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WP/99/46

INTERNATIONAL MONETARY FUND

Policy Development and Review Department

**Political Instability and Economic Vulnerability**

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April 1999

**Abstract**

This paper analyzes and tests the influence of political instability on economic vulnerability in the context of the 1994 and 1997 crises episodes. It constructs four political variables that aim at quantifying political instability. The paper finds that for countries with weak economic fundamentals and low reserves, political instability has a strong impact on economic vulnerability. The estimation results suggest that including political variables in economic models does improve their power to explain and predict economic crises. The paper concludes that countries are more economically vulnerable during and especially following election periods, and when election results are less stable than at other times.

JEL Classification Numbers: F31, F47, H8

Keywords: vulnerability indicators, political cycle, economic crises, emerging markets.

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<sup>1</sup>We would in particular like to thank Ydahlia Metzgen and Roger Nord for suggesting the topic and providing the opportunity to pursue this paper, Andrew Berg for suggesting to use Tornell's model and helpful guidance on the project, Aaron Tornell for help in using his data, and participants at a seminar of the Policy Development and Review Department for useful comments. The views expressed in this paper are not necessarily those of the International Monetary Fund.

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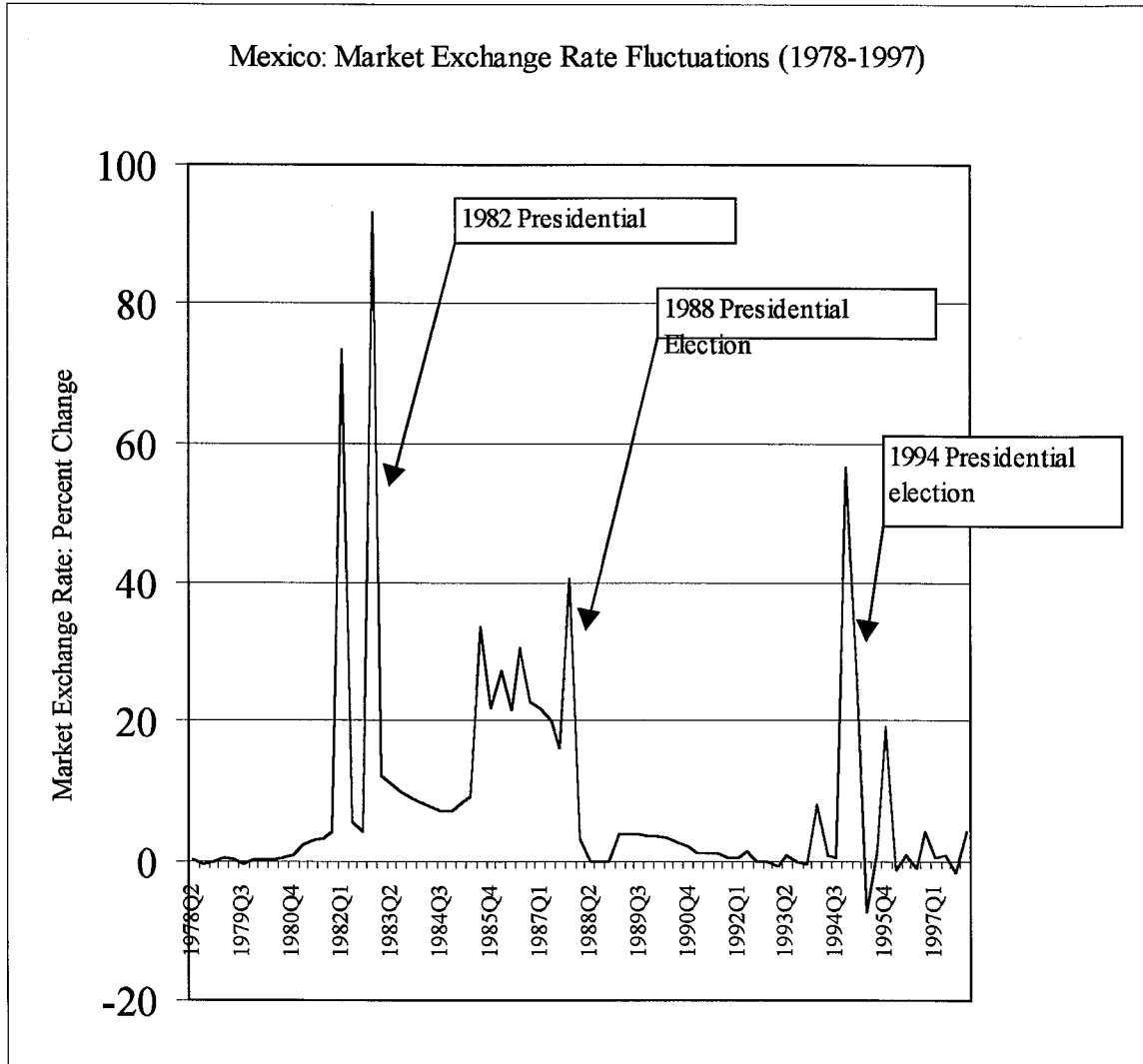
## I. INTRODUCTION

Many striking examples exist of the close links between economic vulnerability and political instability. Both during the so-called 1994 “tequila” crisis and the 1997 Asian crisis, it has been observed that the political setting prevailing at the time a crisis erupts constitutes an essential factor determining the depth of economic recession. The case of Mexico provides a textbook example of how the political uncertainty surrounding elections increases the susceptibility of a country to financial pressures. Each time a presidential election was held since 1982, Mexico experienced a major economic crisis. (Figure 1 shows the coincidence of elections with exchange rate depreciations for Mexico over the period 1979-1987). But the experience is not limited to Latin America. Thailand’s elections in late 1996 did not yield a clear majority and the government was made up of a coalition of 6 parties. The upcoming election in Korea in late 1997 contributed markedly to the uncertainty prevailing at that time: pronouncements of the opposition candidates, e.g., those discounting the commitments under an economic program agreed with the IMF, created uncertainty about the policies that would be applied after the elections in early January, and led to a deepening of the crisis. The political climate also contributed to the dramatic upheavels experienced by Russia in the third quarter of 1998, and the rapid spread of the crisis to Latin America. For example, the run-up to Presidential elections in Brazil in October 1998 coincided with major reserve losses, while the elections were followed by a major devaluation in early 1999.

Thus, assuming that governments will always take the right measures to reduce economic vulnerability misses an important issue. Governments are sometimes unable to implement reforms or preventive measures because they face political constraints. It is therefore not surprising that models using economic variables only do not give entirely satisfying results: Berg and Pattillo (1998) found that three leading empirical estimates of economic vulnerability (Kaminsky, Lizondo and Reinhart, 1998, Frankel and Rose, 1996 and Sachs, Tornell and Velasco, 1996) do not forecast crises accurately when tested out of sample.

Notwithstanding the face value evidence that points to the impact of the political situation, empirical studies have thus far not found any significant impact of political variables on economic vulnerability for the 1994 and 1997 economic crises. Focusing on a different period of time and in a different context, various studies added political indicators to economic variables. In particular, Klein and Marion (1994) investigated the end to exchange-rate pegs for sixteen Latin American countries during the 1957-1991 period. Their results supported the view that executive transfers, regular (elections) and irregular (coups), were empirically important indicators of ending the peg, with irregular transfers the more powerful explanation.

Figure 1. Exchange Rate Depreciation and Presidential Elections in Mexico



Eichengreen, Rose and Wyplosz (1995) also studied the impact of political variables<sup>2</sup> but on the exchange rate regime of 20 OECD countries between 1959 and 1993. They found that past government defeat influenced significantly the exchange rate regime, and that other political indicators were insignificant. These studies show that political elements influence the exchange rate regime, but not necessarily explain crises. There is a need for updated studies on the impact of political variables on economic vulnerability that take into account the 1994 “Tequila” and the more recent Asian and Latin American crises and the political situation of the

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<sup>2</sup>They used the following variables: left-wing government, elections, change in government, past and future government victory or defeat, new finance minister.

nineties. From a political perspective these recent crises noticeably differ from previous episodes of exchange rate instability: most emerging countries are now governed by elected governments, and variables such as the number of coups have lost their relevance.

In a related area, Ul-Haque, Mark and Mathieson (1998) tested the assertions of credit and country rating agencies that they give political factors a weight of up to 40% in their ratings. They found that political variables (such as political assassinations, general strikes, government crises or anti-government demonstrations) were significant but barely added to the economic variables based on the explanatory power of the regressions.<sup>3</sup>

It is the purpose of this paper to provide a test of the impact of political instability on economic vulnerability by quantifying and testing for the first time a set of political variables in the context of the economic currency crises that hit emerging markets in 1994 and 1997. The focus is on political factors that are comparable across democratic countries such as elections, composition of the parliament and the government, rather than incidents whose impact may vary widely across countries. To that end, we compute four indices to measure political indecision and politically induced uncertainty, and test them empirically in an existing model. This method also limits the risk that our results are affected by picking convenient economic specifications.

We opted to use Tornell's data and specification for the economic variables (Tornell, 1998). Tornell's set up is well suited for the purposes of this paper, in view of three of its characteristics: first his model provides a clear benchmark as it uses economic variables only, and has reasonable explanatory power. The influence of contagion and the international environment is taken into account by focussing on the two time periods during which a crisis swept the markets. Second it is estimated for 23 countries and for a time period when these countries have comparable political structures. Virtually all countries in his sample had governments selected directly or indirectly through a multi party election. Third, it provides a single explanatory framework for both the 1994 and the 1997 crises, which allows comparisons of the change in both political and economic fundamentals over time as well as across countries.

Section II presents the four political indices that have been computed to measure political instability. It explains the rationale for using these variables in view of the literature on

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<sup>3</sup> Edwards and Santaella (1993) studied the role of politics in the implementation of IMF programs in developing countries over the period 1954-1971. They found that political instability, measured by various indices, reduced the ability of governments to successfully implement adjustment programs during devaluations. The political indices used by Edwards and Santaella were: politically motivated strikes, political demonstrations and riots, government repression of dissidents, and dummies for democracy and ideology.

The relevance of political variables has been studied in the context of theoretical models that explain inflation as the outcome of political delays in implementing stabilization plans (Alesina and Drazen, 1991, Velasco 1997). Similarly, the literature on political business cycles (Nordhaus 1975, Alesina 1987, 1997) focused on the increase in budget deficits and inflation by governments seeking popular support.

the subject, and it describes the methodology used to calculate them from raw data. Section III tests the political variables in an econometrics model and interprets the results. Section IV concludes and discusses policy implications. Annex I models the impact of elections.

## **II. Quantifying Political Instability: Methodology.**

Political uncertainty and indecision are two of the key sets of problems that may worsen an already vulnerable situation by creating adverse reactions such as capital flight and hindering effective policy reactions to an emerging crisis. This section presents four political indices that aim at capturing the essential structural features that contribute to politically driven uncertainty and indecision in democratic political systems—that is, systems where elections determine directly or indirectly the composition of the government.

- The first two indices focus on political factors that might hinder the effective functioning of democratic political systems, such as divisive and polarized parliaments and coalition governments, and thereby lead to delays in decision making in the face of turmoil and shocks to the economy.
- The third and fourth indices focus on uncertainty about the outcome of the political process, illustrated by such factors as the fickleness of voters and the conduct and timing of elections.

### **A. Political Polarization: The Effective Number of Parties.**

The political cycle literature suggests that the degree of political polarization is important for economic vulnerability as it could hamper the implementation of reforms that are recognized as being needed. Alesina and Drazen (1991) in particular argue that reforms are delayed because parties in the government coalition cannot reach an agreement on how to allocate the cost of the reform. In their model, political parties do not disagree about the necessity of a reform, they disagree about how to share the burden of stabilization such as the incidence of increased taxes to reduce the budget deficit. This disagreement leads to what the authors have dubbed a “war of attrition” in which every party tries to make the other one pay a larger share of the cost. In essence it is the uncertainty about the determination of the other party that prevents them from reaching a negotiated middle of the road solution that avoids the costly delay of necessary measures. More recently, Velasco 1997 published a working paper in which he models how budget deficits increase because of partisan divides, reaching similar conclusions as Alesina and Drazen.

In line with these arguments, countries with a high degree of polarization will be more likely to suffer from economic crises because of the delay in undertaking required reforms. Political scientists (Mainwaring and Scully 1995) have found that the so called effective number of parties is a good proxy for political polarization.

The effective number of parties is defined as (Laakso and Taagepera, 1979):

$$NEFF = \frac{1}{\sum_i P_i^2}$$

Where  $P_i$  represents the share of seats of party  $I$  in the incumbent parliament. This index does not simply measure the number of parties in parliament--which would give too much weight to small parties; by taking the square of the share of the seats of parties, it gives larger parties more weight.

### **B. Political Cohesion of the Government: the COAL Variable**

The degree of polarization not only matters for the composition of parliament but also for the government. Another reason that reforms may be delayed stems from the fact that government effectiveness is hampered by having to cooperate with coalition partners or, in the case of a presidential regime, with a congress dominated by opposition parties.

Following Roubini and Sachs (1988), an index can be constructed to measure the strength of the ruling coalition in the following way:

- 0 for one-party majority parliamentary government; or presidential government, with the same party in the majority in the executive and legislative branches.
- 1 for coalition parliamentary government with two-to-three coalition partners;  
or  
for presidential government, with different parties in control of the executive and legislative branches
- 2 for coalition parliamentary government with four or more coalition partners.
- 3 for minority governments.

### **C. Electoral Indecision: The Volatility Index**

In addition to indecision, uncertainty about the political process and its outcomes is a major potential cause for politically driven vulnerability. In democracies, a major source of uncertainty lies in the difficulty agents have in forming correct expectations about the result of elections. Since the result of elections is a major unknown, agents cannot make precise predictions about fundamentals such as inflation targets, commitment to the exchange rate regime, and the budget deficit. Yet, not all countries are marked by the same degree of uncertainty: in some countries election outcomes are more predictable than others. Although polls provide an important source of information, using them as an indicator does not seem to be entirely convincing because of their lack of reliability (many election outcomes noticeably

differed from polls forecasts). Instead, an index of volatility of the electorate can be used both to capture the uncertainty in the election outcome and the fickleness of the voting public that could limit government's willingness to take tough action in the run up to an election.

This phenomenon is well captured in Pedersen's index of volatility (Pedersen, 1983), which measures the change in the proportion of seats held by each party from one election to the other. To facilitate comparisons, we compute changes from similar elections (two parliamentary or two presidential elections).

Pedersen's index, VOLAT, is defined as:

$$VOLAT = \frac{\sum_i |R_i^A - R_i^B|}{2}$$

where  $R_i^A$  is the percentage of seats obtained by party I in election A and  $R_i^B$  is the percentage of seats obtained by party I in election B.

#### **D. Election Dates: ELECD**

Instead of focussing on the fickleness of the electorate and the political parties, as measured by the volatility of the voting preferences, it is also possible to focus more directly on the election dates. Periods of elections appear to be characterized with a higher degree of economic vulnerability, as was illustrated in the introduction with the case of Mexico. Annex I sets out a model that seeks to explain the conditions under which pending elections or elections that have just been held can have an impact on a country's vulnerability. It models the situation in which the occurrence of elections induces the government to conceal and not act on weaknesses such as banking sector problems before the election in order to facilitate its reelection. This model suggests that economic vulnerability may increase not only before but also after an election when the true magnitude of the problems is revealed and reform is undertaken—a situation that is more recently illustrated by the cases of Brazil, Ecuador and Paraguay.

Elections differ from one country to the other. The main types of elections that can be distinguished are parliamentary elections, presidential elections and nationwide local elections. In the absence of a decisive way to weight the impact of a given election, they have all been treated equally.

#### **E. Tornell's 23 Country Sample**

As discussed, Tornell's data and sample of countries data will be used to test for the significance of political variables. The political regimes in the sample countries are sufficiently uniform to allow for the calculation of the identified political indices. Elections are held in all countries of this sample. They basically all have multi-party regimes in which elections



determine directly or indirectly the government of the countries.<sup>4</sup> The length of the election cycle ranges from 4 to 6 years while the average length equaled 4 years and 10 months and the median length was 5 years. Thirteen of the sample countries have presidential regimes and ten parliamentary regimes.

Tornell's model centers on explaining the movements in a crisis index during two core crisis periods: two five-month periods starting respectively in November 1994 and May 1997. Accordingly the political indices were calculated for 1994 and 1997 for these 23 countries. To avoid the potential for reverse causality the indices have been computed based on variables known at the start of the 5 month crisis periods identified and used in Tornell's paper. Thus, NEFF was calculated based on the party composition of the parliament in November 1994 and May 1997; COAL based on the coalition composition on these dates; VOLAT is based on the two last elections preceding the two dates; and the election dates used are dates of elections that had already taken place or the dates of future elections as expected in November in 1994 and May 1997. The indices were available or could be computed for all countries except Hong Kong (1994) and Jordan. These countries had not developed a political system that could allow us to compute their volatility index on the same basis as for the others, and the volatility index was set to zero in view of the limited weight of the election results in determining government policies.

Key features of the political variables are presented in Box 1. The data for the political indices are derived from the *Country Reports* and *Country Profiles* (various years) of the Economist Intelligence Unit, the *Latin American Political Yearbook 1997* and *Keesing's Record of World Events* (various years).

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<sup>4</sup> The sample includes 22 emerging countries, plus Hong Kong. Seven are Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico, Peru, Venezuela), seven East Asian countries (Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Taiwan, Thailand), three South Asian countries (India, Pakistan, Sri Lanka), one is Asia minor (Turkey), two African countries (South Africa and Zimbabwe), two Eastern European (Hungary and Poland) and one Middle Eastern (Jordan).

### **Box 1. Key Features of Political Variables**

#### **Effective Number of Parties**

The average effective number of parties in the sample was 3.1 and the median value was 2.65. A very clear outlier for NEFF was Brazil, which had the highest score in both 1994 (8.5) and 1997 (8.4): the House elected in November 1994 was notoriously divided, the biggest party (PMDB) holding only 21% of the seats. Political scientists have often described Brazil as a country with “a highly fragmented party system with a broad ideological spread at the elite level” (Mainwaring, 1995). The next highest scores were attained by Peru and Thailand in 1994 (6.2 each), India in 1997 (4.8), Poland in 1997 (4.7), and Turkey in 1994 (4.4). Among the countries with a small effective number of parties are Jordan (1 in both years), Zimbabwe in 1994 (1.5 in both years due to the domineering position of the ZANU-PF party), Malaysia and Pakistan in 1997 (1.5 each), and Indonesia in 1994 (1.8).

#### **Coalition Fragility**

The median value of the coalition variable, COAL, was 1 in the sample. Only 5 country-years had a coalition index of 3: India, Pakistan, Peru and Thailand in 1994, and Thailand in 1997. These countries had minority governments which made the ruling coalition particularly fragile. Thailand is the only country that retained a weak coalition index in both periods, in spite of the election that took place in November 1996—which was the second election in a period of 18 months. The November 1996 election did not yield a clear majority and the ruling coalition was made up of six parties.

#### **Volatility Index**

The mean value of the volatility index, VOLAT, was 17.3 and its median value 14.3. The highest volatility index was reached by Poland in 1994 (49.5). This number reflects the change in the percentage of seats held by parties represented in parliament between the 1991 and the 1993 elections. The size of the volatility index reflects the rise of the SLD (Democratic Left Alliance) in this period, and the fall of parties affiliated with the Solidarity movement. The shift in the political preferences of Polish voters in the post-communist period was a surprise for most political observers. A similar pattern happened in Hungary in 1994 (with a volatility index of 42.5). Other high volatility indices were reached by South Africa and Zimbabwe (35.7 and 46.6) in 1994, due to their change toward a fully-democratic society. For these two countries, a high electoral volatility index did not impact economic vulnerability. In 1997, Zimbabwe had a very low volatility index, reflecting the stable position of the dominant party. Low values were reached by countries which did not have a tradition of fully developed electoral system like Jordan in both years, and Hong Kong in 1994 (for these three country-years, the volatility index was set at 0). The index was also particularly low for Argentina in both years (5), Chile and Indonesia in 1994 (6), and Peru in 1997 (5).

### III. Estimation and Regression Results

#### A. Specification of Tornell's Model

As argued in the introduction, Tornell's 1998 model is a suitable vehicle for testing the political variables is. Based on work by Sachs, Tornell and Velasco (1996) on the Tequila crisis, Tornell's estimations focus on three variables that strongly impact the extent of crises: the weakness of the banking system (proxied with a lending boom index), the extent of real exchange rate appreciation, and the liquidity of the country (measured by the ratio of M2 to reserves in the month preceding the onset of the crisis).<sup>5</sup>

More specifically Tornell estimated the following regression:

$$\text{Crisis}_{i,t} = \alpha_0 + \alpha_1 \text{LB}_{i,t} + \alpha_2 \text{RER}_{i,t} + \alpha_3 \text{Dhr} * \text{LB}_{i,t} + \alpha_4 \text{Dhr} * \text{RER}_{i,t} + \alpha_5 \text{Dsf} * \text{LB}_{i,t} + \alpha_6 \text{Dsf} * \text{RER}_{i,t} + e_{i,t}$$

where the variables are explained in box 2. The effects of the lending boom (LB) and real depreciation (RER) in the case of low reserves and weak fundamentals are captured by  $\alpha_1$  and  $\alpha_2$  respectively ( $\alpha_1 > 0$  and  $\alpha_2 > 0$ ). In case of high reserves (Dhr) or strong fundamentals (Dsf) the dummies kick in. For example the effects of a lending boom are captured by  $\alpha_1 + \alpha_3$  in case of countries with high reserves. If  $\alpha_1 \approx -\alpha_3$  as Tornell reports, then the lending boom has no impact for the high reserve countries.

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<sup>5</sup>Tornell reports results which are similar for the two crisis periods, and which are relatively robust to changes in the length of the crisis period, alternative definitions of the dummies, the exclusion of specific countries, and the inclusion of several additional crisis indicators except possibly for the current account deficit.

## **Box 2. Variables in Tornell's Model**

### **Independent variable**

#### **Crisis index**

The severity of the external crisis is measured by an index consisting of the weighted average of the drop in reserves and the increase of the real exchange rate. Each of the two components is weighted by its precision (the inverse of the variance) over the sum of both precisions calculated from a monthly series of 10 years. Thus the more volatile the variable over the preceding 10 years the less its relative contribution to the crisis index. (See Annex II for the values of variables used by Tornell.)

### **Explanatory Variables**

#### **Real Exchange Rate: RER**

The real exchange rate is measured as a trade weighted average of the bilateral real exchange rates of a given country with respect to the US dollar, the Mark and the Yen.

#### **Lending Boom: LB**

To measure the strength of the banking system, Tornell uses the increase in lending as a proxy for non-performing loans. His "lending boom index" is the real percent increase in loans provided by the banking system to the private sector and state-owned enterprises over the previous four years under the assumption that the greater the lending boom, the higher the amount of bad loans. It is indeed not unreasonable to take this approach as in practice 'non-performing' loans are not only differently defined across countries, but seemingly similar definitions can be implemented in different ways (e.g. the "evergreen accounts problem", where new loans are used to pay interest, may distort the bad loan problem). As a result observed non-performing loans tend to lag the bad loan problem.

#### **The Liquidity Level: M2/R**

The degree of liquidity is a key variable in measuring the vulnerability of a country as Central Banks reserves serve to back the commitments of the authorities. The ratio used by Tornell to proxy the Central Banks 'war chest' is the ratio of M2 to reserves in the month preceding the onset of the crisis (November 1994 or May 1997). Although it is argued in Annex I that the test for high reserves should be somewhat differently defined, we use Tornell's variable in order to present comparable results.

#### **Dummy Variables for High Reserves and Strong Fundamentals: Dhr and Dsf.**

A country has high reserves ( $D_{hr}=1$ ) if its ratio of M2 to Reserves is below 1.8. The group with high reserves includes 7 country-years: Chile, Peru and Venezuela in 1994, Chile, Peru, Hong Kong and Venezuela in 1997.

A country has strong fundamentals ( $D_{sf}=1$ ) if its lending boom is below 0% and its real exchange rate appreciation is less than 5%. The group with strong fundamentals includes 5 country-years: Taiwan and Turkey in 1994, Hungary, Mexico and Venezuela in 1997.

We have been able to reproduce Tornell's results exactly using the data supplied in his paper. These results are presented in column 1 of Table 1.

## B. Regression Results and Interpretation

### 1. Regression Results and Tests of Robustness

Table 2 presents the results of the various regressions run with political variables. Test 1 replicates Tornell's result (t-statistic in parentheses) and Test 2 presents the same regression, correcting for heteroscedasticity using Newey-West as Tornell does. The Newey-West methodology does not affect the coefficients, nor the R-squared, but it does effect the t-statistics, especially of the RER. In the remainder, results are presented with uncorrected t-statistics.<sup>6</sup> Test 3 in Table 2 presents a regression combining all economic variables and all political indicators. Two of the political variables are insignificant (NEFF and COAL), and two are strongly significant and robust to various tests (the volatility index and election variables).

Neither the effective number of parties NEFF nor the coalition fragility index COAL appear to be significant (COAL actually has the wrong sign). T-statistics for NEFF and COAL are not improved when the variables are tested alone, or combined with a dummy to turn off the variables for high reserve countries. The weak impact of these two variables can be explained in various ways: first, the effective number of parties may not be a good proxy for polarization and second ideological polarization may also have a weaker influence on the delaying of reforms than it is usually acknowledged. The poor outcome obtained from COAL is probably linked with the way it was defined: taking into account the number of parties in the coalition does not allow us to capture properly the real weakness of the coalition. More fundamentally, the indecision and polarization may have contributed over a longer period of time to weak economic fundamentals that are already reflected in the economic variables tested.

The volatility index, on the other hand, is significant and robust. When included in the regression with the other political variables, its t-statistic (1.83) is significant at the 10% level. When tested alone, VOLAT is even more significant and increases the adjusted R-squared from 0.37 to 0.41. The volatility index actually remains statistically significant when combined with different election variables, as Tests 5, 6 and 7 in Table 2 demonstrate. It also passes successfully tests for robustness when outliers are removed (see tests 1, 2 and 3 in Table 3.a. when the lowest and highest outliers for VOLAT are removed). When the sample is tested in two different equations for 1994 and 1997, VOLAT appears to fit better the 1997 episode but is still significant for 1994 (as demonstrated in Table 3.a, Test 5 and 6). As a consequence, we can conclude with sufficient confidence that the volatility index does significantly impact economic vulnerability.

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<sup>6</sup> The estimation results have been obtained using OLSQ and E-Views. Tornell corrects the t-statistics for heteroscedasticity using Newey-West. However, the way the variables are defined is such that heteroscedasticity is not expected to have a significant impact. The results are therefore primarily evaluated using uncorrected t-statistics. The main impact of using Newey West corrections is that the t-statistic for RER in Tornell's basic equation halves from 2 to 1.

Election variables also appear to strongly impact economic vulnerability. The period of measurement chosen by Tornell allows us to measure the severity of the crisis during a limited period of time. Tornell measured the crisis for two five month periods starting respectively in end November 1994 and end May 1997 for the two crises. The length of the period nevertheless imposes some complications from the perspective of testing the impact of elections. As is demonstrated in Annex I, the impact of upcoming elections is likely to differ from the impact of elections that have just been held. However, elections that fall in the beginning, middle or end of the five month period are lumped together, as the crisis index cut-off point is the end of the period. Choosing a specification for the election variables must consequently take somewhat of a broad brush approach with regard to measuring the respective impact of elections that have been held and those that are still to be held. The approach taken is to test variables accounting for different periods: the core (measurement) period, the core period and the five preceding months, and the core period and the five following months.

ELECD1 is a dummy variable that equals 1 when a country held an election in the period July 1994 till April 1995 or January 1997 till October 1998, 0 otherwise. Thus, ELECD1 corresponds to the period of measurement chosen by Tornell (December 1994 till April 1995 or June till October 1997) and the five *preceding* months. For countries with high reserves that held an election the dummies are set to zero—later in this paper regressions are discussed where the elections in the two effected countries are taken into account.<sup>7</sup> Having an election during this period strongly affects the crisis index: the coefficient of ELECD1 is high (varying from 8.5 to 10.7 in the various regressions run in Tests 3 to 6, presented in Table 2, implying a reserve loss and depreciation of 8.5-10.7 percent combined) and statistically significant. When the dummy is set back to 1 for countries with high reserves also (Test 1 in Table 3), the t-statistic of ELECD1 is still above 1 but no more significant at the 10% level.

To illustrate the impact of shortening the measurement period, we used a dummy variable (ELECD2), corresponding to an 8 month period (presented in Table 2, Tests 7 and 8). When defined this way, the election variable is highly significant (when included by itself, the adjusted R-squared increases to 0.49 from 0.37 and its t-statistic equals 3.2, which is significant at the 1% level). When elections in high-reserve countries are not excluded (Test 2 in Table 3.b), ELECD2 still has a very significant t-statistic (2.48). Thus, the estimation results imply that holding an election increases economic vulnerability after the election date.

At this point, a natural question arises as to whether taking a dummy that corresponds to countries that held an election during the crisis period (December 1994 till April 1995 or June till October 1997), or during this period and the *following* five months (December 1994 till September 1995 or June 1997 till March 1998) still has an impact on the vulnerability index. Table 3.b displays the results obtained with two variables capturing the effect of elections held

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<sup>7</sup>The countries with high reserves for the 1994 period were Peru and Sri Lanka (the corresponding M2/reserves ratios for these countries were 124 and 185).

in these two periods (respectively ELECD3 and ELECD4, presented in Tests 3 and 4).<sup>8</sup> The regression in which the election variable equals 1 when an election was held during the measurement period (Test 3) does not enter significantly into the regression; neither does ELECD4, corresponding to the 10 month period of the crisis measurement period and during the following 5 months. As a consequence, the results point out that the perilous period is not so much *before* than *after* the election time. A possible explanation why pre-electoral periods do not seem to increase vulnerability significantly in these tests may come from the measurement period chosen by Tornell: the 1997 crisis extended after October 1997. Indeed, Korea is an example of a country that has been hit by a crisis in the run-up to the election; Tornell's crisis index "misses" the impact of the crisis on Korea because it stops measurement too early.<sup>9</sup> What remains is that important countries have been hit by a crisis *after* they had held an election (mainly Mexico and Brazil in 1994, and Indonesia in 1997).

## 2. Interpretation

The core equation we focus on is therefore Test 6 (presented in Table 2). This regression includes all statistically significant economic variables (lending boom, exchange rate depreciation, and Dhr\*LB), as well as the two key political indices (the volatility index and the election variable)<sup>10</sup>:

$$\text{IND}_{it} = -7.69 + 0.25 \text{ LB} - 0.12 \text{ RER} - 0.25 \text{ Dhr*LB} + 0.25 \text{ VOLAT} + 9.82 \text{ ELECD1}$$

(-1.99)	(5.58)	(-1.27)	(-4.86)	(1.73)	(2.07)
[-2.48]	[3.91]	[-1.5]	[-4.37]	[2.01]	[1.31]

As in the original Tornell model, the coefficients of LB and Dhr\*LB have similar but opposite signs: countries with high reserves are not affected by a lending boom. The coefficient of VOLAT is positive and approximately equal to that of LB, but the standard deviation of the lending boom LB is about 4 times that of VOLAT. The lending boom therefore contributes much more to variations in the crisis index than the volatility index: political variables do not determine the extent of the crisis, they improve the explanatory power of the regression when

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<sup>8</sup>A complication arises because of a legal lag in some countries between the election date and the taking office (e.g. Mexico, Brazil). In Mexico, the period between the election of President Zedillo (August 1994) and his taking office (December 1994) occurred to be politically very unstable, as the chronology in Annex II demonstrates. For ELECD2 this is immaterial. ELECD3 has been defined to include the taking office in Mexico and Brazil. Nevertheless ELECD3 is not significant.

<sup>9</sup>The crisis index might have captured the election impact as early as October if it had been able to capture that part of the reserves that were no longer fully available for use at the time.

<sup>10</sup> t-statistics in parentheses, Newey-West corrected t-statistics in square brackets. Figure 3 displays the actual and fitted crisis indices for the sample of 23 countries taken in 1994 and 1997.

combined with economic data. VOLAT varies between 0 and 50, and at its maximum it adds 12.5 percentage points to the crisis index (i.e., it increases the weighted reserve loss and exchange rate depreciation by 12.5 percentage points). Another noteworthy outcome is the size of the coefficient of the election variable: holding an election is equivalent, in terms of impact on the crisis index, to an increase in the lending boom of 40 percent. Holding an election, when not having an adequate reserve cushion, adds about 10 percentage points to the crisis index. The equation implies that countries with sound economic fundamentals are not affected by elections whereas countries with poor fundamentals, indicated primarily by a high lending boom, limited reserves, and an overvalued exchange rate, are at even greater risk during electoral periods.

How do political variables affect economic vulnerability for key countries? To compare regressions using political variables with regressions using only economic variables, we can compare the residuals respectively obtained by the two models. Figure 4 plots the residuals of two regressions: the first one (plain line), was obtained with an econometrics model using only economic variables (Tornell, 1998); the second one (dotted line) was obtained with the core regression which contains political variables.

A first observation that can be inferred from Figure 4 is that the inclusion of political variables in the model helps to reduce errors of forecasting for most countries. In particular, residuals are much smaller for five of the highest peaks left by the original Tornell model: Brazil 1994, Hungary 1994, Mexico 1994, Hungary 1997, Indonesia 1997. The improvement is due mainly to the election dummy for the case of Mexico 1994 and Indonesia 1997, mainly to the volatility index for the case of Hungary in 1994 and 1997, and both variables for Brazil 1994. Political variables also helped to reduce mistakes in the other direction: the original Tornell model “overshot” for some countries, and the inclusion of political variables helped to reduce the overshooting (Argentina 1994 and 1997, Hong Kong 1994, Jordan 1994 and 1997, Colombia 1994 and 1997, Korea 1997). The equation using only economic variables overestimated the impact of the crisis for the countries mentioned above: their fundamentals led to the conclusion that they were going to have a higher crisis index than the value the index actually took. The low level of their political instability index helped narrow the vulnerability indices of these countries.

The second observation from Figure 4 is that the inclusion of political variables leads to overshooting in predicting the crisis index of the following countries: Sri Lanka 1994, Zimbabwe 1994, Peru 1997, Poland 1997. The explanation stems from the fact that the measured political stability in these countries was limited at the time—mainly due to elections in the case of Sri Lanka 1994 and due to a high electoral volatility in the case of Poland 1997—but could avoid the cost of a crisis thanks to their sound economic fundamentals. For example, in 1994 Sri Lanka had a low real exchange rate appreciation (6.39%), limited lending growth (28.08%) and a high level of reserves (its M2 to reserves ratio was equal to 185.51), Poland had a contracting ‘lending boom’ in 1994 (-14.04%).

Finally, it may be noted that when political variables are added to the original Tornell model, economic variables retain the same sign, and their t-statistics actually *increase*. Adding



political variables does not change the impact of economic variables, it reinforces their relevance. This element is particularly important because it stresses the robustness of the underlying model, and demonstrates that political and economic variables are not only compatible but also mutually enlightening.

#### **IV. Conclusion**

This paper found that the inclusion of political variables in economic models does improve the explanatory power of regressions. In particular, it was found that political instability matters for countries with low reserves or weak fundamentals. Countries with a sound economic environment are only marginally affected by political instability: political and economic variables have to be used jointly to give an accurate picture of an economy. A striking finding of this paper is that it is not just pre-electoral but especially post-electoral periods that are characterized by a higher vulnerability. Moreover, high reserves provide some cushion against the uncertainties created by elections. Therefore economic forecasting and advice to policy makers should not overlook political data and the means to offset the added uncertainty.

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Figure 2. Index of Economic Vulnerability

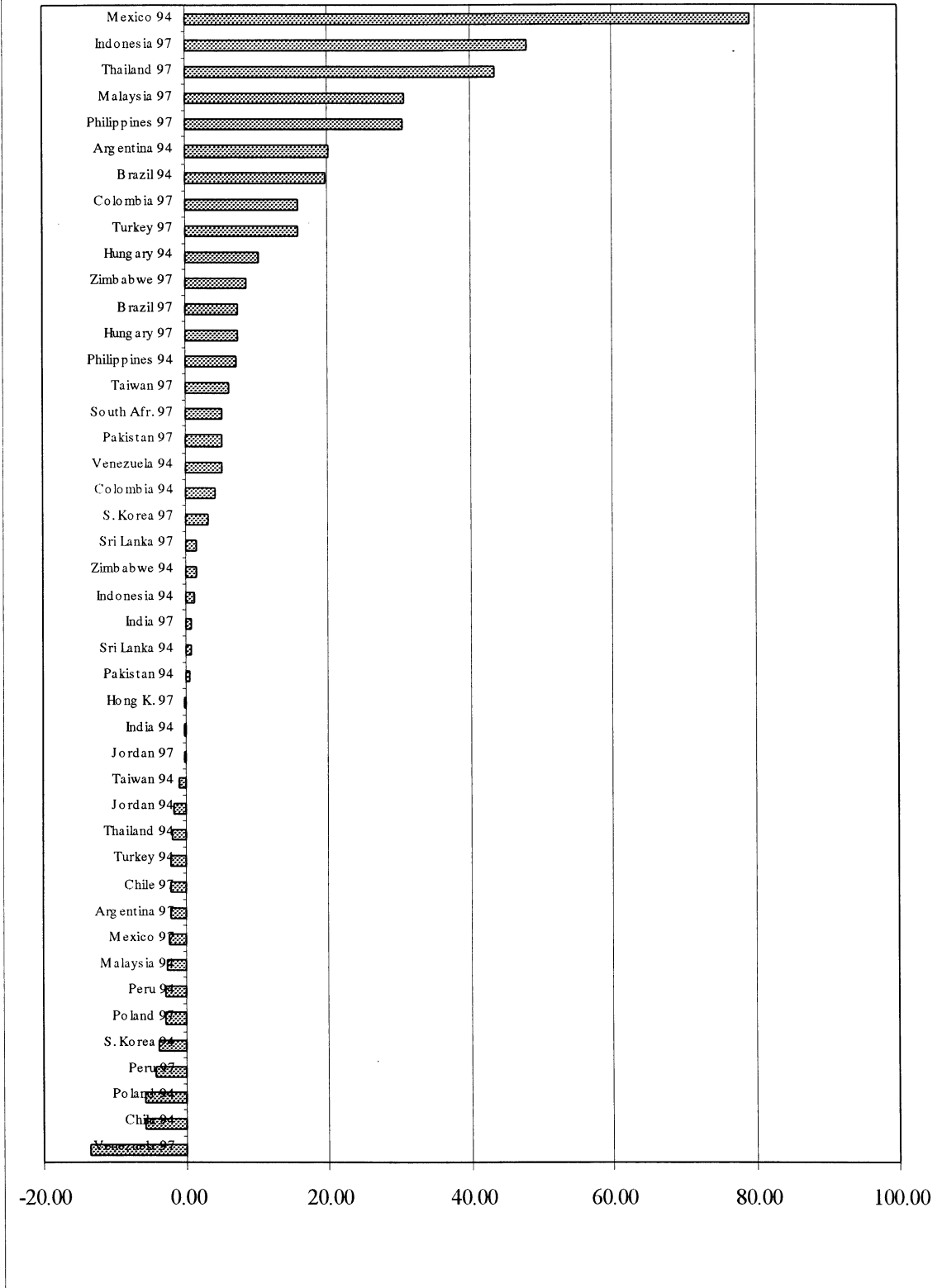


Figure 3. Actual and Fitted Crisis Indices Using Economic and Political Variables

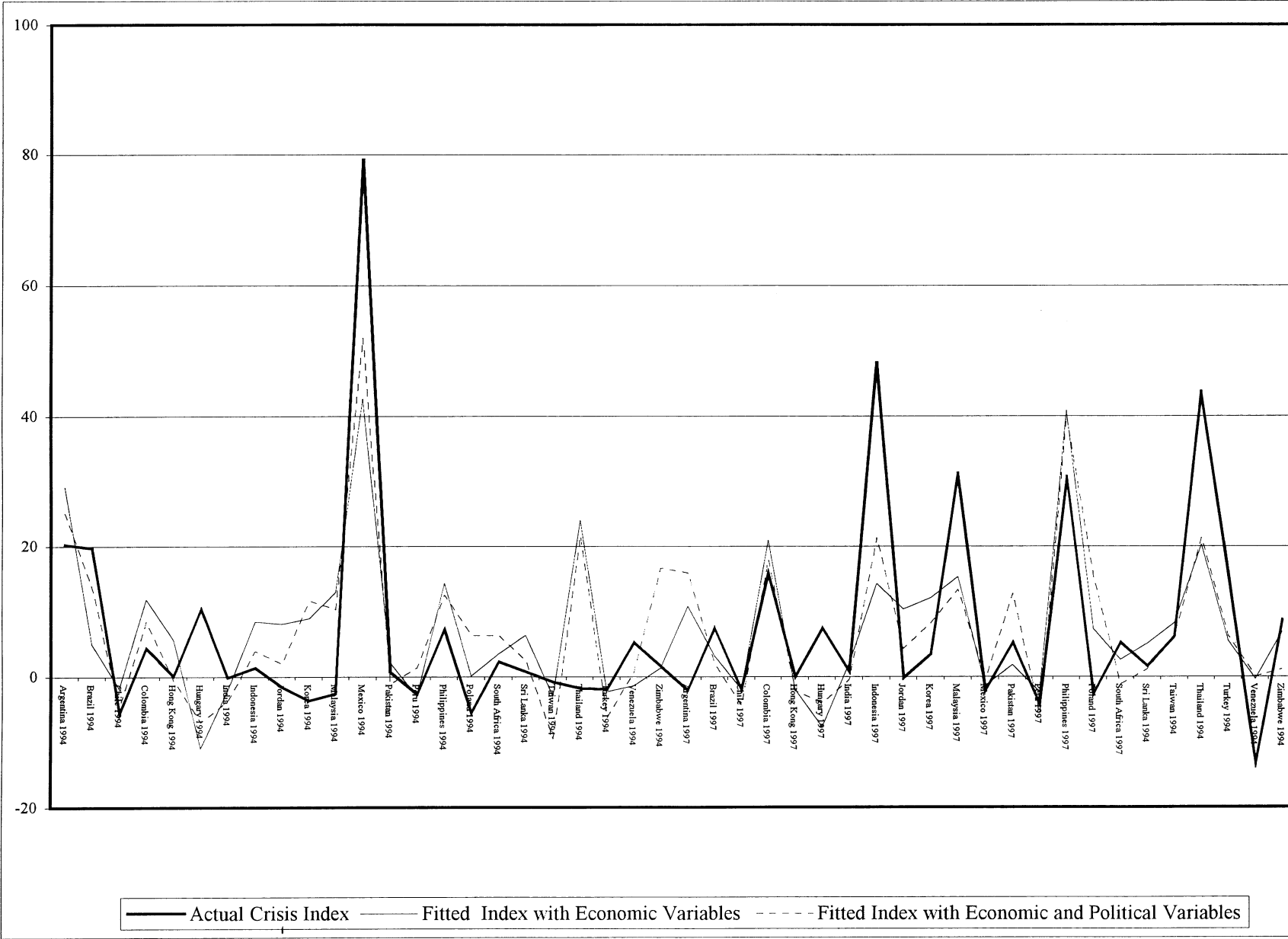


Figure 4. Residuals from Regressions Using Economic and Political Variables

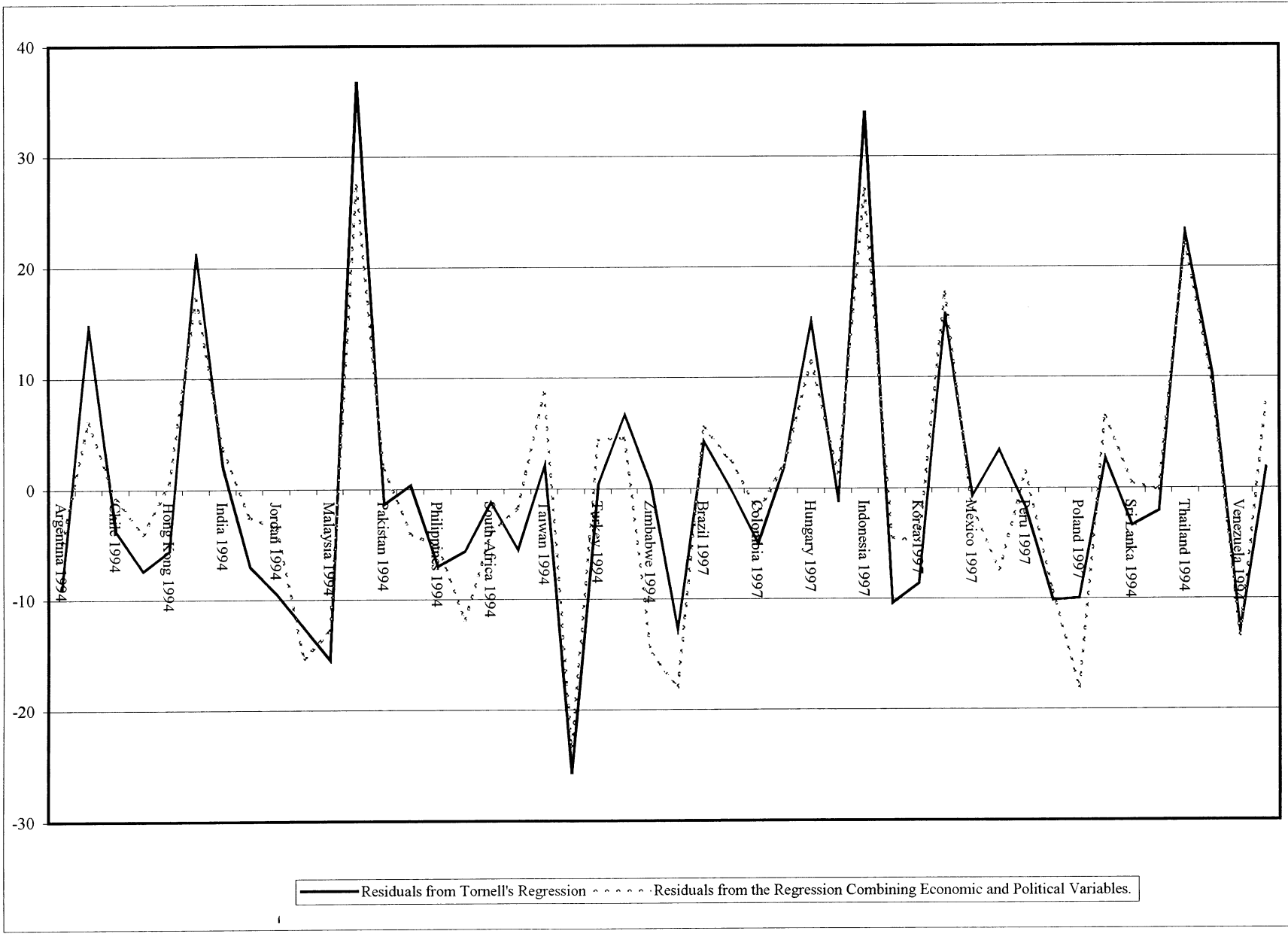


Table 1. Residuals from Regressions Using Economic and Political Variables

Tornell's Model (Economic Variables)

Model Combining Economic  
and Political Variables

Rank	Country	Residual	Rank	Country	Residual
1	Mexico 1994	36.74	1	Mexico 1994	27.38
2	Indonesia 1997	34.00	2	Indonesia 1997	26.96
3	Thailand 1994	23.17	3	Thailand 1994	22.18
4	Hungary 1994	21.29	4	Malaysia 1997	17.65
5	Malaysia 1997	15.67	5	Hungary 1994	17.26
6	Hungary 1997	15.10	6	Hungary 1997	11.44
7	Brazil 1994	14.72	7	Turkey 1994	9.58
8	Turkey 1994	10.32	8	Taiwan 1994	8.63
9	Venezuela 1994	6.64	9	Zimbabwe 1994	7.51
10	Brazil 1997	4.24	10	South Africa 1997	6.41
11	Pakistan 1997	3.38	11	Brazil 1994	6.09
12	South Africa 1997	2.66	12	Brazil 1997	5.47
13	Taiwan 1994	2.14	13	Venezuela 1994	4.53
14	India 1994	1.98	14	Turkey 1994	4.40
15	Hong Kong 1997	1.85	15	India 1994	3.62
16	Zimbabwe 1994	1.79	16	Chile 1997	2.42
17	Turkey 1994	0.36	17	Hong Kong 1997	2.05
18	Peru 1994	0.35	18	Pakistan 1994	1.83
19	Zimbabwe 1994	0.30	19	Peru 1997	1.46
20	Chile 1997	-0.13	20	India 1997	1.25
21	Mexico 1997	-0.74	21	Hong Kong 1994	0.53
22	South Africa 1994	-1.22	22	Sri Lanka 1994	0.49
23	India 1997	-1.24	23	Taiwan 1994	-0.19
24	Pakistan 1994	-1.41	24	Chile 1994	-0.89
25	Peru 1997	-1.84	25	Sri Lanka 1994	-1.70
26	Taiwan 1994	-2.12	26	Mexico 1997	-1.82
27	Sri Lanka 1994	-3.43	27	Colombia 1997	-2.01
28	Chile 1994	-3.82	28	Indonesia 1994	-2.54
29	Colombia 1997	-5.04	29	Jordan 1994	-3.49
30	Sri Lanka 1994	-5.56	30	Peru 1994	-4.00
31	Hong Kong 1994	-5.61	31	South Africa 1994	-4.06



Tornell's Model

Rank	Country	Residual
32	Poland 1994	-5.67
33	Philippines 1994	-7.06
34	Indonesia 1994	-7.07
35	Colombia 1994	-7.45
36	Korea 1997	-8.65
37	Argentina 1994	-8.91
38	Jordan 1994	-9.56
39	Poland 1997	-10.01
40	Philippines 1997	-10.20
41	Jordan 1997	-10.48
42	Korea 1994	-12.57
43	Argentina 1997	-12.85
44	Venezuela 1994	-12.95
45	Malaysia 1994	-15.48
46	Thailand 1994	-25.77

Alternative Model

Rank	Country	Residual
32	Colombia 1994	-4.08
33	Jordan 1997	-4.49
34	Korea 1997	-4.82
35	Argentina 1994	-4.92
36	Philippines 1994	-5.27
37	Pakistan 1997	-7.50
38	Philippines 1997	-9.40
39	Poland 1994	-11.91
40	Malaysia 1994	-12.90
41	Venezuela 1994	-13.38
42	Zimbabwe 1994	-15.01
43	Korea 1994	-15.29
44	Argentina 1997	-17.98
45	Poland 1997	-18.07
46	Thailand 1994	-23.37

Table 2. Regression Results

Variable	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8
LB	0.24 (4.76)	0.24 (2.7)	0.26 (5.05)	0.23 (4.7)	0.25 (5.07)	0.25 (5.58)	0.25 (5.32)	0.23 (4.85)
RER	-0.12 (-1)	-0.12 (-2.14)	-0.13 (-1.05)	-0.14 (-1.22)	-0.14 (-1.27)	-0.12 (-1.27)	-0.09 (-0.88)	-0.09 (-0.8)
Dhr*LB	-0.25 (-3.62)	-0.25 (-3.04)	-0.26 (-3.81)	-0.23 (-3.53)	-0.25 (-3.83)	-0.25 (-4.86)	-0.24 (-4)	-0.23 (-3.65)
Dhr*RER	0.15 (0.25)	0.15 (0.55)	-0.05 (-0.09)	0.07 (0.12)	0.04 (0.07)	-	0 (0)	0.04 (0.1)
Dsf*LB	-0.04 (-0.13)	-0.04 (-0.11)	0 (0)	-0.08 (-0.3)	0.02 (0.06)	-	0.03 (0.13)	-0.05 (-0.16)
Dsf*RER	0.17 (0.52)	0.17 (1.07)	0.13 (0.41)	0.08 (0.27)	0.11 (0.38)	-	-0.02 (-0.05)	-0.05 (-0.16)
NEFF	-	-	0.4 (0.24)	-	-	-	-	-
COAL	-	-	-2.24 (-0.9)	-	-	-	-	-
VOLAT	-	-	0.3 (1.85)	-	0.26 (1.65)	0.25 (1.73)	0.27 (1.88)	-
ELECD1	-	-	8.52 (1.6)	10.72 (2.12)	9.53 (1.9)	9.82 (2.07)	-	-
ELECD2	-	-	-	-	-	-	15.8 (2.98)	16.36 (3)
C	-1.27 (-0.41)	-1.27 (-0.35)	-7.48 (-1.41)	-2.99 (-0.97)	-7.93 (-1.87)	-7.69 (-1.99)	-8.12 (-2.04)	-2.7 (-0.95)
R2	0.45	0.45	0.57	0.51	0.54	0.54	0.6	0.56
Adjusted R2	0.37	0.37	0.43	0.42	0.44	0.48	0.51	0.48

ELECD1 corresponds to the 10 months period 07-94 till 04-95 and 01-97 till 10-97

ELECD2 corresponds to the 8 months period 08-94 till 03-95 and 02-97 till 09-97

t-statistics in parenthesis

Table 3.a. Testing for Robustness on VOLAT

Variable	Tornell Model	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7
LB	0.24 (4.76)	0.27 (5.23)	0.27 (4.89)	0.29 (5.11)	0.29 (4.84)	0.3 (3.77)	0.23 (2.91)	0.27 (5.24)
RER	-0.12 (-1)	-0.12 (-1.08)	-0.12 (-0.97)	-0.096 (-0.7)	-0.09 (-0.59)	-0.17 (-1.05)	-0.07 (-0.41)	-0.12 (-1.06)
Dhr*LB	-0.25 (-3.62)	-0.27 (-3.97)	-0.27 (-3.77)	-0.296 (-4.14)	-0.3 (-3.95)	-0.35 (-2.36)	-0.22 (-2.54)	-0.27 (-3.99)
Dhr*RER	0.15 (0.25)	0.1 (0.18)	0.11 (0.17)	-0.07 (-0.11)	-0.08 (-0.13)	-0.64 (-0.46)	0.17 (0.23)	-0.32 (-0.39)
Dsf*LB	-0.04 (-0.13)	0.08 (0.26)	0.07 (0.24)	0.034 (0.96)	0.33 (0.9)	-1.61 (-0.71)	0.48 (1.31)	-0.05 (-0.14)
Dsf*RER	0.17 (0.52)	0.19 (0.62)	0.18 (0.56)	0.297 (0.92)	0.29 (0.85)	-0.37 (-0.35)	0.19 (0.39)	0.15 (0.47)
VOLAT	-	0.3 (1.88)	0.29 (1.52)	0.33 (1.55)	0.31 (1.21)	0.33 (1.39)	0.73 (2.12)	-
Dhr*VOLAT	-	-	-	-	-	-	-	-0.02 (-0.04)
(1-Dhr)*VOLAT	-	-	-	-	-	-	-	0.32 (1.94)
C	-1.27 (-0.41)	-7.26 (-1.66)	-6.84 (-1.28)	-8.39 (-1.9)	-8.12 (-1.47)	-	-8.78 (-1.24)	-7.59 (-1.72)
R-squared	0.45	0.498	0.498	0.56	0.56	0.54	0.57	0.51
Adj. R2	0.37	0.41	0.395	0.47	0.46	0.33	0.37	0.399

Test 2: removing the four lowest outliers for VOLAT

Test 3: removing the four highest outliers for VOLAT

Test 4: removing the four lowest and the four highest outliers for VOLAT

Test 5: 1994 period only

Test 6: 1997 period only

t-statistics in parenthesis

Table 3.b Testing for Robustness on Election Variables

Variable	Test 1	Test 2	Test 3	Test 4
LB	0.23 (4.7)	0.22 (4.6)	0.24 (4.6)	0.24 (4.44)
RER	-0.13 (-1.14)	-0.08 (-0.69)	-0.12 (-1)	-0.12 (-1)
Dhr*LB	-0.25 (-3.74)	-0.25 (-3.89)	-0.24 (-3.5)	-0.24 (-3.4)
Dhr*RER	0.14 (0.24)	0.17 (0.3)	0.12 (0.2)	0.13 (0.25)
Dsf*LB	-0.07 (-0.24)	-0.03 (-0.13)	-0.05 (-0.17)	-0.04 (-0.14)
Dsf*RER	0.10 (0.33)	-0.03 (-0.1)	0.1 (0.33)	0.17 (0.5)
ELECD1 (10 month period), including high reserve countries	8.19 (1.75)	-	-	-
ELECD2 (8 month period), including high reserve countries	-	13.37 (2.48)	-	-
ELECD3 (five month period), including Mexico and Brazil 1994	-	-	5.87 (0.98)	-
ELECD4 ("anticipation", 10 month period)	-	-	-	0.8 (0.15)
C	-2.65 (-0.85)	-1.91 (-0.66)	-1.84 (-0.59)	-1.39 (-0.43)
R2	0.49	0.53	0.47	0.45
Adjusted R2	0.399	0.44	0.37	0.35

Independent variable is IND.

t-statistic in parentheses

ELECD1 corresponds to the period 07-1994 till 04-1995 and 01-1997 till 10-1997.

ELECD2 corresponds to the period 08-1994 till 3-1995 and 02-1997 till 09-1997.

ELECD3 corresponds to the period 12-1994 till 04-1995 and 06 till 10-1997.

ELECD4 corresponds to the period 12-1994 till 09-1995 and 06-1997 till 03-1998.

## A Formal Model of the Impact of Elections on Exchange Rate and Banking Crises

As demonstrated empirically in the main body of the paper, countries are especially vulnerable for an external crisis at the time of elections, most particularly after elections. Below we outline a model that explains some key features of the interaction of elections, reserves and external vulnerability in an economy with a fixed exchange rate. The model sheds light on the conditions under which crisis occur in the run up to elections (e.g., Korea 1997), and following elections (e.g., Mexico 1994). The model also explains the frequently observed non-transparency during periods of elections, when governments on occasion have resorted to concealing information that is of special importance to market participants. Taking its cue from the Korean experience the model focusses on bad loans and insolvency of the banking sector as the underlying problem.

### Bad Loans, Elections and Non-transparency

Take an emerging market economy which has achieved a significant positive steady state economic growth rate  $g^s$ . Financial intermediation in this economy is taking place through a large banking sector. However, banking supervision is still developing and bad loans (BL) are increasing over time at a rate  $\alpha$ :

$$BL(t) = \alpha (t+1-t_w) \text{ if } t \geq t_w, \quad BL(t) = 0 \text{ if } t < t_w.$$

The accumulation of bad loans is not observed by market participants, but can only be observed by the government which is responsible for banking supervision through one of its agencies or the central bank. It is assumed that  $\alpha$  itself follows a step function:  $\alpha = 0$  until  $t_w$  at which time it jumps to  $\alpha^s$ . Market participants are aware of this step function, and the constant probability  $P^\alpha$  that  $\alpha$  jumps in each period of given length (it is assumed that the number of periods between elections is less than  $1/P^\alpha$ ) but they do not observe  $t_w$ , the moment at which the bad loan problem emerges.

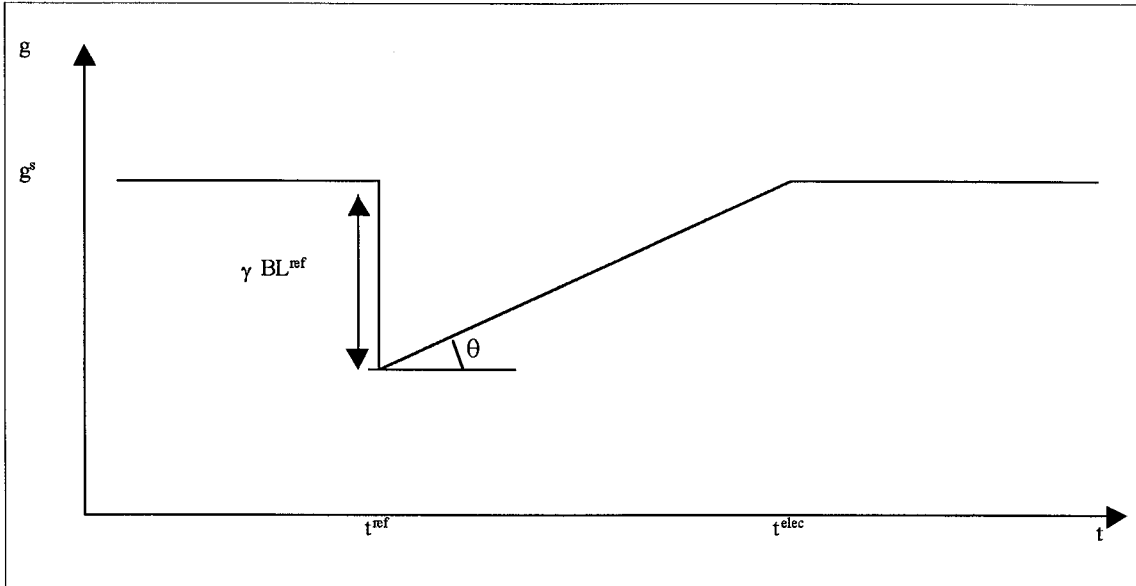
The government is not a benevolent optimizer, but will undertake reform of the banking sector only if it suits its political purposes, which primarily consist of aiming to be reelected at the election date  $t_{elec}$ . The electorate on its part is just concerned about economic growth, a well-known observation in political science (Nelson 1990, Nordhaus 1975), and will reelect the incumbent government if growth is  $g^s$  or higher.

The government is aware that cleaning up the banking system will depress growth by reducing available credit and thus effects its reelection chances. More in particular we assume that growth is immediately depressed by the amount of bad loans at the moment of clean up ( $BL_{reform}$ ) and gradually returns to normal, as the restructuring banks are forced to curtail lending immediately and it takes time for the idled resources to be reallocated (figure 1):

$$g = g^s - \gamma BL_{reform} + \min(\theta(t - t_{reform}), \gamma BL_{reform}) \text{ for } t_{reform} \leq t$$

In other words, on occurrence of the reform ( $t = t_{reform}$ ), growth dips by  $\gamma BL_{reform}$ , and gradually recovers over time to steady state growth  $g^s$ .

Figure 1. Growth Fluctuations After a Banking Sector Overhaul.



This yields as a first result a **non transparency or indecision result**: If the election is sufficiently far off, the government will undertake a banking sector reform immediately upon observance of the banking sector problems. However, with  $\alpha^s$  positive, there is a given period, ahead of the elections,  $t_{nontransparent}$ , after which the government no longer will undertake bank reform until the elections are over as the revelation of the problems would result in a drop in growth which would not recover in time for the elections. More in particular the government ceases reform when:

$$t_{nontransparent} = t_{elec} - \gamma \alpha^s / \theta.$$

The length of the period during which the government pursues lax banking supervision or does not reveal the problems encountered is  $\gamma \alpha^s / \theta$ , and varies linearly with the size of the immediate jump in bad loans,  $\alpha^s$ , with the impact of the jump on growth,  $\gamma$ , and inversely with the speed at which growth returns to normal,  $\theta$ .

In practice, incidences of non-transparency are regularly observed. Noteworthy examples include the delays in publication of reserve data in the second half of 1994 in Mexico that would have shed light on the waning confidence in the Mexican economy, and its competitiveness problems, the lack of information on the state of the banking sector and the

reserve position of the central bank of Korea in late 1997 and the absence of information provided on forward sales of foreign currency in Thailand in early 1997.

### Spillover to External Vulnerability

How will this domestic uncertainty, arising from incentives to hide information that will indirectly impact election results, spill over into external vulnerability? The remainder of this annex focusses on the conditions under which the non-transparency could lead to an external crisis in the context of a very simple model of the exchange rate and reserves.

In line with Chang and Velasco (1998) it is assumed that the Central Bank holds reserves to honor its commitments. These commitments here consist in the exchange rate peg and the objective to maintain a working banking system. More specifically we assume that the Central Bank needs to hold a minimum level of reserves equal to the size of M1 and the expected size of bad loans if it is to avoid an attack on the currency or a run on the banks:

$$RES_{\min} = e (M1 + BL_{\exp}),$$

where  $e$  is the exchange rate, and reserves (RES) are defined in foreign currency. If reserves fall below this level, the Central Bank cannot honor its commitments, confidence in the exchange rate peg is undermined, and capital would flee the country, forcing a devaluation of the currency to a new level where  $e_{\text{dev}} = RES / (M1 + BL_{\text{reveal}})$ .<sup>11</sup> Abstracting from Central Bank credibility problems, we assume that the Central Bank preempts any capital flight by devaluing immediately to avoid hemorrhaging of reserves that would lead to a greater devaluation.<sup>12</sup> Similarly it is assumed that the exchange rate appreciates to accommodate a better than

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<sup>11</sup>While this is not material to the result, it may nevertheless be useful to discuss the rationale for focussing on M1 and bad loans, rather than M2 (as in Chang and Velasco) as the amount of domestic liquidity that needs to be covered to avoid a run on banks in a fixed exchange rate regime where the Central Bank is a lender of last resort. The rationale for including M1, is that M1 is not backed by other assets. However, M2-M1 is backed by loan claims held by the banks. The banks, and their loan claims, can be sold to foreign investors, so the Central Bank does not need to cover the entire deposit base with reserves. Abstracting from banks' own capital, the implicit commitment of the Central Bank as lender of last resort is to cover the amount of bad loans in the banking system—as a proxy for the amount the Central Bank would have to put up to sell intervened banks. This should in principle be sufficient to prevent rational depositors from engaging in a run on the banks. It also corresponds more closely with the observed stylized fact that reserves seldom approach the size of M2. Under conservatively managed currency boards or fixed exchange rate regimes reserves are often held in the size of M1 plus a margin (e.g. Hong Kong and Croatia at end-1997).

<sup>12</sup> We also abstract from the fact that the exchange rate may well devalue more than the reserve loss suggests if the bad loan problem is compounded by the devaluation (Finland 1991, Mexico 1994).

expected bad loan result and reward investors for maintaining their currency holdings through the elections. This is to avoid having to model an interest rate or other offset for a one-sided chance of devaluation.

Three basic results can be derived. The first may be referred to as a **war chest result**: if the country maintains ample reserves, it will not suffer from a speculative attack, neither in the run up to elections nor following the elections when the bad loans are revealed. More in particular, if the size of reserves exceeds the maximum size of bad loans that might be concealed by the incumbent government, the Central Bank is prepared for the worst case and will always be able to honor its commitments:

$$RES \geq RES_{\text{warchest}} = M1 + BL_{\text{max}}, BL_{\text{max}} = (1 + \gamma\alpha^s/\theta)\alpha^s.$$

The ‘warchest’ reserve level is quadratic in the jump in bad loans,  $\alpha^s$ , as that affects both the length of period during which the bad loan problem is hidden, and the rate at which the problem accumulates.

A second result is a **post-election disappointment or revelation result**. An exchange crisis may occur when the elections are over when the new government takes office the true state of the economy is revealed, and the size of the bad loan problem is worse than expected. In that case the exchange rate will be devalued to restore the relation between the exchange rate and the level of reserves. For the situation where  $RES = RES_{\text{min}}$  before the elections, the change in the exchange rate is:

$$1 - (M1 + BL_{\text{exp}})/(M1 + BL_{\text{reveal}}) \geq 0 \text{ if } BL_{\text{reveal}} \geq BL_{\text{exp}}$$

This equation also implies that the expected exchange rate change is zero, and the exchange rate devalues upon a negative surprise. If reserves were such that a preelection crisis did not occur, but if the size of bad loans exceeds the level that would have triggered a crisis before the election, a crisis will take place after all.

The third result is an **election anticipation result**: if reserves are small an attack on the currency is inevitable in the run up to the elections. Notwithstanding the non-transparency, market participants can calculate the trajectory of the maximum size of bad loans, and they will form expectations as to the actual size of the bad loan problem. The size of the expected bad loans  $BL_{\text{exp}}$  depends on the probability distribution of  $\alpha$ .

$$M1 \leq RES \leq M1 + BL_{\text{exp}}, BL_{\text{exp}} = \sum_{i=1}^{i=\gamma\alpha^s/\theta} (1+i)\alpha^s/P^i \leq 0.5 BL_{\text{max}}$$



To avoid a run on its reserves in non-election times the Central Bank at any time needs to maintain a minimum of M1 in reserves.<sup>13</sup> To avoid a run on reserves in the run up to elections the Central Bank needs to have a war chest that is somewhat larger to make up for the non-transparency. The size of the additional reserves necessary to avoid a preelection crisis depends especially on the size of the jump or surprise in bad loans  $\alpha^s$  as well as the impact of bad loans on growth and the speed of adjustment. It is unlikely that an independent Central Bank, unless it clearly misreads the expectations in the market about the quality of the banking sector and the problems are quite serious, will have insufficient reserves to cover the expected bad loan problem if it already covers M1. In such circumstances exchange rate crises are most likely to occur in the post election period. However, this misreading of market expectations may occur, especially when the problems are very sizable as in Korea in 1997, where the negative market perception of the bad loan problem manifested itself in a large scale withdrawal of interbank credit lines and loans.<sup>14</sup>

The above analysis has abstracted from economic fundamentals that impact the evolution of the level of reserves. A deterioration in economic fundamentals at the time of elections will affect the level of reserves and the adequacy of the reserve cushion. If economic fundamentals deteriorate, the uncertainty regarding the state of the banking sector may trigger a crisis. Fundamentals such as those factors affecting the trade balance, or general confidence levels of emerging market investors (contagion) may lead to a liquidity squeeze and pressure on the exchange rate.

## **Conclusion**

This annex has demonstrated conditions under which governments may have an incentive to be less than fully transparent, and conditions under which a pre election or post election crisis may be triggered by this lack of transparency. What policy solution should be drawn from this analysis? A cynic's conclusion is that elections should never be held. However, it can be convincingly argued that elections ensure the legitimacy and forcefulness of an elected government. A pragmatic conclusion is that Central Banks should accumulate an increased war chests ahead of elections, especially in the presence of weak banking supervision or the potential for shocks to the fundamentals. Such war chest could also take the form of liquidity requirements on banks (e.g., Croatia), or credit lines (e.g., Argentina, Mexico).

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<sup>13</sup> Thus we rule out a Central Bank which pursues a monetary policy that is inconsistent with the basic reserve target (as in Krugman 1979).

<sup>14</sup>It may also be the case that markets expect the Central Bank to be able to honor part of the short term domestic and external debt obligations of the government until such time that it can arrange alternative revenue sources (raising taxes, obtaining privatization proceeds) while it is under "siege" and not able to tap international or domestic markets to roll-over its commitments. In such circumstances and those noted above the war chest needs to be significantly larger.

In addition mechanisms for enforcing transparency, good governance need to be enhanced to ensure the divulging of information in a way that voters can distinguish between shocks to growth which are exogenous and those that can be attributed to the policies of the incumbent government.

## Tornell's 1998 Data

Countries	Year	IND	RER	LB	M2/Res.
Argentina	94	20.20	-39.76	105.86	406.16
Brazil	94	19.65	-20.79	15.49	404.46
Chile	94	-5.63	-10.30	43.20	154.09
Colombia	94	4.31	-23.55	42.29	196.56
Hong K.	94	0.03	-12.63	22.36	442.27
Hungary	94	10.29	-19.57	-49.48	261.56
India	94	-0.14	38.46	15.01	751.87
Indonesia	94	1.32	-3.57	38.02	612.41
Jordan	94	-1.56	0.98	38.60	385.25
S. Korea	94	-3.70	0.54	41.97	665.04
Malaysia	94	-2.63	-5.17	55.61	213.92
Mexico	94	79.30	-17.95	171.71	924.90
Pakistan	94	0.68	7.39	17.38	871.39
Peru	94	-2.69	-17.62	244.36	124.85
Philippines	94	7.19	-18.01	55.19	476.51
Poland	94	-5.59	-40.69	-14.04	516.82
South Afr.	94	2.22	0.98	19.87	5052.17
Sri Lanka	94	0.74	-6.39	28.08	185.51
Taiwan	94	-0.87	9.67	-10.73	480.00
Thailand	94	-1.82	-5.51	101.12	378.11
Turkey	94	-1.96	35.80	-13.72	434.55
Venezuela	94	5.16	-7.90	-7.88	175.43
Zimbabwe	94	1.58	40.60	30.04	308.97
Argentina	97	-2.14	-3.91	47.42	358.19
Brazil	97	7.38	-48.80	-5.34	346.53
Chile	97	-2.06	-11.74	60.06	179.83
Colombia	97	15.82	-30.27	76.51	195.22
Hong K.	97	-0.11	-16.29	37.55	149.59
Hungary	97	7.35	-3.74	-30.40	186.33
India	97	0.76	10.46	18.48	729.97
Indonesia	97	48.22	-6.82	60.48	616.40
Jordan	97	-0.21	2.12	48.50	430.62
S. Korea	97	3.35	-4.63	52.40	619.67
Malaysia	97	30.92	-4.54	65.81	351.12
Mexico	97	-2.21	29.16	-8.01	415.68
Pakistan	97	5.16	6.90	15.86	2087.50
Peru	97	-4.26	-2.15	216.29	143.15
Philippines	97	30.57	-15.68	165.46	486.75
Poland	97	-2.73	-18.20	26.42	264.62
South Afr.	97	5.19	23.60	26.99	1790.03
Sri Lanka	97	1.59	-5.43	23.26	254.43
Taiwan	97	6.08	11.43	44.48	563.00
Thailand	97	43.41	-7.01	85.13	498.60
Turkey	97	15.78	16.57	35.68	311.69
Venezuela	97	-13.36	-3.36	-37.16	93.70
Zimbabwe	97	8.65	-3.33	31.86	467.68

Key Statistical Indicators for the Economic and Political Variables

Variables	IND	LB	RER	NEFF	COAL	VOLAT
Mean	7.157	44.52	-4.36	3.11	1.19	17.32
Median	1.45	36.61	-4.9	2.65	1.00	14.3
Maximum	79.3	244.36	-40.6	8.46	3.00	49.5
Minimum	-13.36	-49.48	-48.8	1.00	0.00	0.00
Std. Dev.	16.43	59.09	18.95	1.64	1.07	12.82
Skewness	2.49	1.56	0.29	1.63	0.16	0.85
Kurtosis	9.97	5.8	3.52	5.77	1.62	2.87
Jarque-Bera	140.88	33.61	1.17	35.05	3.84	5.63
Probability	0.00	0.00	0.56	0.00	0.15	0.06