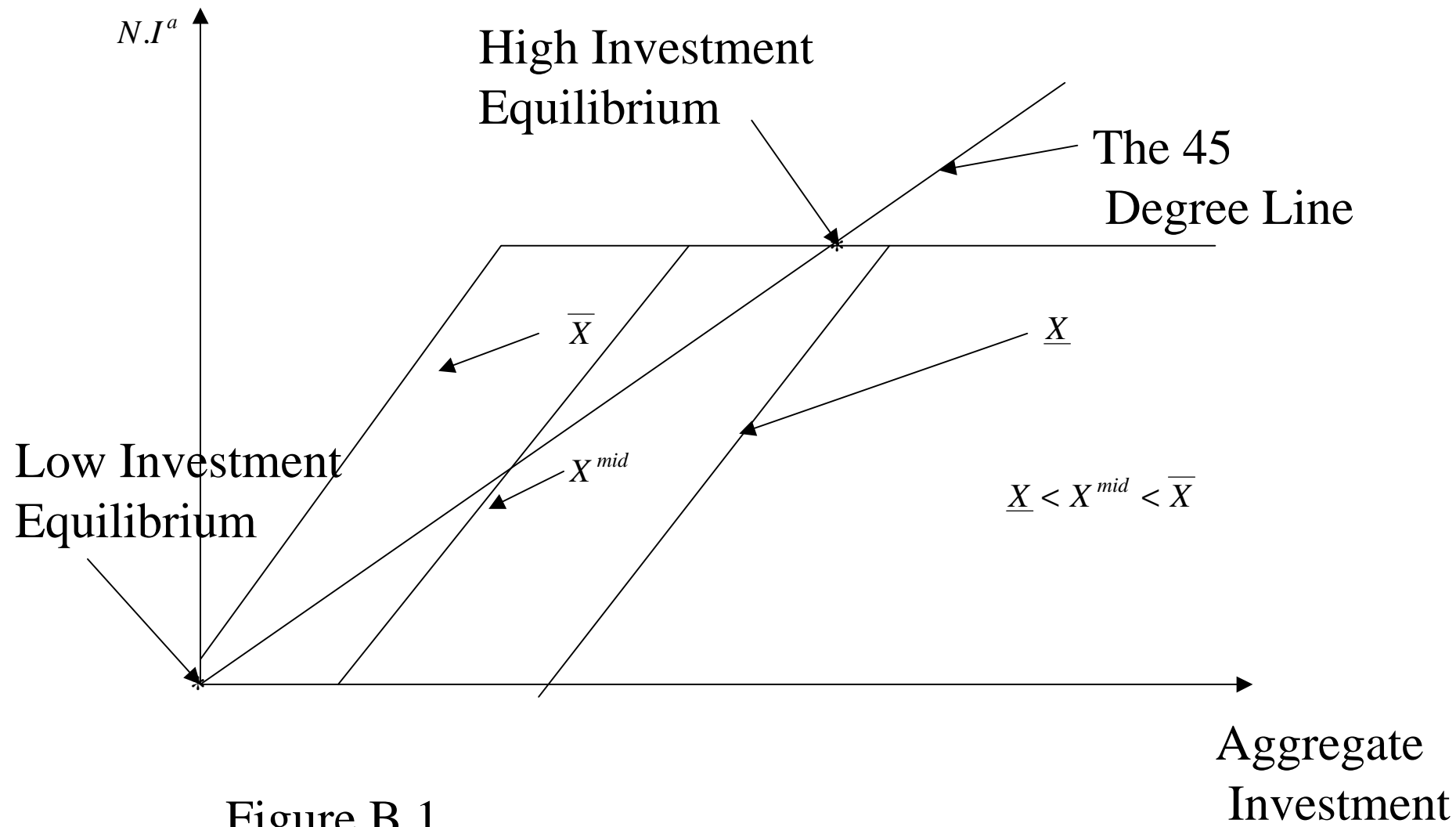- $\underline{X} < X^{mid} < \overline{X}$
- Aggregate Investment (horizontal axis)

Box 2: The Statistical Model

Let $Y_{2,j,t}^*$ denotes a *latent* variable indicating a *crisis prone state* of the economy for of country j in time t. The *crisis prone state* of the economy is a *continuous* stochastic variable. If its realization is non negative, $Y_{2,j,t}^* \geq 0$, a realization of sudden stops occurs, whereas if $Y_{2,j,t}^* < 0$, the sudden stops do not occur. A realization of sudden stops is *observable*. The observable binary variable which indicates whether or not sudden stops occur, $Y_{2,j,t}$, is equal to 1 , if the sudden stops occur in a country j at time t, and 0 otherwise.

$$Y_{2,j,t} = \begin{cases} 1 & if \ Y_{2,j,t}^* \geq 0 \\ 0 & \text{otherwise} \end{cases}. \tag{1}$$

Binary indicators of the exchange rate regime, D_1 , and capital market liberalization regime, D_2 ,are denoted by:

$$D_{1,j,t} = \begin{cases} 1 & \text{if peg} \\ 0 & \text{if float} \end{cases}, \tag{2}$$

and:

$$D_{2,j,t} = \begin{cases} 1 & \text{if capital controls} \\ 0 & \text{if liberalization} \end{cases}. \tag{3}$$

The equation of the latent variable, $Y_{2,j,t}^*$, is a linear function of policy-regime dummies (D_1, D_2) and a vector of controls (Z):

$$Y_{2,j,t}^* = \beta_2 Z_{j,t} + \gamma_2 D_{1,j,t} + \delta_2 D_{2,j,t} + \phi_2 Y_{1,j,t} + \varepsilon_{2,j,t}, \tag{4}$$

where, $\varepsilon_{2,j,t}$ is a country specific time variant *i.i.d.* random shock.
Let $Y_{1,j,t}$ denote the GDP per capita growth rate of country j in period t. The growth rate is assumed to be linear function of the policy regime indicators (D_1, D_2), and a vector of standard controls (X), as follows.

$$Y_{1,j,t} = \beta_1 X_{j,t} + \gamma_1 D_{1,j,t} + \delta_1 D_{2,j,t} + \phi_1 \hat{Y}_{2,j,t}^* + \varepsilon_{1,j,t}, \tag{5}$$

where, $\varepsilon_{1,j,t}$ is a country specific time variant *i.i.d.* random shock and $\hat{Y}_{2,j,t}^*$ is the best predictor by the market participants of $Y_{2,j,t}^*$.
The econmterican and the market participants do not observe the "true" value of the *crisis prone state* of the economy,$Y_{2,j,t}^*$. Both use a projection of $Y_{2,j,t}^*$ based on the right hand side of Equation (5). Accordingly, let $P_{j,t} = \Pr(Y_{2,j,t} = 1 \mid \cdot)$ be the conditional probability that a country j faces sudden stops in period t. That is,

$$P_{j,t} = \Pr(\beta_2 Z_{j,t} + \gamma_2 D_{1,j,t} + \delta_2 D_{2,j,t} + \phi_2 Y_{1,j,t} > -\varepsilon_{2,j,t}). \tag{6}$$

We assume that $\varepsilon_{2,j,t} \sim N(0,1)$.

Then, the equation for $P_{j,t}$ is given by:

$$P_{j,t} = \Phi\left(\beta_2 Z_{j,t} + \gamma_2 D_{1,j,t} + \delta_2 D_{2,j,t} + \phi_2 Y_{1,j,t}\right), \tag{7}$$

where Φ denotes the cumulative distribution function of the unit normal distribution. The corresponding *projected* probability is given in the form of a Probit equation, as follows.

$$\hat{P}_{j,t} = \Phi\left(\hat{\beta}Z_{j,t} + \hat{\gamma}_2 D_{1,j,t} + \hat{\delta}_2 D_{1,j,t} + \hat{\phi}_2 Y_{1,j,t}\right) \tag{8}$$

For consistency of the (γ_1, δ_1) estimates we use lag variables of the policy regime dummies, $D_{1,j,t-1}$ and $D_{2,j,t-1}$, as instruments. To recover the parameters of interest (γ_1, δ_1) in the growth equation we end up estimating the following equation.

$$Y_{1,j,t} = \beta_1 X_{j,t} + \gamma_1 D_{1,j,t-1} + \delta_1 D_{2,j,t-1} + \phi_1 \Phi^{-1}\left(\hat{P}_{j,t}\right) + \varepsilon_{1,j,t}, \tag{9}$$

Note that the term $\hat{P}_{j,t}$, (in $\Phi^{-1}\left(\hat{P}_{j,t}\right)$) is the projection of the probability of sudden stops that market participants also use when they make investment decisions. This is in contrast to another case in econometrics where the market participants do observe the latent variable but the econometrician does not. In other words, the econometrician and an individual market participant do share in the *same* information set concerning realizations of aggregate variables. Therefore, in the regression equation (9) there is also no need to correct the standard errors estimates of (γ_1, δ_1) , as typically done in the standard case where the market participants and the econometrician do not share the same information.

The confounding effect of policy regimes

What happens if one ignore the crisis probability variable in the growth equation, as has been the case in the literature?
In this case, the estimated growth effects of the instrumented policy-regime dummies $D_{1,j,t}^{IV}$, $D_{1,j,t}^{IV}$ is given by:

$$E\left(\hat{\gamma}_1^{IV}\right) = \frac{\partial E\left(Y_{1,j,t} \mid X_{j,t},\ D_{1,j,t}^{IV},\ D_{2,j,t}^{IV}\right)}{\partial D_{1,j,t}} = \frac{1}{1 - \phi_1\phi_2}\left(\gamma_1 + \phi_1 \frac{\partial \Phi^{-1}\left(\hat{P}_{j,t}\right)}{\partial D_{1,j,t}}\right)$$

and:

$$E\left(\hat{\delta}_1^{IV}\right) = \frac{\partial E\left(Y_{1,j,t} \mid X_{j,t},\ D_{1,j,t}^{IV},\ D_{2,j,t}^{IV}\right)}{\partial D_{2,j,t}} = \frac{1}{1 - \phi_1\phi_2}\left(\delta_1 + \phi_1 \frac{\partial \Phi^{-1}\left(\hat{P}_{j,t}\right)}{\partial D_{2,j,t}}\right)$$

.
Typically, the crisis state has a negative net effect on growth:

$$\phi_1 < 0.$$

Assume that , $\phi_1\phi_2 < 1$.
Because the peg increases the sudden stops probability , whereas the imposition of capital controls lowers the probability, we get:

$$\frac{\partial \Phi^{-1}\left(\hat{P}_{j,t}\right)}{\partial D_{2,j,t}} > 0$$

$$\frac{\partial \Phi^{-1}\left(\hat{P}_{j,t}\right)}{\partial D_{2,j,t}} < 0.$$

Therefore, the IV estimate for the marginal effect of exchange-rate regime on growth is equal to:

$$\left(1 - \phi_1\phi_2\right) E\left(\hat{\gamma}_1^{IV}\right) = \gamma_1 + \phi_1 \frac{\partial E\left(\Phi^{-1}\right)}{\partial D_{1,j,t}} < \gamma_1 > 0.$$

Similarly, the IV estimate for the marginal effect of the imposition of capital controls on growth is equal to:

$$\left(1 - \phi_1\phi_2\right) E\left(\hat{\delta}_1^{IV}\right) = \delta_1 + \phi_1 \frac{\partial E\left(\Phi^{-1}\right)}{\partial D_{2,j,t}} > \delta_1 < 0.$$

This means that if the econometrician ignores the effect on growth of the projected probability of sudden stops the estimate of the direct effect of the peg on growth is biased towards zero. Similarly, the direct effect on growth of the imposition capital controls is also biased towards zero.

Note also that the $\partial E\left(\Phi^{-1}\right)/\partial D_{1,j,t}$ and $\partial E\left(\Phi^{-1}\right)/\partial D_{1,j,t}$ are the *sample average* effects of policy regimes on the crisis probability. But because of the assumption of a normal distribution for the residual of the Probit equation, the effect is *non linear*. This means that , $\frac{\partial E\left(\Phi^{-1}\right)}{\partial D_{2,j,t}} > \frac{\partial\left(\Phi^{-1}\right)}{\partial D_{2,j,t}}$ for countries with strong fundamentals, whereas $\frac{\partial E\left(\Phi^{-1}\right)}{\partial D_{2,j,t}} < \frac{\partial\left(\Phi^{-1}\right)}{\partial D_{2,j,t}}$ for country with weak fundamentals.

Table 1:
The Frequency of Crises, Switches Between Float and Peg and Switches between Capital Controls and Liberalizations (%)

Variable	Frequency
Crsises	22.61
Switches to peg	1.71
Switches to float	3.91
Switches to controls	1.03
Switches to liberalizations	0.9

Table 2:
List of Countries

(1)	Algeria	(51)	Malawi
(2)	Argentina	(52)	Malaysia
(3)	Bangladesh	(53)	Maldives
(4)	Barbados	(54)	Mali
(5)	Belize	(55)	Malta
(6)	Benin	(56)	Mauritania
(7)	Bhutan	(57)	Mauritius
(8)	Bolivia	(58)	Mexico
(9)	Botswana	(59)	Morocco
(10)	Brazil	(60)	Myanmar
(11)	Burkina Faso	(61)	Nepal
(12)	Burundi	(62)	Nicaragua
(13)	Cameroon	(63)	Niger
(14)	Cape Verde	(64)	Nigeria
(15)	Central African	(65)	Oman
(16)	Chad	(66)	Pakistan
(17)	Chile	(67)	Panama
(18)	China	(68)	Papua New Guinea
(19)	Colombia	(69)	Paraguay
(20)	Comoros	(70)	Peru
(21)	Congo	(71)	Philippines
(22)	Cote d'Ivoire	(72)	Portugal
(23)	Dominican Rep.	(73)	Romania
(24)	Ecuador	(74)	Rwanda
(25)	Egypt, Arab Rep	(75)	Sao Tome and Pr
(26)	El Salvador	(76)	Senegal
(27)	Equatorial Guin	(77)	Seychelles
(28)	Ethiopia	(78)	Sierra Leone
(29)	Fiji	(79)	Solomon Islands
(30)	Gabon	(80)	Somalia
(31)	Gambia, The	(81)	South Africa
(32)	Ghana	(82)	Sri Lanka
(33)	Grenada	(83)	St. Vincent
(34)	Guatemala	(84)	Sudan
(35)	Guinea	(85)	Swaziland
(36)	Guinea-Bissau	(86)	Syrian Arab Rep
(37)	Guyana	(87)	Tanzania
(38)	Haiti	(88)	Thailand
(39)	Honduras	(89)	Togo
(40)	Hungary	(90)	Trinidad and To
(41)	India	(91)	Tunisia
(42)	Indonesia	(92)	Turkey
(43)	Iran, Islamic R	(93)	Uganda
(44)	Jamaica	(94)	Uruguay
(45)	Jordan	(95)	Vanuatu
(46)	Kenya	(96)	Venezuela
(47)	Lao PDR	(97)	Western Samoa
(48)	Lesotho	(98)	Zaire
(49)	Liberia	(99)	Zambia
(50)	Madagascar	(100)	Zimbabwe

Table 3:
Exchange Regime and Capital Controls: Cyclical Effects

Panel A: Dependent Variable: Growth Rates

Variables	OLS (i)	OLS (ii)	FE (iii)	FE (iv)
Switching to peg between t-2 to t-1	**1.6423 (0.7503)***	**4.6209 (1.4795)****	**1.2041 (0.9958)**	**5.0215 (1.7630)****
Switching to float between t-2 to t-1	0.1761 (0.6483)	0.6383 (0.6692)	-0.0539 (0.7039)	0.2005 (0.7401)
Switching to Capital Controls between t-2 to t-1	**-1.8832 (0.8616)***	**-4.7173 (1.5363)****	**-1.9592 (1.0495)**	**-6.3843 (2.0713)****
The probability of having currency crisis this year ^		**-9.6164 (5.0663)**		**-12.7791 (4.9934)***

Controllers

	OLS (i)	OLS (ii)	FE (iii)	FE (iv)
1970 GDP per capita	**-0.0012 (0.0005)***	**-0.0011 (0.0005)***	--	--
Currency crisis at time t-1	0.5612 (0.5949)	2.7602 (1.2740)*	0.7579 (0.4506)	2.5482 (0.8331)**
Currency crisis at time t-2	-2.1345 (0.6375)**	-1.5347 (0.7221)*	-1.6442 (0.4525)**	-2.2155 (0.4852)**
Growth rate at time t-1	0.2540 (0.0464)**	0.2552 (0.0469)**	0.1802 (0.0275)**	0.2267 (0.0312)**
Growth rate at time t-2	0.1093 (0.0366)**	0.1048 (0.0372)**	0.0069 (0.0274)	-0.0224 (0.0313)

Panel B: Dependent Variable: Currency Crisis (0,1). 1 if REE(t)-REE(t-1)>15% - Probit (dF/dX) estimators

1970's GDP per capita		0.0000 (0.0000)	--
Switching to peg between t-2 to t-1		**0.3125 (0.0991)***	**0.2893 (0.1028)***
Switching to float t-2 to t-1		**0.0557 (0.0510)**	0.0325 (0.0516)
Switching to Capital Controls between t-2 to t-1		**-0.2656 (0.0470)***	**-0.3313 (0.0524)***
Currency crisis at time t-1		0.2299 (0.0377)**	0.1314 (0.0349)**
Currency crisis at time t-2		0.0563 (0.0296)	-0.0307 (0.0256)
Government def t-1 ^^		0.0000 (0.0000)	0.0000 (0.0000)
Country fixed-effects		**No**	**Yes**

Note:
Data includes 106 countries in the years 1970 to 1997
^ Currency crisis =1 if the real exchange rate increased by 15% between t-1 to t (1 STD)
All specifications include linear time trend
( ) Standard errors in parenthesis
* significant at 5%; ** significant at 1%

Table 4:
Exchange Regime and Capital Controls: Cyclical and Persistent Effects

**Panel A: Dependent Variable: Growth Rates**

Variables	OLS (i)	FE (ii)
Peg at time t-1	-0.6088 (0.2899)*	-0.1813 (0.4787)
Switching to peg between t-2 to t-1	3.9786 (1.2935)**	4.9046 (1.4604)**
Switching to float between t-2 to t-1	0.4657 (0.7124)	0.8090 (0.8382)
Capital Controls at t-1	-1.2843 (0.4539)**	-1.1997 (0.9385)
Switching to Capital Controls between t-2 to t-1	-1.2843 (0.4539)**	-5.9101 (1.7511)**
The probability of having currency crisis this year ^	-7.9131 (6.0140)	-13.7764 (4.4409)**
**Controllers**		
1970 GDP per capita	-0.0013 (0.0006)*	--
Currency crisis at time t-1	2.3069 (1.4183)	2.6221 (0.7543)**
Currency crisis at time t-2	-1.7389 (0.7269)*	-2.3438 (0.4911)**
Growth rate at time t-1	0.2481 (0.0456)**	0.2247 (0.0312)**

**Panel B: Dependent Variable: Currency Crisis (0,1). 1 if REE(t)-REE(t-1)>15% - Probit (dF/dX) estimato**

1970's GDP per capita	0.0000 (0.0000)	--
Peg at time t-1	-0.0192 (0.0221)	0.0368 (0.0361)
Switching to peg between t-2 to t-1	0.2798 (0.1029)**	0.2106 (0.1070)*
Switching to float t-2 to t-1	0.0801 (0.0567)	0.1085 (0.0674)
Capital Controls at t-1	-0.0383 (0.0283)	-0.1021 (0.0639)
Switching to Capital Controls between t-2 to t-1	-0.2491 (0.0513)**	-0.2820 (0.0646)**
Currency crisis at time t-1	0.2264 (0.0373)**	0.1255 (0.0345)**
Country fixed-effects	**No**	**Yes**

Note:
Data includes 106 countries in the years 1970 to 1997
^ Currency crisis =1 if the real exchange rate increased by 15% between t-1 to t (1 STD)
All specifications include linear time trend
( ) Standard errors in parenthesis
* significant at 5%; ** significant at 1%

Table 5:
The Effect of Sudden Stop Crisis and
Dollarization (Foreign Liabilities - Money Supply Ratio) on Growth

Variable	(i)	(ii)	(iii)
Foreign Liabilities - Money Suuply Ratio (FLM)	0.001 (0.042)	-0.001 (0.042)	0.000 (0.042)
Sudden Stop Crisis	-0.881 (0.384)	-0.781 (0.378)	-0.250 (0.431)
Growth at t-1		0.173 (0.021)	0.172 (0.021)
Interaction			
Sudden Stop Crisis * FLM			**-2.384** **(0.931)**
Country fixed effect	Yes	Yes	Yes
Observations	2228	2228	2228

Table 6:
The Effect of Sudden Stop Crisis on Dollarization (Foreign Liabilities - Money Supply Ratio)

Variable	(i)	(ii)	(iii)
Crisis at t-2	-0.034 (0.020)		-0.034 (0.020)
Peg at time t-2	0.042 (0.024)		0.010 (0.028)
Capital Controls at t-2	-0.013 (0.028)		-0.009 (0.028)
The probability of having currency crisis this year^		-0.200 (0.070)	-0.176 (0.083)
Country fixed effect	Yes	Yes	Yes
Observations	1176	1176	1176

Exchange Regime and Capital Controls: Cyclical and Persistent Effects
Fixed Effects Estimates

Panel A: Dependent Variable: Growth Rates

Variables	(i)	(ii)	(iii)
Peg at time t-1	-0.2316	-0.2489	-0.1634
	(0.4719)	(0.4717)	(0.4724)
Switching to peg between t-2 to t-1	**1.7474**	**6.2424**	**8.0168**
	(1.1446)	(1.7852)**	(2.0441)**
Switching to float between t-2 to t-1	-0.1928	0.3147	0.4185
	(0.7819)	(0.8073)	(0.8081)
Fiscal deficit t-1 (Billions)	**0.0001**	**0.0001**	**0.0001**
	(0.0001)	(0.0001)*	(0.0001)*
Capital Controls at t-1	**0.1109**	**-1.7246**	**-2.5289**
	(0.8135)	(0.9276)	(1.0162)*
Switching to Capital Controls between t-2 to t-1	**-1.7266**	**-5.3025**	**-8.1364**
	(1.1289)	(1.7135)**	(2.2228)**
The probability of having currency crisis this year ^		**-13.2526**	**-20.7375**
		(4.2074)**	(5.7751)**
Controllers			
Currency crisis at time t-1	0.6887	2.9102	4.1773
	(0.4698)	(0.8505)**	(1.0817)**
Currency crisis at time t-2	-1.5427	-2.3514	-2.5932
	(0.4726)**	(0.5253)**	(0.5430)**
Growth rate at time t-1	0.1784	0.1681	0.1638
	(0.0281)**	(0.0284)**	(0.0285)**
Growth rate at time t-2	0.0106	0.0022	0.0022
	(0.0280)	(0.0283)	(0.0283)
Durbin-Watson statistic	2.00	2.00	2.00

Table 7 - Cont.

__Panel B: Dependent Variable: Currency Crisis (0,1). 1 if REE(t)-REE(t-1)>15%__

	Probit dF/dX	Linear Probability
Peg at time t-1	0.0287	0.0391
	(0.0371)	(0.0335)
Switching to peg between t-2 to t-1	**0.3053**	**0.2694**
	(0.1253)*	(0.0738)**
Switching to float t-2 to t-1	-0.0121	-0.0065
	(0.0499)	(0.0470)
Capital Controls at t-1	**-0.1521**	**-0.1311**
	(0.0780)	(0.0483)**
Switching to Capital Controls between t-2 to t-1	**-0.2650**	**-0.3181**
	(0.0672)**	(0.0598)**
Currency crisis at time t-1	0.1552	0.1708
	(0.0373)**	(0.0275)**
Currency crisis at time t-1	-0.0469	-0.0483
	(0.0248)	(0.0277)
Fiscal deficit t-1 (Billions)	0.0000	0.0000
	(0.0000)	(0.0000)
Excluded variable		
Total external debt (Billions)	**0.0023**	**0.0023**
	(0.0011)*	(0.0010)*

Note:
Data includes 106 countries in the years 1970 to 1997
^ Currency crisis =1 if the real exchange rate increased by 15% between t-1 to t (1 STD)
All specifications include linear time trend
( ) Standard errors in parenthesis
* significant at 5%; ** significant at 1%

Table 7:
The Effect of Sudden Stop Crisis and
Dollarization (Foreign Liabilities - Money Supply Ratio) on Growth

Variable	(i)	(ii)	(iii)
Foreign Liabilities - Money Suuply Ratio (FLM)	0.001 (0.042)	-0.001 (0.042)	0.000 (0.042)
Sudden Stop Crisis	-0.881 (0.384)	-0.781 (0.378)	-0.250 (0.431)
Growth at t-1		0.173 (0.021)	0.172 (0.021)
Interaction			
Sudden Stop Crisis * FLM			**-2.384 (0.931)**
Country fixed effect	Yes	Yes	Yes
Observations	2228	2228	2228

Table 8:
The Frequency of Sudden Stop and Domestic Prices Crises
Using Reinhart-Rogoff (2004) Classification*,**

		Domestic Price Crises		
		0	**1**	
Sudden Stops Crises	**0**	24.6	9.9	34.5
	1	29.3	36.3	65.5
		53.9	46.1	100.0

Notes:
* Reinhart and Rogoff (2002) classified into 5 categories: (i) peg,
 (ii) limited flexibility, (iii) managed floating , (iv) freely floating and (v) freely falling.
 We aggregate it into 2 main categories: (i) peg_rr, including the first 3 and (ii)
 float_rr, including the other two.
** Data includes 58 countries in the years 1970 to 1997
Domestic prices crisis = 1 if the inflation rate is above 20% per year and 0 otherwise.
Sudden stop crisis = 1 if the real exchange rate depreciation is above 15% per year and 0 otherwise.

Table 9:
Switches Between Float and Peg
Using Reinhart-Rogoff (2004) Classification*,**

Variable	Frequency
Switches to peg	10.18
Switches to float	9.97

Notes:
* Reinhart and Rogoff (2002) classified into 5 categories: (i) peg,
 (ii) limited flexibility, (iii) managed floating , (iv) freely floating and (v) freely falling.
 We aggregate it into 2 main categories: (i) peg_rr, including the first 3 and (ii)
 float_rr, including the other two.
** Data includes 58 countries in the years 1970 to 1997

Table 10:
Exchange Regime and Capital Controls
Using Reinhart-Rogoff (2004) Classification*,**
Fixed-Effects Estimators

**Dependent Variable: Growth Rates**

Variables	(i)	(ii)	(iii)
Peg at time t-1	1.656	1.330	1.729
	(0.557)	(0.549)	(0.565)
Capital Controls at t-1	-0.439	-0.587	0.156
	(0.890)	(0.991)	(1.022)
Switching to Capital Controls between t-2 to t-1	-5.852	-3.374	-6.155
	(1.799)	(1.518)	(1.809)
The probability of having currency crisis this year^ excluding the effect of price crisis	-14.843		-22.359
	(4.937)		(7.996)
The probability of having currency crisis this year - real^^ including the effect of price crisis		-6.824	7.632
		(4.084)	(6.578)
**Controllers**			
Growth rate at time t-1	0.176	0.191	0.183
	(0.034)	(0.034)	(0.034)
Growth rate at time t-2	0.008	0.022	0.019
	(0.035)	(0.035)	(0.035)
Currency crisis at time t-1	2.812	0.917	3.340
	(0.978)	(0.629)	(1.069)
Currency crisis at time t-2	-1.904	-1.804	-1.831
	(0.479)	(0.483)	(0.481)
Price (CPI) crisis at time t-1	-0.100	1.078	-1.251
	(0.491)	(0.772)	(1.133)
Price (CPI) crisis at time t-2	0.385	0.374	0.468
	(0.488)	(0.491)	(0.490)

Notes:
* Reinhart and Rogoff (2002) classified into 5 categories: (i) peg, (ii) limited flexibility, (iii) managed floating
, (iv) freely floating and (v) freely falling. We aggregate it into 2 main categories: (i) peg_rr, including the first 3 and (ii) float_rr, including the other two.
** Data includes 58 countries in the years 1970 to 1997
^ The estimated the likelihood for a currency crisis ignoring the effect of price crisis.
^^ The estimated probability for a currency crisis including the effect of past price crisis
All specifications include linear time trend
( ) Standard errors in parenthesis

Figure 1:
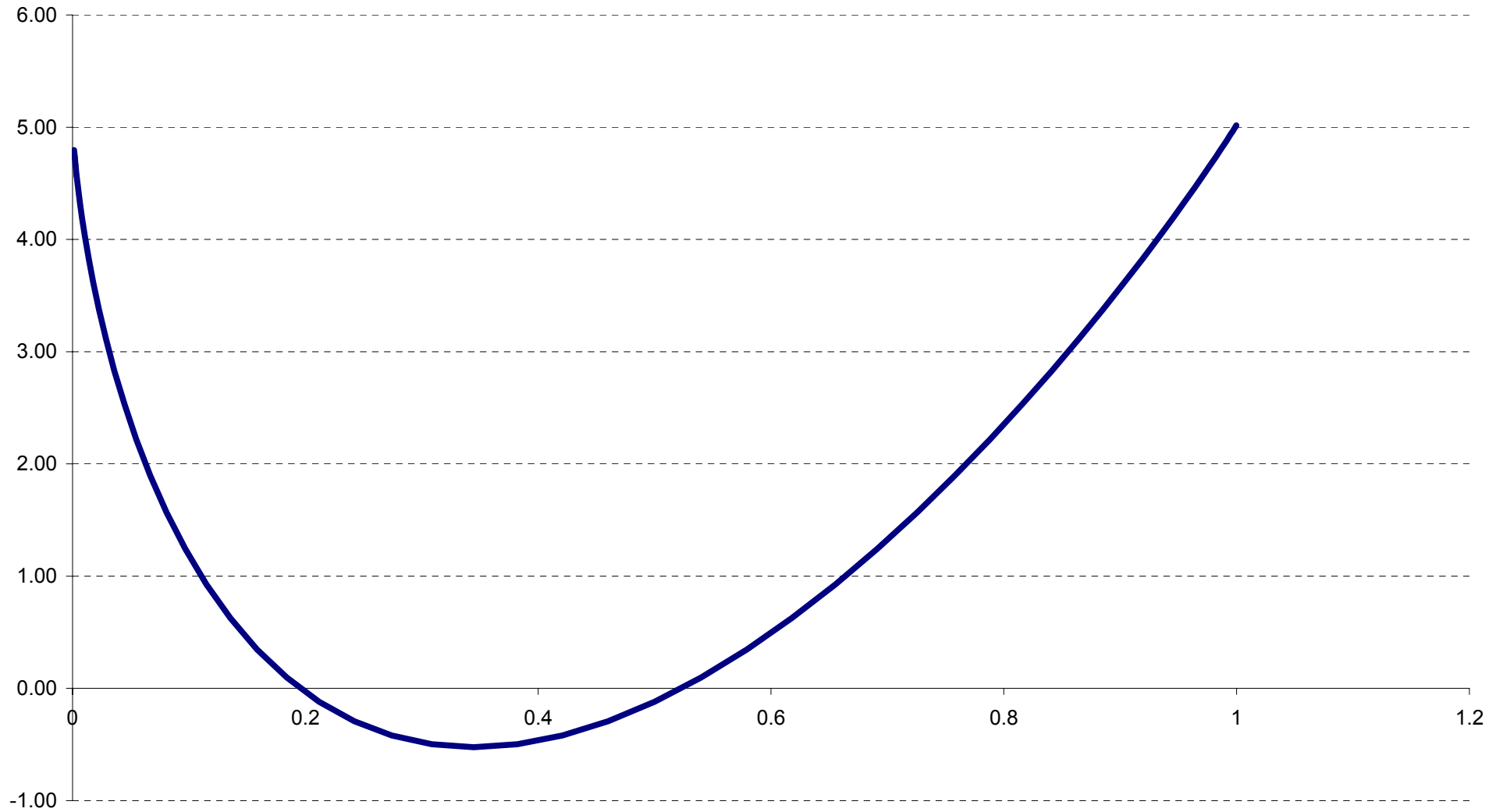**The Marginal Effect of Switiching from Float to Peg on Growth**

Figure 2:
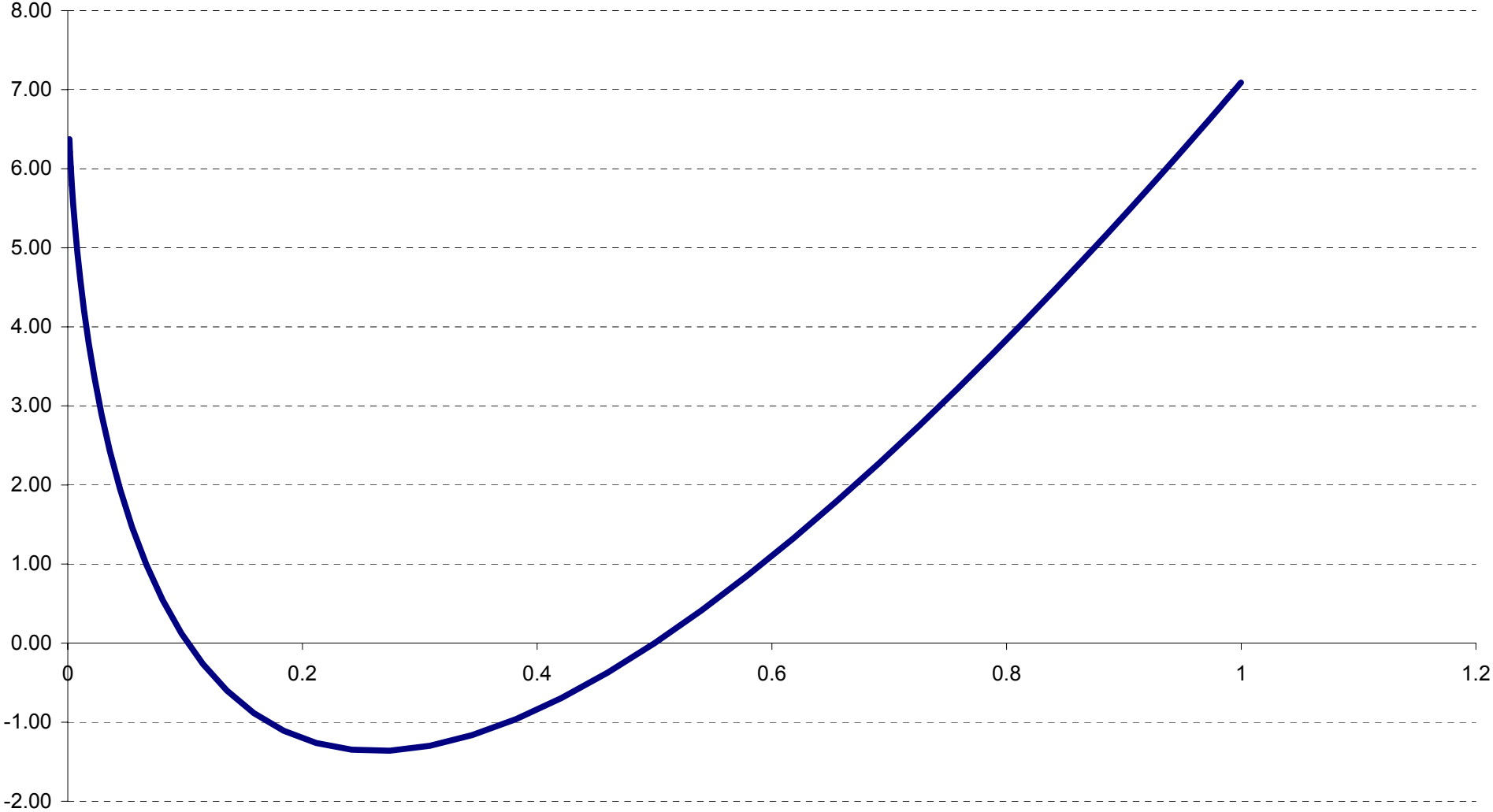**The Marginal Effect of Liberalization in Capital Controls on Growth**

Figure 3:
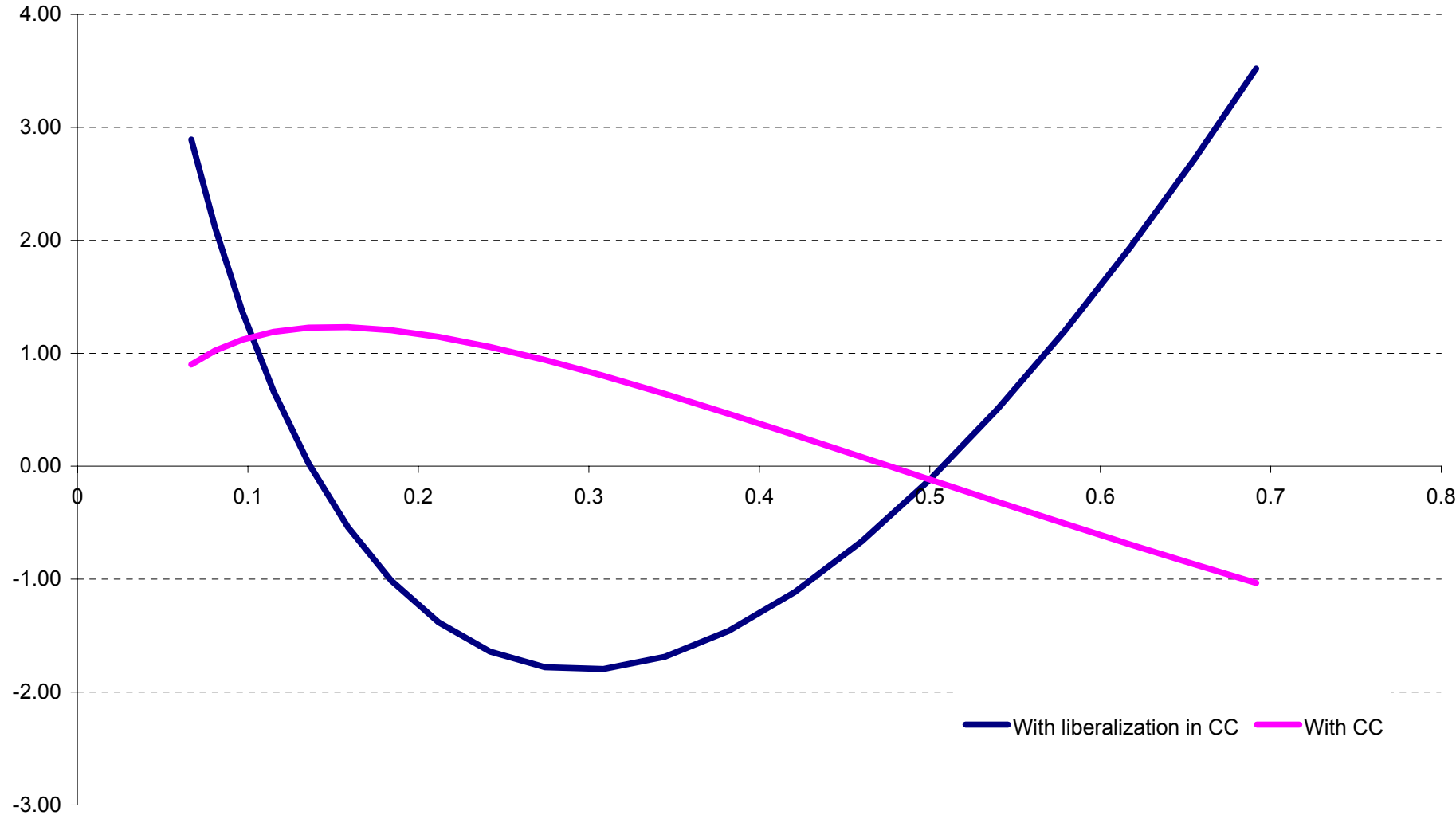**Switching from Float to Peg with and without Capital Controls**

Figure 4:
The Marginal Effect of Switiching from Float to Peg on Growth
by The Foreign Liabilities - Money Suuply Ratio