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FUNDAMENTAL DETERMINANTS OF THE ASIAN CRISIS: THE ROLE OF FINANCIAL FRAGILITY AND EXTERNAL IMBALANCES

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Fundamental determinants of the Asian crisis: the role of financial fragility and external imbalances*

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1 Introduction

Episodes of speculative attacks on currencies in the 1990s (such as the 1992-93 crisis in the European Monetary System, the 1994 Mexican peso collapse, and especially the Asian turmoil of 1997-98) have generated a considerable — and finely balanced — debate on whether currency and financial instability should be attributed to arbitrary shifts in market expectations and confidence, rather than to weaknesses in the state of economic fundamentals.[1] Yet, advocates of both the 'fundamentalist' and the 'non-fundamentalist' views agree in principle that a deteriorating macroeconomic outlook is a necessary condition for an economy to be vulnerable to a crisis. In fact, it is well understood that multiple instantaneous equilibria — which provide the theoretical preconditions for self-fulfilling crises to occur as rational events — are only possible in a region of parameters in which the current or anticipated economic performance of a country is sufficiently weak.

The problematic economic and financial conditions in Southeast Asia in the years preceding the crisis have been documented in a number of recent studies (including our own contributions in Corsetti, Pesenti and Roubini (1999a,b)).[2] A widespread view holds that, while the extent of the plunges in asset prices went beyond what was necessary to restore external balance, weak economic fundamentals were certainly a crucial element of the genesis of the crisis, and also in its spread across countries. In support of this thesis, in this paper we present some preliminary formal evidence on the links between indicators of currency instability in 1997 and a number of indicators of real and financial fragility at the onset of the crisis. The proposed tests do not aim at discriminating among alternative explanations — rather, the goal here

[1] Among recent studies focusing on the large-scale speculative episodes in the 1990s before the Asian crisis, see Eichengreen and Wyplosz (1993) and Buiter, Corsetti and Pesenti (1998a, b) on the European Monetary Systyem crisis of 1992-93, and Sachs, Tornell and Velasco (1996) on the Mexican peso crisis of 1994. A number of recent contributions on financial and balance of payments crises provide a discussion of the issues introduced in this paper — among others see Dornbusch, Goldfajn and Valdes (1995), Milesi-Ferretti and Razin (1996), Mishkin (1996), Kaminsky, Lizondo and Reinhart (1998) and Roubini and Wachtel (1998).

[2] A partial list of recent analyses of the Asian crisis includes Alba *et al.* (1998), Dornbusch (1998), Feldstein (1998), Goldstein (1998), IMF (1998), OECD (1998), Pomerleano (1998), and Radelet and Sachs (1998). A large number of contributions on the crisis are available online on Nouriel Roubini's Asian Crisis Homepage at www.stern.nyu.edu/~nroubini/asia/AsiaHomepage.html.

is to provide a set of baseline results to complement and integrate previous analyses pointing at the fragile state of the Southeast Asian economies before the eruption of the crisis.

One of the interesting pieces of evidence that corroborates the fundamental interpretation of the crisis is that well-performing Asian countries were spared its most pervasive consequences. Taiwan, Singapore, and Hong Kong were, relatively speaking, less affected by the regional turmoil. The Hong Kong currency parity was maintained despite strong speculative attacks. Taiwan and Singapore decided to let their currency float rather than lose reserves by attempting to stabilize the exchange rate; however, the depreciation rates of their currencies were modest, and, most importantly, these countries did not experience drastic reversals in market sentiment, financial panic and large-scale debt crises.

The three countries that were only mildly affected by the turmoil shared a number of characteristics: first, their trade and current account balances were in surplus in the 1990s; second, their foreign debt was low (Taiwan was a net foreign creditor towards BIS banks); third, their financial and banking systems did not suffer from the same structural weaknesses and fragility observed in the crisis countries; fourth, they had a relatively large stock of foreign exchange reserves compared to the crisis countries; fifth, they were to a large extent immune from forms of 'crony capitalism', that is, from the system of intermingled interests among financial institutions, political leaders and corporate elites that was characteristic of Korea, Indonesia, Malaysia and Thailand.[3] In principle, China also falls in the category of countries that were not too exposed to disruptive speculative pressure — the Chinese currency did not depreciate in 1997. However, the presence of constraints on capital mobility make it difficult to compare the performance of this country with the other three.

Conversely, the countries that came under attack in 1997, as a group, had the largest current account deficits throughout the 1990s. While the degree of real appreciation over the 1990s differed widely across Asian countries, with the important exception of Korea all the currencies that crashed in 1997 had experienced a real appreciation.

[3]Note that the crisis of the Philippines, a country with better fundamentals and a less fragile financial system than other countries in the region, was also relatively contained. Even though the exchange rate plunged and the stock market dropped by over 30% in 1997, this country did not experience the extent of the turmoil and financial panic that hit Korea, Thailand, Indonesia and Malaysia.

The literature has pointed out several factors that contributed to the deterioration of fundamentals in the region. The region experienced significant negative terms of trade shocks in 1996, with the fall in price of semi-conductors and other goods. For most countries hit by the crisis, the long stagnation of the Japanese economy had led to a significant slowdown of export growth. Close to the onset of the crisis, the abortive Japanese recovery of 1996 was overshadowed by a decline in activity in 1997. Last but not least, the increasing weight of China in total exports from the region enhanced competitive pressures over the period.

On the financial side, there is a large body of evidence showing that the corporate, banking and financial systems of the crisis countries were very fragile — poorly supervised, poorly regulated, and already in shaky conditions before the onset of the crisis. The evidence suggests a sustained lending boom in the Philippines, Thailand and Malaysia – strikingly, these were also the first countries to be hit by currency speculation in 1997. It also suggests a severe mismatch between foreign liabilities and foreign assets of Asian banks and non-bank firms. Domestic banks borrowed heavily from foreign banks but lent mostly to domestic investors.[4]

By the end of 1996, a share of short-term foreign liabilities above 50% was the norm in the region. At the same time, the ratio between M2 and foreign reserves in most Asian countries was dangerously high: in the event of a liquidity crisis — with BIS banks no longer willing to roll-over short-term loans — foreign reserves in Korea, Indonesia and Thailand were insufficient to cover short-term liabilities, let alone to service interest payments and to repay the principal on long-term debt coming to maturity in the period. One could certainly hold the view that the creditors' 'panic' in Korea and Indonesia purely resulted from a standard 'collective action' problem faced by a large number of creditors in their decisions whether to roll-over existing credits or call in their loans.[5] It should also be recognized that market reactions took place under conditions of extreme political uncertainty, low credibility of the existing governments, and skepticism about the direction of, and the commitment to, structural reforms.

Although Asian countries were characterized by very high savings rates throughout the 1990s, the deficiencies of their financial sector posed a severe

[4]On the role of moral hazard in generating such 'overborrowing' syndrome, see McKinnon and Pill (1996), Krugman (1998) and Corsetti, Pesenti and Roubini (1999a).

[5]See *e.g.* Chang and Velasco (1998a,b).

burden on the fiscal balances of the affected countries. Such costs represented an implicit fiscal liability not reflected by data on public deficits until the eruption of the crisis but large enough to affect the sustainability of the pre-crisis current account imbalances. The size of this liability contributed to generate expectations of drastic policy changes (a fiscal reform required to finance the costs of financial bailouts) or currency devaluations (as a result of higher recourse to seigniorage revenues).[6]

This paper reports and discusses a number of tests of the empirical relevance of the set of macroeconomic factors recalled above. In our tests we compare the performance of all the Asian countries subject to pressures in 1997 with the performance of other emerging economies, for a total sample of 24 countries whose selection has been determined by data availability.[7]

The paper is organized as follows. In section 2, we present a summary of the analytical model that is the basis of the empirical tests in the paper. In section 3, we present the results of our empirical analysis. Next, in section 4 we elaborate on the role played by the banking crisis and the financial distress of over-leveraged firms in explaining the financial crisis in Asia in the last two years. Section 5 presents a summary of economic developments in Asia and the spread of the contagion from the East Asian region to a global crisis in 1998. Section 6 presents some concluding remarks.

2 A model of the Asian crisis

After the outburst of the currency and financial crises in Southeast Asia in the summer of 1997, many observers noted that the traditional conceptual and interpretive schemes[8] did not appear, *prima facie*, to fit the data well and fell short in a number of dimensions.

A first reason is the role of fiscal imbalances. At the core of 'first generation' (or 'exogenous-policy') models of speculative attacks á-la-Krugman (1979) and Flood and Garber (1984), the key factor that explains the loss of

[6]See Corsetti, Pesenti and Roubini (1998a) and Burnside, Eichenbaum and Rebelo (1998).

[7]The countries are Argentina, Brazil, Chile, China, Colombia, Czech Republic, Hong Kong, Hungary, India, Indonesia, Jordan, Korea, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Singapore, Sri Lanka, Taiwan, Thailand, Turkey and Venezuela.

[8]See Buiter, Corsetti and Pesenti (1998a), Calvo (1998), Calvo and Vegh (1998), Cavallari and Corsetti (1996) and Flood and Marion (1998) for recent surveys.

reserves leading to a crisis is the acceleration in domestic credit expansion related to the monetization of fiscal deficits. In the case of Southeast Asia, the pre-crisis budget balances of the countries suffering from speculative attacks were either in surplus or limited deficit.

In 'second generation' (or 'endogenous-policy') models of currency crisis governments rationally choose — on the basis of their assessment of costs and benefits in terms of social welfare — whether or not to maintain a fixed rate regime. A crisis can be driven by a worsening of domestic economic fundamentals, or can be the result of self-validating shifts in expectations in the presence of multiple equilibria,[9] provided that the fundamentals are weak enough to push the economy in the region of parameters where self-validating shifts in market expectations can occur as rational events. The indicators of weak macroeconomic performance typically considered in the literature focus on output growth, employment, and inflation. In the Asian economies prior to the 1997 crisis, however, GDP growth rates were very high and unemployment and inflation rates quite low.

In Corsetti, Pesenti and Roubini (1999) we have suggested a formal interpretive scheme that, while revisiting the classical models, brings forward new elements of particular relevance for the analysis of the 1997-98 events. Specifically, we have analyzed financial and currency crises as interrelated phenomena, focusing on moral hazard as the common factor underlying the 'twin' crises.[10]

At the core of our model is the consideration that, counting on future bailout interventions, weakly regulated private institutions have a strong incentive to engage in excessively risky investment. A bailout intervention

[9] See among others Obstfeld (1994), Cole and Kehoe (1996) and Sachs, Tornell and Velasco (1996). If investors conjecture that a country's government will eventually devalue its currency, their speculative behavior raises the opportunity cost of defending the fixed parity (for instance, by forcing a rise in short-term interest rates), thus triggering a crisis in a self-fulfilling way. Note that multiple equilibria can arise even in 'first-generation' models (see for instance Obstfeld (1986)). Somewhat confusingly, the literature occasionally identifies 'first-generation' models with unique equilibria, and 'second-generation' models with multiple equilibria. A classification of the models based on exogenous versus endogenous policies provides a more accurate taxonomy.

[10] Among recent contributions to the literature on the 'twin' crises see *e.g.* Velasco (1987), Kaminsky and Reinhart (1997), Goldfajn and Valdes (1997), Kumhof (1997), Chang and Velasco (1998a,b). The role of moral hazard in the onset of the Asian crisis has been discussed by a number of authors. See *e.g.* Krugman (1998), Greenspan (1998), Fischer (1998).

can take different forms, but ultimately has a fiscal nature and directly affects the distribution of income and wealth between financial intermediaries and taxpayers: an implicit system of financial insurance is equivalent to a stock of contingent public liabilities that are not reflected by debt and deficit figures until the crisis occurs.

These liabilities may be manageable in the presence of firm-specific, or even mild sector-specific shocks. They become a concern in the presence of cumulative sizable macroeconomic shocks, which fully reveal the financial fragility associated with excessive investment and risktaking. While fiscal deficits before a crisis are low, the bailouts represent a serious burden on the *future* fiscal balances. The 'currency' side of a 'financial' crisis can therefore be understood as a consequence of the anticipated fiscal costs of financial restructuring, that generate expectations of a partial monetization of future fiscal deficits and a fall in economic activity induced by the required structural adjustment.

Expectations of a future bailout need not be based on an explicit promise or policy by the government. Bailouts can be rationally anticipated by both domestic and foreign agents even when no public insurance scheme is in place and the government explicitly disavows future interventions and guarantees in favor of the corporate and banking sectors. In his celebrated analysis of currency and financial crises of the early 1980s, Carlos Díaz-Alejandro stresses the time-consistency problem inherent in moral hazard:

> *"Whether or not deposits are explicitly insured, the public expects governments to intervene to save most depositors from losses when financial intermediaries run into trouble. Warnings that intervention will not be forthcoming appear to be simply not believable."*[11]

This is because no *ex-ante* announcement by policy-makers can convince the public that, *ex-post* (that is, in the midst of a generalized financial turmoil) the government will cross its arms and let the financial system proceed towards its debacle. Agents will therefore expect a bailout regardless of "*laissez-faire commitments*" — in the words of Díaz-Alejandro[12] — "*which a misguided minister of finance or central bank president may occasionally utter in a moment of dogmatic exaltation*".

[11] Díaz-Alejandro (1985), p.374.

[12] Ib., p.379.

To summarize, in our model private agents act under the presumption that there exists public guarantees on corporate and financial investment, so that the return on domestic assets is perceived as implicitly insured against adverse circumstances. To the extent that foreign creditors are willing to lend against future bailout revenue, unprofitable projects and cash shortfalls are re-financed through external borrowing. Such a process translates into an unsustainable path of current account deficits.

While public deficits need not be high before a crisis, the eventual refusal of foreign creditors to refinance the country's cumulative losses forces the government to step in and guarantee the outstanding stock of external liabilities. To satisfy solvency, the government must then undertake appropriate domestic fiscal reforms, possibly involving recourse to seigniorage revenues through money creation. Speculation in the foreign exchange market, driven by expectations of inflationary financing, causes a collapse of the currency and anticipates the event of a financial crisis.

Financial and currency crises thus become indissolubly interwoven in an emerging economy characterized by weak cyclical performances, low foreign exchange reserves, and financial deficiencies eventually resulting into high shares of non-performing loans. Our empirical exercise below is cast within this conceptual framework. Adopting the methodology suggested in previous studies,[13] in the next sections we first construct a 'crisis index' as a measure of speculative pressure on a country currency. Then, we compute a set of indexes of financial fragility, external imbalances, official reserves adequacy and fundamental performance. Finally we report the results of the regressions of the crisis index on the above indexes.[14]

3 A preliminary empirical assessment

3.1 The crisis index

Our crisis index (IND) is a weighted average of the percentage rate of exchange rate depreciation relative to the US dollar — if such depreciation can be deemed as abnormal, as explained below — and the percentage rate of

[13] See *e.g.* Eichengreen, Rose and Wyplosz (1996), Sachs, Tornell and Velasco (1996), and Kaminsky, Lizondo and Reinhart (1998).

[14] Recent empirical studies of the causes of the Asian crisis include Berg and Pattillo (1998) and Alba *et al.* (1998).

change in foreign reserves between the end of December 1996 and the end of December 1997.[15] The logic underlying the index IND is quite simple. A speculative attack against a currency is signalled either by a sharp depreciation of the exchange rate or by a contraction in foreign reserves which prevents a devaluation.[16] We present the values for IND in Table 1: a large negative value for IND corresponds to a high devaluation rate and/or a large fall in foreign reserves, *i.e.* a more severe currency crisis.

In evaluating the crisis index we need to control for the fact that, in some countries, a high rate of depreciation in 1997 may reflect a past trend rather than severe speculative pressures. For example, the fact that the Turkish currency depreciated by over 50% in 1997 should not be interpreted as a signal of 'crisis,' as chronically high inflation rates in Turkey over the 1990s have been associated with 'normally' high depreciation rates.[17]

There is no obvious way to purge the sample of the effects of trend depreciations not associated with a crisis. In this study, we take the following approach: if a currency in 1997 has fallen in value by less than its average depreciation rate in the 1994-1996 period, we consider this as being part of a trend depreciation and set the 1997 depreciation rate equal to zero in constructing the index.[18] In our sample, such screening procedure leads to a significant re-sizing of the crisis index for two high-depreciation countries: Turkey and Venezuela.

As Table 1 shows, in 1997 the countries that appear to have been hit by the most severe crises are, in order, Thailand, Malaysia, Korea, Indonesia, Philippines and the Czech Republic. Among Asian countries, the currencies of Singapore and Taiwan were also moderately devalued in 1997, but these

[15]The weights assigned to exchange rate and reserves changes in IND are respectively 0.75/0.25. For the purpose of sensitivity analysis, we consider alternative crisis indexes with different weights, and find that the choice of the weight coefficients is not crucial to our results. Also, alternative tests with different samples of shorter size provide similar results. All tests are available upon request.

[16]While of course an increase in domestic interest rates may also signal a frustrated speculative attack, our crisis index excludes changes in interest rates. This is because an increase in interest rates in the presence of speculative pressures is highly correlated with non-sterilized foreign exchange intervention leading to a fall in reserves.

[17]Note that Turkey exhibited a satisfactory economic performance in 1997, with GDP growing over 6% and its stock market being a leading performer among emerging countries.

[18]Other authors use a different approach to the same problem. For example, Sachs, Tornell and Velasco (1996) control for the variance of the exchange rate and reserves in the last 10 years.

two countries were not subject to such extensive and dramatic financial turmoils as the ones affecting other East Asian economies. Conversely, outside the Asian region the Czech Republic appears as a crisis country[19] since its currency, which had been pegged since 1992, suffered a severe speculative attack in the spring of 1997 leading to a devaluation.[20]

3.2 Indexes of financial fragility

Measures of banking system weakness are provided by the stock of non-performing loans as a share of total assets in 1996 (NPL)[21] and an index of 'lending boom' (LB), defined as the growth of commercial bank loans to the private sector (as percentage of GDP) in the period 1990-96. The latter is an indirect measure of financial fragility suggested by Sachs, Tornell and Velasco (1996).[22] Both variables (NPL and LB) are reported in Table 1.

[19]The Czech Republic shared many symptoms with the Asian crisis countries: a fixed exchange rate regime maintained for too long, a severe real appreciation, a dramatic worsening of the current account, and a weak banking system with large shares of non-performing loans.

[20]Note that we limit our sample to devaluations in 1997 to try to test whether the devaluations during that year can be explained by fundamentals. During 1998, a number of the crisis countries in Asia (namely Korea, Thailand and Indonesia) experienced some degree of appreciation of their currencies. However, such appreciation were the result of macroeconomic adjustment policies and implementation of structural reforms. Also, while some currencies appreciated relative to their bottom values in early 1998, they remained through 1999 depreciated relative to their pre-crisis levels. Note also that some countries in the sample experience currency and financial crisis in 1998 and 1999, outside our sample period. Specifically, Brazil was eventually forced to devalue its currency in January 1999 while Pakistan experienced a severe currency and banking crisis in 1998. The case of Pakistan fits very well our model of the crisis: this country had already in 1997 a very fragile banking system with a large stock of non-performing loans that led to a severe banking crisis in 1998. Also, a large current account deficit added to the external financing problem of the country. Brazil, instead, did not experience a banking crisis but had an overvalued currency and a large current account deficits, two factors that enter significantly in our empirical analysis. Also note that our sample does not include two countries, Russia and Ecuador, that experienced a severe currency and banking crisis in 1998-99. Adding these two countries to an extended sample would have strengthened the results of the our empirical analysis.

[21]In the Appendix we describe in detail our methodology to estimate the series NPL.

[22]These authors argue that such a measure is a proxy for financial fragility as the quality of bank loans is likely to deteriorate significantly — and a large fraction is likely to become non-performing — when bank lending grows at a rapid pace in a relatively short period of time.

We adopt two indicators of domestic financial fragility. The first one encompasses the information in both NPL (non-performing loans) and LB (lending boom) and is defined as follows: if the sign of the lending boom in the 1990s is positive, we assign to the new indicator $NPLB$ the original value of NPL; if the lending boom in the 1990s is negative, we set $NPLB$ equal to zero:[23]

$$NPLB = \begin{cases} NPL & \text{if} \quad LB > 0 \\ \\ 0 & \text{if} \quad LB \leq 0 \end{cases}$$

As regards the second indicator, note that according to the theoretical model presented in Corsetti, Pesenti and Roubini (1999a) the vulnerability of a country to currency and financial crises increases with the implicit fiscal costs of financial bailouts. Under the maintained hypothesis that the time series of NPL provides information about the size of the overall bailout in the event of a crisis, we can obtain a statistical *proxy* for the associated fiscal costs by taking the ratio of non-performing loans to GDP in 1996. This series is denoted $NPLY$, and is defined as the product of NPL and commercial bank loans to the private sector as a share of GDP in 1996. This variable allows us to properly assess the performance of those countries with low ratios of bank loans to GDP but relatively large non-performing loans as a share of banking assets (*e.g.* India and Pakistan). In those countries, the contingent fiscal liabilities related to bailout costs are smaller relative to countries with a similar NPL, but have a higher ratio of bank lending to GDP.

3.3 Indexes of current account imbalances

Table 1 reports the average current account balance as a share of GDP in the 1994-1996 period (CA) and the real exchange rate appreciation in the 1990s (RER). There is no simple way to assess when a current account balance is sustainable (*e.g.*, when it is driven by investment in sound projects) and when it is not (*e.g.*, when it reflects a structural loss of competitiveness), or to what extent a real appreciation is due to misalignment, as opposed to an appreciation of the fundamental equilibrium real exchange rate. However, the consensus in the empirical literature on crisis episodes is that the *combi-*

[23] The logic of the $NPLB$ variable is straightforward: non-performing loans represent a source of severe tension only when observed in tandem with excessive bank lending that enhances the vulnerability of the country to a crisis.

nation of a sizable current account deficit and a significant real appreciation represents a worrisome signal of external imbalance.

Consistent with this view, we construct an index of *current account imbalance*, CAI, defined as follows: if the rate of real exchange rate appreciation is above a given threshold T, CAI is equal to the current account balance (as a share of GDP); if the real appreciation is below the threshold (or there is a real depreciation), CAI is set equal to zero:[24]

$$CAI = \begin{cases} CA & \text{if } RER \text{ appreciates by more than } T \\ & (T = 0,\ 10\%) \\ 0 & \text{otherwise} \end{cases}$$

3.4 Indexes of foreign reserves adequacy and fundamentals performance

Other things being equal, the vulnerability of a country to a currency crisis is higher when reserves are low relative to some measure of domestic liquid assets or short-term foreign debt. To assess the role played by reserves availability, we construct three different measures: the ratio of $M1$ to foreign exchange reserves ($M1/RES$), the ratio of $M2$ to foreign reserves ($M2/RES$), and the ratio of the foreign debt service burden (i.e. short-term foreign debt plus interest payments on foreign debt) to foreign reserves (STD/RES). The values of these variables are reported in Table 1.

To test for the joint role of fundamentals and foreign reserves in determining a currency crisis, we classify the countries in our sample as being *strong* or *weak* with regards to these two dimensions using dummy variables. Regarding foreign reserves, we use a broad classification according to which a country is strong if the ratio of $M2$ to reserves is in the lowest quartile of the sample. The resulting dummy variable for low reserves, $D2^{LR}$, is defined as:

$$D2^{LR} = \begin{cases} 1 & \text{if } M2/RES \text{ above lowest sample quartile} \\ 0 & \text{otherwise} \end{cases}$$

Similar dummies are created by replacing $M2/RES$ with $M1/RES$ and STD/RES; such dummy variables are labelled $D1^{LR}$ and $D3^{LR}$.

[24] In the tables, we present regression results for the 10% threshold, but similar results are obtained for the zero threshold.

In regards to fundamentals, we focus on current account imbalances and financial fragility. Countries are classified as being *strong* or *weak* according to the scheme:

$$D^{WF} = \begin{cases} 1 & \text{if either } CAI \text{ in highest sample quartile} \\ & \text{or } NPLB \text{ in lowest sample quartile} \\ 0 & \text{otherwise} \end{cases}$$

A similar dummy can be obtained by replacing $NPLB$ with $NPLY$.[25]

3.5 Testing for the role of fundamentals imbalances in the crisis

3.5.1 Financial fragility and external imbalances

The results of the regression of IND on CAI and $NPLB$ are shown in column (1) of Table 2. The coefficients of the two regressors have the expected sign and are statistically significant at the 5% level: both a large current account deficit associated with a real appreciation and a larger rate of non-performing loans associated with a lending boom worsen the crisis index. In columns (2)-(4) we interact the two regressors with the dummies for low reserves. The coefficients β_2 and β_3 measure the effects of CAI and $NPLB$ on the crisis index in countries with high reserves ($D^{LR} = 0$); conversely, the sums of the coefficients $\beta_2 + \beta_4$ and $\beta_3 + \beta_5$ measure the impact of fundamental imbalances on the crisis index in countries with low reserves ($D^{LR} = 1$).

Looking at the regression results shown in columns (2)-(4), the coefficients β_2 and β_3 are not significant on their own, but rather only when reserves are low. In fact, for the case in which we use the reserve dummy $D2^{LR}$, based on $M2$ data, the Wald tests indicate that the hypotheses $\beta_2 + \beta_4 = 0$ and $\beta_3 + \beta_5 = 0$ can be rejected at the 1% and 10% significance levels[26]. Similar or stronger results are obtained when we use the other two low-reserves dummies, $D1^{LR}$ and $D3^{LR}$. As a whole, these results suggest that structural imbalances (current account deficits/currency appreciation and

[25] In this case, the dummy variable would be equal to zero for countries with our index of current account imbalance (CAI) in the highest quartile of the sample, or with a rate of non-performing loans as a share of GDP, *i.e.* $NPLY$, in the lowest quartile of the sample; it would be equal to one otherwise.

[26] Their *p-values* are 0.005 and 0.09 respectively.

non-performing loans/lending boom) play a role in the onset of a crisis to the extent that there is insufficient availability of foreign reserves — that is, in the light of both fundamental and non-fundamental models of currency crises, low reserves enhance the vulnerability of the economy to speculative attacks.

In Table 3 we test whether the effects of current account imbalances CAI on the crisis index depend on weak fundamentals D^{WF} and low reserves $D2^{LR}$. Relative to column (2) of Table 2, in column (1) of Table 3 we consider an additional regressor, namely an interaction term equal to CAI times $D2^{LR}$ times D^{WF}. In this case, the sum of the coefficients $\beta_2+\beta_4+\beta_6$ captures the effects of current account imbalances on the crisis index in countries with low reserves and weak fundamentals. If $\beta_2+\beta_4+\beta_6$ is positive while $\beta_2+\beta_4$ is not significantly different from zero, the crisis index worsens when a high-deficit country with an appreciated currency meets both 'weak fundamentals' and 'low reserves' criteria, but the crisis index does not respond to the reserves indicator if such a country is in the 'strong fundamentals' region. The results of the Wald tests show that $\beta_2+\beta_4+\beta_6$ is indeed significantly positive at the 1% significance level, while $\beta_2+\beta_4$ is not significantly different from zero.[27]

Column (2) of Table 3 includes a similar test for the role of non-performing loans. Here we add an additional regressor to those of column (2) in Table 2, which is an interaction term equal to $NPLB$ times $D2^{LR}$ times D^{WF}. Thus, the sum of the coefficients $\beta_3+\beta_5+\beta_7$ captures the effects of non-performing loans on the crisis index in countries that meet both 'low reserves' and 'weak fundamentals' criteria. Our tests show that $\beta_3+\beta_5+\beta_7$ is negative at the 5% significance level while $\beta_3+\beta_5$ is not significantly different from zero. The crisis index depends on non-performing loans in countries with weak fundamentals and weak reserves, but not in countries with strong fundamentals and weak reserves. The implication of these results is that a crisis need not be related to current account imbalances or bad loans *per se*: such imbalances represent a source of severe tension only when they are observed in parallel with fundamental *and* reserve weaknesses.[28]

[27]Note also that the coefficient on $NPLB$ (β_3) is still significantly different from zero in this regression.

[28]In column (3) of Table 3, we consider interactions of both CAI and $NPLB$ with the dummies for weak fundamentals and low reserves. The results for $NPLB$ are similar to those in column (2). For the current account, instead, we fail to reject the hypothesis that both $\beta_2+\beta_4+\beta_6$ and $\beta_2+\beta_4$ are equal to zero. Formal tests such as the variance inflation test suggest that this is due to multicollinearity between the two interaction terms: when

3.5.2 Fiscal implications of financial fragility

Next, in Tables 4 and 5 we perform regressions similar to those in Tables 2 and 3, but now we move our focus away from financial fragility and onto the role of the fiscal implications of financial fragility. We therefore substitute $NPLB$ — the non-performing loans ratio adjusted to account for the lending boom — with $NPLY$ — a more direct *proxy* for the implicit fiscal costs of banking sector bailouts.

The results are very similar and, if anything, even stronger than those obtained in Tables 2 and 3. First, as Table 4 column (1) shows, both $NPLY$ and CAI are statistically significant regressors of the crisis index (at the 5% level and 1% level respectively). Second, columns (2)-(4) of Table 4 confirm that the effects of current account deficits are more relevant when reserves are low.[29] The results of columns (2)-(3) in Table 4 are worth emphasizing. Note that the coefficient on $NPLY$, β_3, maintains the predicted sign and is statistically significant on its own at the 5% level. This suggests that non-performing loans as a share of GDP — that is, as a measure of the intrinsic fiscal burden — affect the crisis index regardless of whether reserves are low or high.

In Table 5 we present results of regressions equivalent to those in Table 3, again using $NPLY$ instead of $NPLB$. Once again, current account deficits and non-performing loans matter if both reserves and fundamentals are weak.[30] However, observe that the coefficient on $NPLY$ tends to maintain the expected sign and be statistically significant on its own, affecting the crisis index *regardless* of whether reserves are low or high, as well as *regardless* of whether fundamentals are weak or not.[31]

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they both appear in a regression, the effects of CAI are swamped by those of $NPLB$.

[29] The *p-values* on the Wald tests for $\beta_2 + \beta_4 = 0$ are 0.001, 0.002 and 0.016 respectively in columns (2), (3) and (4), under the three different measures of low reserves.

[30] These are the implications of the Wald tests on $\beta_2 + \beta_4 + \beta_6 = 0$ in column (1) and $\beta_3 + \beta_5 + \beta_7 = 0$ in columns (2) and (3). The failure to reject $\beta_2 + \beta_4 + \beta_6 = 0$ in column (3) is again due to multicollinearity between 'CAI times $D2^{LR}$ times D^{WF}' and '$NPLY$ times $D2^{LR}$ times D^{WF}'.

[31] To test for the robustness of our results we perform a number of other tests. First, we use two other indicators of crisis that give more weight to reserve losses relative to exchange rate depreciation; our qualitative results remain the same. As reported in Tables 2-5, the results are also robust to the use of three alternative definitions of low reserves. Next, we test whether the significance of CAI is sensitive to the threshold for the real exchange rate appreciation; instead of a 10% trigger we use a 0 trigger and obtain the same qualitative results. The significance of the two non-performing loans measures $NPLB$ and $NPLY$ is

3.5.3 Real and financial weaknesses

Finally, we attempt to test whether direct measures of capital productivity have explanatory power as regressors of the crisis index. Conventional wisdom holds in that borrowing from abroad is less 'dangerous' for external sustainability if it finances new investment (leading to increased productive capacity and to higher future export receipts) rather than consumption (which implies lower saving). For these reasons, a current account deficit that is accompanied by a fall in savings rates is regarded as more problematic than a deficit accompanied by rising investment rates.

Underlying such 'conventional' conclusions, however, is the implicit assumption that the return on investment is at least as high as the cost of the borrowed funds.[32] As evidence on the profitability of the investment projects we employ a standard measure of investment efficiency, the $ICOR$ or 'incremental capital output ratio' defined as the ratio between the investment rate and the output growth rate. In Corsetti, Pesenti and Roubini (1999b), we document that, for all the Asian countries except Indonesia and the Philippines, the $ICOR$ had increased sharply in the 1993-96 period relative to the previous three years 1987-1992. This evidence suggests that the efficiency of investments in South East Asia was already falling in the four years prior to the 1997 crisis.

Here, we derive a measure of the $ICOR$ for all the countries in our sample in the period 1993-1996. We then test for its significance in our basic regression model.[33] We find that the $ICOR$ variable is generally not significant; however, a simple transformation of the $ICOR$ is significant in some regressions. We then define a new variable, $ICORLB$, which is equal to the original $ICOR$ when the lending boom variable is positive, and is equal to zero when the lending boom is negative. The idea here is that low capital

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also invariant with respect to modification of the definitions of these variables. All these results are available upon request.

[32] Also implicit is the assumption that high investment rates contribute to the enhancement of productive capacity in the traded sector. If the investment boom is confined to the non-traded sector (commercial and residential construction, as well as inward-oriented services), in terms of sustainability analysis the contribution of such investment projects to future trade surpluses — thus to the ability of the country to repay its external debt obligations — is limited to their indirect impact on the productivity of the traded sector. The two 'implicit' assumptions above need not hold in the Asian case.

[33] Recall that the $ICOR$ measures the ratio of the share of investment in GDP to the growth rate of output.

profitability is not problematic in itself if the corporate and financial sectors are able to properly assess the characteristics of the investment projects, but may significantly contribute to the build-up of tensions in the financial markets if there is a lending boom and excessive credit growth – perhaps driven by moral hazard and implicit guarantees on investment by the public sector. When we regress the crisis index on the $ICORLB$ variable and $NPLY$ we find that both variables have the expected sign and are statistically significant.[34]

4 The role of banking crises and their fiscal costs

4.1 Banking and currency crises in the 1990s

Our interpretation of the Asian crisis has stressed the role played by weaknesses in the financial and banking system in triggering the currency crisis in 1997-98. It is interesting to note that many other episodes of currency crisis in the 1990s, other than the Asian one, were associated with banking crises. In Mexico, the financial system was very fragile even before the peso crisis of 1994 (see Krueger and Tornell (1999)) and a severe banking crisis emerged after the collapse of the peso. While some have suggested that the Mexican banking crisis was the result of the double shock of devaluation and high real interest rates in 1995 on the balance sheets of the financial and corporate firms, a closer look at the data suggests that the banking system was already on the verge of a crisis before the onset of the crisis. Poor regulation and supervision, an inadequate capital adequacy ratio and a poorly designed deposit safety net all led to moral hazard in the banking system and to a surge in non-performing loans before the peso crisis. Also, a poorly designed privatization program in the early 1990s exacerbated the weaknesses of the financial system. The peso crisis of 1994 was the final nail in the coffin of a weakened banking system, leading to a crisis that eventually is expected to cost about 14-20% of GDP.

[34] Specifically, our regression yields:

$$\begin{array}{lcccccccc} IND & = & 11.3 & - & 2.21 & NPLY & - & 2.94 & ICORLB \qquad R^2 = 0.48 \\ & & (5.28) & & (0.77) & & & (1.25) & \end{array}$$

Even in the case of the ERM crisis in 1992-93, currency depreciation was associated with banking problems. This is most evident in some Scandinavian countries (Sweden and Finland) where a severe banking crisis emerged in the early 1990s and also in Italy where banks in regions such as the South (the 'Mezzogiorno') were fragile to begin with and then suffered the consequences of the change in the relative price of traded versus non-traded goods caused by the devaluation. The banking crises in Korea, Thailand, Indonesia and Malaysia in 1997-98 were exacerbated by the devaluation but these financial systems were in serious financial distress even before the devaluation. In the episodes of Ecuador, Pakistan and Russia following the Asian crisis, currency crises were associated with severe banking crises in an environment where the banking system was effectively distressed before devaluation caused the clear emergence of banking problems: these are Russia, Pakistan and Ecuador. The fiscal costs of the bailout of the banking system in these 3 countries amounted to 15 to 30% of GDP.

Some (Sachs and Radelet (1998) and Chang Velasco (1998, 1999)) have tried to interpret recent crisis episodes as being caused by international 'runs', the international equivalent of Diamond-Dybvig (1983) bank runs. Such runs are not triggered by fundamentals but instead caused by self-fulfilling banking panics. This non-fundamental interpretation with multiple equilibria has been supported by the apparent observation that the Asian countries did not suffer the traditional fundamental causes of currency crises.

Although the crisis was exacerbated by speculative capital flight, we have argued (Corsetti, Pesenti and Roubini (1999a,b)) that, along with their many strong economic fundamentals, East Asian crisis countries also possessed some severe structural distortions and institutional weaknesses, especially in the financial and banking sectors. These vulnerabilities eventually led to the crisis in the summer of 1997.

The financial sectors of the Asian crisis countries were prone to fragility due to the prevalence of corrupt credit practices with loans often politically directed to favored firms and sectors. In addition, regulation and supervision of crisis country banking systems were notably weak. Moreover, moral hazard arose from implicit or explicit government bailout guarantees of financial institutions. Such financial sector weaknesses contributed to a lending boom and overinvestment in projects and sectors that often were risky and of low profitability, such as real estate and other non-traded sectors (excessive capacity accumulated in some traded goods sectors). Prior to the crisis, speculative purchases of assets in fixed supply fed an asset price bubble, with

equity and real estate prices rising beyond levels warranted by fundamentals. Poor corporate governance and what has now come to be called 'crony capitalism' exacerbated the distortions in this system and fueled the investment boom. Domestic and international capital liberalization may have aggravated the original distortions by allowing banks and firms to borrow more and at lower rates in international capital markets.

In Thailand, regulations restricting entrance into the banking system led to the growth of unregulated, non-bank finance companies. Excessive borrowing by these firms fueled a boom in the real estate sector. Liberalization of capital account regulations (e.g. the establishment of the Bangkok International Banking Facility) enabled Thai banks and firms to borrow heavily from abroad, in foreign currency and at very short maturities. Fifty-six of these finance companies who had borrowed excessively from abroad in foreign currency were distressed even before the Thai baht crisis and were eventually closed after the onset of the crisis.

In Korea, excessive investment was concentrated among the chaebols, the large conglomerates dominating the economy. The chaebols' control of financial institutions, together with government policies of directed lending to favored sectors, led to excessive and low profitability of investment in such traded goods sectors as automobiles, steel, shipbuilding and semiconductors. By early 1997, well before the onset of the won crisis, seven out of the thirty main chaebols were effectively bankrupt and the Korean economy was mired in a deep recession. High levels of corporate leverage were already prevalent in 1996, well before the currency crisis increased the burden of foreign debt. In Korea, the average debt to equity ratio of the top thirty chaebols was over 300%.

In Indonesia, a large amount of all bank credit consisted of directed credit, which is channeled to politically favored firms and sectors. Although Indonesia had already suffered a banking crisis in the early 1990s, these practices remained prevalent. Moreover, most of the borrowing took place in foreign currency terms, compounding debtors' inability to repay when the local currency depreciated. In Indonesia, a large fraction of foreign banks' lending was directly to the corporate sector rather than being intermediated through the domestic banking system.

Empirical studies confirm that the return to capital fell sharply in the East Asia region as the result of excessive investment. Studies document a rapid build-up of fixed assets throughout Asia between 1992 and 1996 with particularly rapid growth in Indonesia and Thailand. With most of the

growth financed by debt (especially in Thailand and Korea), high levels of corporate leverage were already prevalent in 1996, well before the currency crisis increased the burden of foreign debt. At the same time, moderate to low profitability severely impaired the ability of many Asian firms to meet their interest payment obligations.

The high level of non-performing loans in the crisis countries at the eve of the currency crisis confirms the role of fundamentals in triggering the financial crisis in the region. Thus, the interpretation of the Asian crisis in terms of an international bank run does not seem to be supported by the facts.

Note that, even in a domestic context, while the possibility of a pure 'irrational' run on a healthy bank exists in theory, in reality almost all known runs have occurred on banks that fundamentally had serious weaknesses. A pure bank panic and run not justified by any fundamental is mostly a theoretical curiosity since banks that experience a run usually have serious problems. In other words, this means that investors are not irrational and do not attack banks just for the sake of it; they run on banks under fundamental distress.

There is a large body of literature showing that banking crises are not due to the irrational run of panicky depositors but are the outcome of severe problems of the banking system: excessive lending, high non-performing loans, moral hazard distorted incentives, connected and directed lending, a weak macroeconomic environment, poorly designed deposit insurance and poorly managed liberalization in the presence of distorted incentives (see Dziobek and Pazarbasioglu (1997), Honohan (1997), Goldstein and Turner (1996), Asli Demirgüç-Kunt and Enrica Detragiache (1997), Caprio (1998)). Quite simply, depositors usually do not suddenly decide to jointly panic and run on a healthy bank. When runs occur, it is always the case that there is something seriously wrong with the banks. Thinking that systemic banking crises occur because of sudden and unjustified depositors' panic appears to be naive given the large literature on the causes of banking crises.

Moreover, the multiple equilibria literature is somewhat incomplete because, once an economy is in the region where such bad equilibria may occur, nothing in the model explains why investors focus their expectations on the bad equilibrium rather than the good one. They are all as likely as the other. Some papers rely on sunspots to nail down the probability of a run — this is just a gimmick with little economic or empirical content. In reality the probability of ending up in the bad equilibrium would depend on fundamentals;

if fundamentals are weak, the probability that agents attack is higher. In the banking context, it is weak banks that are attacked; solid, healthy banks are almost never attacked. If one takes this analogy to a country level, then the message is clear. It is unlikely that a country that has good fundamentals would be attacked, save extreme cases of contagion that such countries can deal on their own. Countries that are attacked are usually countries that, in some dimension or the other, have weak fundamentals.

4.2 The 1998 recession in Asia: the role of financial distress and the need for systemic corporate and bank restructuring

By the summer of 1998, the debt overhang problem in Indonesia, Korea and Thailand was severe. The combination of sustained high interest rates and illiquidity led to harsh economic contraction and a vast overhang of bad debt throughout Asia. Many corporations are frozen in their production decisions as they have little access to working capital and are severely burdened by a massive stock of debt. Debt to equity ratios were already very high before the crisis (about 300%). The credit crunch in the region led otherwise solvent companies to bankruptcy, exacerbating the recession. A vicious circle was at work: the credit crunch led to further economic downturn; this in turn caused higher non-performing loans and higher credit risk; these in turn caused further retrenchment in credit supply that worsened the recession. Moreover, the actual amount of foreign financing disbursed has been significantly less than the headline amounts announced. Thus, the liquidity squeeze in capital markets remained.

Banks were under extreme stress and had essentially stopped making new loans. By early 1998, large parts of the banking systems of Korea, Thailand and Indonesia were effectively bankrupt as the result of high interest rates, a large and increasing amount of non-performing loans and the attempts to rapidly recapitalize. The net worth of a large part of the banking system in these countries was negative. The only viable banks were foreign banks and a few domestic banks.

Because of the liquidity squeeze faced by the banks and the risks of corporate bankruptcies, banks were not making any new loans, not even for trade credits and working capital. Because of this, many corporations were going bankrupt even if they would be solvent under normal credit conditions.

This view was supported by the fact that, by mid-1998, in spite of massive real depreciations, the exports of the crisis countries had not significantly increased in value terms. Many firms had little access to working capital and trade credits necessary to import intermediate inputs and to produce and export goods. Because of the liquidity crunch, an illiquidity problem was turning into an insolvency problem for most corporations. While some might have been bankrupt even before the crisis and should have been liquidated, many other firms that would otherwise be viable had negative net worth; a combination of real depreciation, high real interest rates, collapsing aggregate demand and liquidity squeeze was leading them to effective bankruptcy. A large part of the corporate sector in the three countries was likely to have negative net worth in spite of the fact that a large fraction would have been solvent under normal circumstances. With little alternative source of financing (other than banks), the credit crunch afflicting the crisis economies was giving way to a vicious cycle: retrenchment in credit - further economic downturn - higher non performing loans and credit risk - more retrenchment in credit supply. Contractions in trade credit were particularly painful, as such cuts undermined the firms' ability to import intermediate inputs and to produce and export domestic goods.

The credit crunch for corporate firms was exacerbated by the fact that in East Asia bank loans were a prevalent source of financing for firms. With banks and other financial institutions in severe financial distress, short-term lending (for working capital purposes) and long-term lending by banks and non-bank financial institutions were drastically reduced, thus worsening the credit squeeze of the corporate sector.

While a banking crisis was also experienced by Mexico in 1995 following the collapse of the Peso, the nature of the banking crisis was different in East Asia from Mexico. In Mexico, the lending boom was concentrated in the household sector, with many households borrowing heavily from banks (often in foreign currency) to finance the consumption of durable goods and household services. Thus, the peso fall and the ensuing economic recession led to financial distress among heavily leveraged households. The inability of the latter to service their debt led to the collapse of many financial institutions. Relative to the case of East Asia, corporate bankruptcies were less important in triggering the financial distress of the financial sector. Conversely, in Asia the distress of the financial institutions was mainly triggered by the financial and debt-servicing problems of the corporate sector.

Over the summer of 1998, interest rates in Asia had significantly fallen

relative to the peaks of the crisis, and in Korea they came back to pre-crisis levels. In spite of this, the credit crunch was still severe in most countries: while the price of credit had been falling, banks that were effectively bankrupt or experiencing financial distress were unwilling to lend to corporations suffering from debt overhang, so loans were still drastically rationed. In such a situation, capital controls leading to lower interest rates would have done little to ease the credit crunch, and it is far from clear whether they would have helped to remove structural impediments to recovery.

While the need for a more decisive expansionary policy was widely recognized, several observers emphasized that an effective way to help the Asian countries to start producing and exporting again would consist of an accelerated debt restructuring process. The goals of this process were to recapitalize banks, reduce corporate debt overhang, and provide firms with debt moratoria and new priority financing of working capital and trade.

Suggestions for a comprehensive approach to bank and corporate restructuring, including a more active role of governments, were widely debated. An accelerated restructuring of the banking system could be accomplished in a number of alternative ways. Banks that were undercapitalized but still solvent had to be recapitalized, either with capital injections from domestic and/or foreign investors or through capital injections by the government. In the case of institutions that were clearly insolvent or borderline insolvent, the governments had to intervene directly, eventually deciding among possible alternative actions: to recapitalize them in order to sell them to (domestic and/or international) private investors, to merge them with stronger institutions, or to close them down in order to sell their assets.

Korea, Indonesia, Thailand and Malaysia tried out different approaches to bank capitalization, with a different mix of private and public participation. These included recapitalization (mostly via foreign injections of new equity), closure and mergers with other financial institutions. Accelerated disposal of bad loans, proper loan classification and provisioning for bad loans were all elements of an accelerated bank restructuring strategy.

In these three countries the approach to bank and corporate restructuring was modeled on a variant of the "London approach" used by the UK to achieve out-of-court restructuring of corporate distress. While this approach was mostly voluntary, case-by-case and market based, some suggested that the systemic nature of the corporate and bank financial distress required a more aggressive approach with more coercive elements, greater government involvement and a systemic rather than a case by case approach. Indeed,

while the Asian countries have relied so far on variants of the London approach the restructuring process has been, so far, relatively slow, especially in the corporate area. While the recapitalization of the banking system picked up speed in the second half of 1998, progress on corporate restructuring remained slow through the spring of 1999 with very few distressed firms having restructured their debts.

4.3 The role of foreign ownership of domestic banks in preventing emerging market crises

One issue that has importance for the Asian crisis and future crises is whether a substantial ownership by foreign banks of the domestic financial system could have beneficial effects for a country and contribute to the prevention of currency and financial crises. In the case of East Asia, most international bank lending was made from BIS country banks to East Asian banks who in turn lent to domestic corporations. Even in the case of Indonesia, where there was a large amount of direct corporate lending by international banks, this lending was mostly offshore; for the most part, foreign banks were not borrowing and lending onshore. Conversely, it has been argued that a strong direct ownership of a fraction of the domestic financial system by foreign banks in countries such as Argentina and, in a smaller measures, in other Latin American countries, may be a stabilizing factor.

Apart from bringing competition, efficiency, new managerial skills and banking knowledge, international banks may provide other benefits in a period of crisis. First, if a foreign bank solely lends to an emerging market bank, it does not have any stake in the lending that the domestic bank does with domestic firms. If expectations of a crisis increase, it may be rational for a foreign bank not to roll over its loans to the domestic bank even if this decision may trigger a financial crisis by running down foreign reserves and/or forcing the local bank to call in loans and thus trigger financial distress for corporations. If a foreign bank would instead operate locally, it would have more at stake and be less likely to call in loans and repatriate its liabilities; in fact, calling in loans would trigger a crisis harming the bank directly.

Second, since one cannot always trust the emerging market regulator's ability to properly supervise and regulate their domestic banks, the presence of foreign banks could mitigate such a problem. Foreign banks may behave less on the basis of relationship banking and more arms-length; they may

be subject to less pressure to provide direct lending; and strong regulations by home country (say US) regulators of the activities of their home-based banks may indirectly provide regulation of the activities of their foreign-based branches. Third, a safety net in the form of lender of last resort role for an emerging market central bank may be less necessary if foreign owned banks can rely on home countries funds to cover sudden and rapid deposit withdrawals observed during episodes of bank panic. Given the above arguments, some have claimed that, at one extreme, a fraction of emerging markets banking system should be controlled by foreign banks to ensure competition, efficiency and stability. The examples of Hong Kong and Singapore where a large fraction of the banking system is foreign owned may be cases in favor of such a view.

Are there any objections to such a view? One is, of course, a question of sovereignty. But why should countries care about who owns their banks more than they care about who owns their factories? The reason is that banks have traditionally been used for political purposes through direct lending as a source of revenue via financial repression. This is why governments are wary of letting go of domestic banks. While these arguments explain positively why governments do not want a foreign ownership of domestic banks, they provide a stronger normative argument in favor of such foreign ownership. A second argument is that it is not obvious that foreign banks would behave properly and avoid excessive gambles. A reference is the case of Chile in the early 1980s where the Chilean subsidiaries of foreign banks were also involved in very risky loans and excessive credit creation. A third argument is that, if the financial system is owned by a small number of foreign banks, it is not obvious that these banks would not request ex-post the lender of last resort support of the local central bank if economic shocks or poor lending decisions led to bad loans and financial distress in the banking system. Such foreign banks may have the power to impose ex-post liquidity and other forms of support such as a government bail-out of their bad loans.

The above objections do not appear to be very strong and the arguments in favor of foreign ownership of domestic banks in emerging market appear to have more validity based on the experience of countries where foreign banks own a large fraction of the domestic banking system. However, more thinking will have to be put to these questions. Do foreign owned banks in emerging markets need a domestic safety net (lender of last resort and deposit insurance)? Will they expect it, require it and get it ex-post if they experience financial distress? Should the home country rather than the host

country provide regulation and lender of last resort support? These are complex questions with no easy answers.

5 East Asia and the world economy in 1998-1999

5.1 From regional crisis to global turmoil

In the summer of 1998, what had been until then a severe regional economic crisis in East Asia turned into a devastating global turmoil enveloping a large group of emerging markets and spreading even to the US (and other OECD) capital markets. During 1998, forecasts of the economic slowdown in the crisis countries were steadily revised downward. The economic recession in East Asia spread from the crisis countries (Korea, Indonesia, Thailand and Malaysia) to Hong Kong, Singapore, the Philippines and Taiwan. The Indian subcontinent was fragile, Pakistan in particular having serious external balance and debt problems and experiencing a banking crisis. More crucially, the economic conditions in Japan, the prominent economy in the region, deteriorated in 1998, and was in need of difficult banking and structural reforms, let alone an effective macroeconomic policy to recover from the long period of stagnation.[35] In the middle of 1998 policy failures leading to a further weakening of the yen risked to undermine the stability of the currencies of China and Hong Kong and threatened to trigger a further round of stagflationary competitive devaluations in the entire Asian region.

Economic fundamentals remained strong in the US but by the fall of 1998 there was clear evidence of a worldwide growth slowdown. The IMF's growth forecast for world output, 2.0% (in the October 1998 World Economic Outlook), represented a precipitous drop from the 4.3% rate anticipated one year before in October 1997. Expected growth in the Western Hemisphere was 2.3%, down from 5.1%. The estimated 2.0% world growth rate was comparable to that observed during previous world recessions, such as 1974-

[35] In this respect, James Tobin wrote: "Considering the damage Japan's disastrous macroeconomic performance has done to the Asian and world economies along with the apparent inability of the Japanese to enjoy spending money on themselves, perhaps the Japanese government should unilaterally transfer bundles of yen to other Asian countries and poor countries everywhere for development projects and relief of poverty, requiring that these yen be spent in Japan" (*The Straits Times*, July 18, 1998).

75, 1980-83, and 1990-91. Apart from the South-East Asia countries, Japan's economy was expected to decline by 2.5%, while Russia was expected to contract by 6% in 1998.

Moreover, commodities prices fell sharply in 1997-1998 per effect of the global economic slowdown. In Latin America falling oil prices hit Mexico and Venezuela, falling copper prices hurt Chile and Peru, and falling agricultural prices affected Argentina. Advanced industrial countries were not spared either. Commodity prices played a crucial role in the depreciations of the currencies of Canada, Australia and New Zealand; given their tight trade links with East Asia, the latter was headed towards a recession.

Russia experienced a severe economic and financial crisis following the August 1998 collapse of the ruble and the decisions to unilaterally reschedule the domestic-currency public debt and impose capital controls. The crisis in Russia led to rapid worldwide contagion and affected currencies and stock markets in Latin America, increasing the risk of a continental crisis in the summer and fall of 1998. Currency speculation in 1998 did not even spare the Northern European countries which were not perspective members of the European Monetary Union.

Contagion was exacerbated by a concern that a devaluation in Brazil could lead to currency devaluations in Venezuela, Argentina, Chile, Colombia and Mexico. While Latin American economies were structurally stronger than Russia, investors became increasingly risk averse. In August 1998, emerging market spreads over Treasuries (about 1500 basis points) were close to the peaks reached during the 1995 Mexican peso crisis. The appetite for risk of international investors sharply fell, making room for a major portfolio reshuffling from emerging markets to safe-haven assets and from stocks to liquidity.

The contagion from Russia to Latin America affected capital markets in the US and Europe. The losses incurred by financial institutions — the near collapse of Long Term Capital Management (LTCM) representing a paradigmatic case — led to a serious liquidity squeeze in US capital markets; such liquidity shock sharply increased the spreads (over US Treasuries) of a broad range of private bonds, even high-grade corporate bonds. By September 1998, the risks of a global recession in 1999 had significantly increased. However, the conditions in international and domestic financial markets improved substantially in October and November 1998 following a series of positive policy developments.

5.2 Fundamental causes of contagion in 1998

While episodes of international contagion are not fully understood, there were many reasons underlying the spread of the crisis from Russia to Brazil, and from emerging to advanced economies; similarly, there were many fundamental factors behind the recovery of confidence in international financial markets in October and November.

Consider for instance why the Russian crisis was rapidly transmitted to Brazil, Latin America, other emerging markets and the US capital markets. There were a number of 'news' and fundamental 'shocks' that emerged after the August 17 Russian policy decisions. First, investors realized that the availability of liquid resources by the IMF was now curtailed, and feared a greater reluctance to use them unconditionally to bail out countries in crisis. Second, Russia, the country that had been considered the best example of a too-big-to-fail country, fell into crisis because of its policy shortcomings and indeed was not bailed out. Third, Russia implemented an unexpectedly large devaluation, as well as an effective unilateral default on its domestic debt that surprised international investors and led to a sharp increase in their aversion to risk.

Fourth, Russia imposed severe capital controls entailing large extra losses for investors that had used forward contracts to hedge their GKOs positions; at the same time Malaysia introduced drastic capital controls. These two episodes led to concerns that many more emerging markets would also impose such controls. Fifth, investors overstated the perceived similarities, in terms of macro conditions, between Brazil and Russia, thus overlooking structural differences within the highly heterogeneous group of 'emerging' economies. Finally, the Russian default and its spillovers to emerging markets caused large losses for a large number of financial institutions and highly leveraged hedge funds; the ensuing margin calls exacerbated the rush to dump emerging market assets and transmitted the contagion to US capital markets. The LTCM episode revealed the vulnerability of some G-7 financial institutions to the global turmoil.

5.3 Recovery of investors' confidence in October-November 1998

While the crisis in August and September raised concerns about a global financial meltdown, a number of important developments restored investors'

and market participants' confidence in October and November. The emerging markets sovereign spreads over Treasuries fell from 1500 basis points to 1100 basis points; spreads over Treasuries of US corporate bonds also fell significantly; and stock markets recovered in the US, Latin America, Asia and the rest of the emerging markets.

What can help explain such recovery of confidence? First, the US Fed reduced interest rates twice, once unexpectedly, signaling a strong commitment to prevent both a global and a domestic crisis, as well as to minimize the risks of a liquidity crisis in the US. Second, the US Fed rate cut was followed by a series of interest rate reductions in Japan, Canada, six European countries and 20 other countries around the world. Third, the US Congress passed the USD18 billion IMF refunding legislation, opening the way for USD80 billion of new money to the IMF. Fourth, the strong G-7 commitment to support Brazil and design a large stabilization package to help this country (eventually announced on November 13) contributed to prevent economic turmoil in Latin America.

Fifth, the passage of bank reform legislation in Japan and the expectation of a supplementary fiscal package helped the Asian asset markets to recover. Sixth, the sharp increase in the value of the yen reduced the risks of a Chinese devaluation that would have led to another round of competitive devaluations in Asia. Seventh, the rescue of LTCM prevented the systemic effects that could have resulted from its collapse. Eighth, in a series of speeches the US President Clinton presented a number of policy proposals to deal with the crisis, including an emergency fund within the IMF in support of countries with good economic fundamentals subject to speculative pressures, measures to accelerate the restructuring of banks and corporations in Asia, increases in multilateral banks' support of social safety nets in crisis countries and increases in trade financing for the affected countries. Ninth, the G-7 communiques of October 30 reaffirmed the commitment to implement specific measures to contain current and future crises, following the guidelines on the reform of the international financial architecture presented in three reports of the G-22 group published in October.

5.4 Economic recovery in East Asia and the world economy in 1999

The positive policy developments between September and November 1998, together with a strong economic performance of the US economy in the latter part of 1998, led to a rapid recovery of confidence among investors and a progressive recovery of economic prospects in East Asia. In East Asia the macroeconomic adjustment, the implementation of structural reforms, the beginning of bank and corporate restructuring and the relaxation of monetary and fiscal policies led to the first tentative signs of economic recovery in a number of countries.

The first signs that the crisis was bottoming out came from financial variables: currencies that had sharply depreciated (the Korean won, the Thai baht and even the Indonesian rupiah), started to appreciate. Next, nominal and real interest rates moved towards pre-crisis levels. In Korea and Thailand, spreads on sovereign bonds also fell to pre-crisis levels, following the recovery of confidence by international investors. The easing in monetary policy and expectations of a financial clean-up of banks and firms led next to a strong improvement in the stock markets. The turnaround in real variables took longer, but, by the spring of 1999, there were signs of economic recovery in most of the crisis-afflicted countries. In Korea, Thailand and Malaysia, industrial production and GDP started to recover and GDP was expected to show positive growth in 1999. Signs of economic recovery were also evident in the rest of East Asia, including Hong Kong, Singapore and the Philippines. In Indonesia, however, the recovery was still limited to financial variables and the recession had not yet bottomed out — due to serious policy and political uncertainties and the delay in the bank and corporate restructuring processes.

By the spring of 1999 the risks of a worldwide recession appeared significantly diminished relative to the concerns that emerged in the fall of 1998. The IMF presented a more optimistic outlook for the world economy in the May 1999 World Economic Outlook, even though the prospects for Europe and Latin America had worsened relative to forecasts in 1998. Weaknesses in Germany, Italy and other European Union countries (partly caused by the loss of export demand triggered by the recession in East Asia) clouded the expectations for European growth, while the Brazilian devaluation in January 1999 and the partial contagion to Latin America increased the likelihood of a significant growth slowdown in the region. However, while to some extent

contagion was experienced in Latin America following the Brazilian devaluation, it was much less virulent than the one following the Russian collapse in August 1998. The reduction in overall investors' leverage and the intervention of the IMF after the devaluation of the Brazilian real limited the possibility of international contagion, with emerging market spreads sharply falling in March and April after the strong spike that followed the fall of the real.

In other regions of the world business cycle conditions had improved. The expected slowdown in US growth failed to materialize in the fourth quarter of 1998 and first quarter of 1999. The recovery of non-Japan Asia was significant, China was still experiencing solid growth and, even in Japan, significant policy changes (loose monetary policy, fiscal expansion, bank and corporate restructuring) suggested that the economy may be close to bottoming out. Also, growth prospects in European transition economies appeared to be improving while the severity of the Russian recession appeared to be partially contained. By May 1999, an increasing number of observers suggested that the two-year global crisis that had started with the devaluation of the Thai baht in July 1997 might be over.

6 Conclusions

The results of our empirical analysis provide evidence in support of the thesis that crises are systematically related to the fundamental weaknesses in the real and financial sectors of the economy. The recent turmoil in Asia does not seem to represent an exception in this respect. External imbalances, as measured by the current account deficits associated with real exchange rate appreciation, are significantly correlated with the crisis index. So are measures of financial fragility (non-performing loans in the presence of a lending boom) and measures of the fiscal costs associated with financial bailouts (non-performing loans as a share of GDP). The effects of these variables on the crisis index are found to be stronger in countries with low reserves.

The empirical analysis presented in this paper is quite preliminary. Yet, it complements other analyses showing the extent of the deterioration of fundamentals in Asia in the years before the crisis. Per se, these results cannot discriminate across alternative explanations of currency crises based on self-fulfilling speculative attacks, as opposed to fundamental factors. They do, however, identify a set of variables that appear to enhance the vulnerability

of an economy to a crisis.

The indicator that seems to be most robust in our analysis is the indirect measure of the implicit costs of bailouts in the presence of a financial crisis, *i.e.* non-performing loans before the crisis as a share of GDP. In related work (Corsetti, Pesenti and Roubini (1999a)) we have provided a consistent theory of the role that contingent public debt plays in generating 'twin' financial and currency crises. We interpret the empirical evidence presented in this paper as an indication that this is the right direction to pursue in a comprehensive research agenda on the Asian crisis.

The analysis in this paper highlights the role played by the financial distress of banks, other financial institutions and corporation in the Asian crisis. The fiscal costs of cleaning up the balance sheets of banks is bound to be very high, while the prospects for a rapid and sustained recovery of economic growth in Asia depend on an accelerated process of bank and corporate restructuring in the region. The recent recovery in economic activity in the region may experience a relapse unless bank and corporate restructuring is pursued more aggressively in the near future.

Appendix

In this appendix we describe in detail the construction of the variables used in the empirical analysis.

Crisis index (IND)

The index is a weighted average of the percentage rate of exchange rate depreciation relative to the US dollar and the percentage rate of change in foreign reserves between the end of December 1996 and the end of December 1997. A large negative value for IND corresponds to a high devaluation rate and/or a fall in foreign reserves, *i.e.* a more severe currency crisis. All data are from the International Financial Statistics of the International Monetary Fund (IFS-IMF).

Real exchange rate appreciation

This variable measures the percentage rate of change of the real exchange rate between the end of 1996 and an average over the 1988-1990 period. The real exchange rate measure is based on wholesale price indexes, using trade weights of OECD countries (excluding Mexico and Korea). For the three transition economies — Czech Republic, Hungary and Poland — whose real exchange rates exhibit large fluctuations in the early transition years, the appreciation is calculated between 1996 and 1992. For Argentina, whose real exchange rate experienced large swings in the hyperinflation period, the real exchange rate is computed between 1996 and the end of 1990.

Current account deficits and the CAI index

The current account deficit as a share of GDP is an average over the 1994-96 period. Data are from IFS-IMF. The index of current account imbalances CAI is computed as follows: for countries where the real exchange rate appreciated more than 10% over the period defined above, CAI takes the value of the average 1994-96 current account balance (as a share of GDP); for all other countries, CAI is set equal to zero.

Lending boom (LB)

This variable is the rate of growth between 1990 and 1996 of the ratio between the claims on the private sector of the deposit money banks (line 22d in IFS-IMF) and nominal GDP. All data are from IFS-IMF. In the case of transition economies whereas either data since 1990 are not available or the ratio is very unstable in the early transition years, we take 1992 (rather than 1990) as the starting date.

Non-performing loans as a share of total bank assets (NPL).

As there are no homogeneous series for non-performing loans, we need to

build our dataset relying on several sources. For most of the Asian countries in our sample (Korea, Indonesia, Hong Kong, Taiwan, Malaysia, Thailand) there are two available estimates of NPL in 1996; one from the 1997 BIS Annual Report, the other from Jardine Fleming. Both estimates are biased: the former underestimates non-performing loans before the onset of the crisis (for instance, the end-of-1996 figure for Korea is 0.8%); the latter is based on data from the third quarter of 1997, when non-performing loans are already reflecting the consequences of the currency crises on the financial conditions of banks and corporate firms (for instance, Korean non-performing loans are estimated to be 16%). We take the average of the two figures as a reasonable estimate of the non-performing loans before the onset of the crisis, *i.e.* end 1996-early 1997. For the remaining countries, we proceed as follows: for India, Argentina, Brazil, Chile, Colombia, Mexico, Peru, Venezuela we use the estimates for 1996 in the BIS 1997 Annual Report. For China, Singapore and the Philippines, we use estimates from Jardine Fleming. For the other countries in the sample, we rely on information derived from IMF country reports. It is worth emphasizing that our estimates do not appear to be systematically biased towards the countries that suffered a crisis in 1997. Note in fact that non-crisis countries such as Mexico, China, India and Pakistan all show a very large fraction of non-performing loans (over 10% of total loans).

Fiscal cost of the bailout of the banking system as a share of GDP ($NPLY$)

This variable is computed as follows. We take the estimate of the non-performing loans as a share of bank assets (NPL) derived above and we multiply it by the ratio of claims on the private sector by deposit money banks at the end of 1996 to GDP. The latter variable is computed from IFS-IMF data.

The NPLB index

In deriving $NPLB$, we interact the lending boom variable with the non-performing loans variable: for countries where the sign of the lending boom variable is positive, we set $NPLB$ equal to NPL; for countries with a negative lending boom, we set $NPLB$ equal to zero.

Reserve adequacy ratios

We compute three ratios for reserve adequacy at the end of 1996. The first is the ratio of $M1$ to foreign exchange reserves ($M1/RES$); the second is the ratio of $M2$ to foreign reserves ($M2/RES$); the third is the ratio of the foreign debt service burden (*i.e.* short-term foreign debt plus interest payments on foreign debt) to foreign reserves (STD/RES). Foreign exchange reserve data are from the IFS-IMF (line 1l.d). Data on short term debt and

interest payments on foreign debt are from Datastream.

Taiwan

Taiwan is not included in the IMF data base. Our data for Taiwan are from Datastream and rely on Taiwan national data sources.

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Table 1. Crisis and Economic Indicators
Percentage or percentage change

Country	*Crisis Index (IND)*	*Real Appreciation (RER)*	*Current Account (CA)*	*Lending Boom (LB)*	*Non-Performing Loans (NPL)*	*Reserves Adequacy (M2/RES)*	*Reserves Adequacy (M1/RES)*	*Reserves Adequacy (STD/RES)*
Argentina	4.9	38.6	-1.9	16.5	9.4	351.0	108.2	147.8
Brazil	-0.5	75.8	-2.0	-26.3	5.8	345.9	66.8	78.3
Chile	-1.4	37.5	-1.7	24.1	1.0	188.2	41.9	53.3
China	7.6	4.9	0.8	6.9	14.0	828.9	334.0	26.7
Columbia	-9.1	26.6	-5.0	35.0	4.6	209.4	104.3	73.9
Czech	-19.5	50.7	-4.4	22.7	12.0	356.9	139.5	42.9
Hong Kong	5.7	31.8	-1.6	25.5	3.4	411.9	34.2	20.0
Hungary	-1.6	-38.8	-6.5	-56.5	3.2	167.1	83.3	52.3
India	5.7	-29.1	-1.2	-2.3	17.3	860.0	296.5	37.2
Indonesia	-38.3	17.5	-2.9	9.6	12.9	614.8	114.3	188.9
Jordan	9.8	6.1	-4.5	1.4	6.0	437.8	141.4	33.9
Korea	-38.6	11.1	-2.5	11.2	8.4	665.4	147.6	217.0
Malaysia	-38.8	19.9	-6.4	31.1	9.9	364.8	115.6	45.3
Mexico	10.9	8.9	-2.7	-10.9	12.5	444.8	129.3	142.9
Pakistan	11.4	-2.0	-5.3	-3.7	17.5	3369.9	1822.8	399.0
Peru	0.7	-20.4	-6.2	177.2	5.1	123.6	32.4	61.6
Philippines	-29.8	38.9	-4.6	150.8	14.0	465.6	91.8	849.3
Poland	3.5	30.0	0.9	38.5	6.0	262.3	95.9	14.2
Singapore	-15.7	4.7	16.5	16.7	4.0	103.5	25.0	20.0
Sri Lanka	-1.0	17.7	-5.7	28.4	5.0	236.4	72.9	26.8
Taiwan	-11.4	-7.0	2.9	43.4	3.9	575.1	141.0	22.8
Thailand	-47.8	20.0	-7.2	58.0	13.3	380.5	43.3	121.5
Turkey	4.3	-16.1	-0.1	43.2	0.8	302.6	48.9	76.0
Venezuela	4.9	2.2	6.8	-51.5	3.8	102.4	58.5	28.2

Table 2. Explaining the Crisis Index[a]

Estimated coefficient and summary statistic	*Independent variable*	*(1)*	*(2) Regression with M2/RES*	*(3) Regression with M1/RES*	*(4) Regression with STD2/RES*
β_1	constant	6.877	7.073	7.437	5.324
		(3.755)	(4.094)	(3.956)	(3.552)
β_2	*CAI*	3.768	0.849	2.210	0.569
		(1.254)	(2.869)	(3.677)	(1.971)
β_3	*NPLB*	-1.338	-2.888	-2.805	-0.476
		(0.605)	(2.073)	(1.946)	(0.782)
β_4	$CAI \times D2^{LR}$		3.613		
			(3.191)		
β_5	$NPLB \times D2^{LR}$		1.761		
			(2.035)		
β_4	$CAI \times D1^{LR}$			1.467	
				(3.982)	
β_5	$NPLB \times D1^{LR}$			1.534	
				(1.929)	
β_4	$CAI \times D3^{LR}$				3.571
					(2.564)
β_5	$NPLB \times D3^{LR}$				-0.864
					(0.986)
Summary statistic					
$\overline{R}^2$		0.555	0.541	0.536	0.622
R^2		0.594	0.621	0.616	0.688
Addendum: Wald tests					
Null hypothesis		*p values*	*p values*	*p values*	*p values*
$\beta_2 + \beta_4 = 0$			0.005	0.018	0.023
$\beta_3 + \beta_5 = 0$			0.099	0.057	0.091

[a] The dependent variable is the crisis index, *IND*. See Table 1 and Appendix for definition of variables. Standard errors are shown in parentheses.

Table 3. Explaining the Crisis Index[a]

Estimated coefficient and summary statistic	*Independent Variable*	(1)	(2)	(3)
β_1	constant	-2.861	5.535	5.602
		(2.138)	(3.887)	(4.082)
β_2	*CAI*	0.841	0.762	0.766
		(2.946)	(2.694)	(2.771)
β_3	*NPLB*	-1.338	-2.569	-2.583
		(0.605)	(1.954)	(2.017)
β_4	$CAI \times D2^{LR}$	2.851	1.118	1.559
		(6.650)	(3.274)	(6.293)
β_5	$NPLB \times D2^{LR}$	1.769	2.448	2.446
		(2.091)	(1.945)	(2.000)
β_6	$CAI \times D2^{LR} \times D^{WF}$	0.834		-0.497
		(6.337)		(6.004)
β_7	$NPLB \times D2^{LR} \times D^{WF}$		-2.120	-2.131
			(1.123)	(1.164)
Summary statistic				
$\overline{R}^2$		0.516	0.596	0.572
R^2		0.621	0.684	0.683
Addendum: Wald tests				
Null hypothesis		*p values*	*p values*	*p values*
$\beta_2 + \beta_4 = 0$		0.547	0.337	0.688
$\beta_2 + \beta_4 + \beta_6 = 0$		0.009		0.388
$\beta_3 + \beta_5 = 0$		0.146	0.883	0.875
$\beta_3 + \beta_5 + \beta_7 = 0$			0.017	0.026

[a] The dependent variable is the crisis index, *IND*. See Table 1 and Appendix for definition of variables. Standard errors are shown in parentheses.

Table 4. Explaining the Crisis Index[a]

Estimated coefficient And summary Statistic	*Independent variable*		(1) *Regression with M2/RES*	(2) *Regression with M1/RES*	(3) *Regression with STD2/RES*
β_1	constant	6.682	8.142	6.289	5.491
		(3.699)	(3.951)	(3.789)	(3.492)
β_2	*CAI*	4.156	2.288	-1.402	0.845
		(1.158)	(2.394)	(4.511)	(1.963)
β_3	*NPLY*	-1.630	-6.579	-4.817	-0.597
		(0.724)	(3.263)	(2.419)	(0.874)
β_4	$CAI \times D2^{LR}$		2.594		
			(2.657)		
β_5	$NPLY \times D2^{LR}$		5.133		
			(3.170)		
β_4	$CAI \times D1^{LR}$			5.760	
				(4.660)	
β_5	$NPLY \times D1^{LR}$			3.481	
				(2.497)	
β_4	$CAI \times D3^{LR}$				3.487
					(2.530)
β_5	$NPLY \times D3^{LR}$				-1.185
					(1.248)
Summary statistic					
$\overline{R}^2$		0.558	0.578	0.634	0.618
R^2		0.596	0.651	0.557	0.684
Addendum: Wald tests					
Null hypothesis		*p values*	*p values*	*p values*	*p values*
$\beta_2 + \beta_4 = 0$			0.001	0.002	0.016
$\beta_3 + \beta_5 = 0$			0.074	0.105	0.107

[a] The dependent variable is the crisis index, *IND*. See Table 1 and Appendix for definition of variables. Standard errors are shown in parentheses.

Table 5. Explaining the Crisis Index[a]

Estimated coefficient and summary statistic	*Independent variable*	(1)	(2)	(3)
β_1	constant	9.060	3.754	3.677
		(4.233)	(2.731)	(3.026)
β_2	*CAI*	2.438	1.570	1.557
		(2.439)	(1.577)	(1.633)
β_3	*NPLY*	-6.912	-4.985	-4.957
		(3.347)	(2.164)	(2.263)
β_4	$CAI \times D2^{LR}$	-7.295	-2.753	-2.085
		(14.900)	(2.033)	(9.972)
β_5	$NPLY \times D2^{LR}$	5.425	5.287	5.267
		(3.246)	(2.081)	(2.160)
β_6	$CAI \times D2^{LR} \times D^{WF}$	9.905		-0.685
		(14.676)		(10.005)
β_7	$NPLY \times D2^{LR} \times D^{WF}$		-5.420	-5.436
			(1.060)	(1.117)
Summary statistic				
$\overline{R}^2$		0.566	0.818	0.808
R^2		0.660	0.858	0.858
Addendum: Wald tests				
Null hypothesis		*p values*	*p values*	*p values*
$\beta_2 + \beta_4 = 0$		0.741	0.424	0.957
$\beta_2 + \beta_4 + \beta_6 = 0$		0.001		0.633
$\beta_3 + \beta_5 = 0$		0.073	0.626	0.445
$\beta_3 + \beta_5 + \beta_7 = 0$			0.000	0.000

[a] The dependent variable is the crisis index, *IND1*. See table 1 and Appendix for definition of variables. Standard errors are shown in parentheses.