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Political Risk and the Exchange Rate: An Exploration with a Regime Switching Model

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Abstract

Political factors are often cited as potential determinants of the nominal exchange rate. However, empirical exchange rate models seldom capture this influence. This paper applies the Markov regime-switching model to identify regime switches for a sample of 25 countries over an 8-year time period. It then uses the estimated transition probabilities obtained as observations for the dependent binary variable in a panel Probit model, which includes political risk as an independent variable. The study finds that political risk exerts a (marginally) statistically significant contemporaneous effect on the nominal exchange rate. Furthermore, while only contemporaneous political risk is important for developed economies, both contemporaneous as well as lagged political risk play a role in developing countries. Finally, the study also finds some weak evidence that, after the Asian financial crisis, currency traders in emerging markets have learnt to better incorporate political risk into their buy and sell decisions.

Keywords: Markov regime switching, panel Probit, exchange rate, political risk

JEL Classification: C23, F31, O16

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I. Introduction

Political factors, especially political risk, are often cited as potential determinants of the exchange rate, both in popular economic writing as well as academic research. However, as the celebrated paper by Meese & Rogoff (1983) has illustrated, and later researchers have ascertained (Chinn, Cheung & Garcia Pascual 2002), empirical exchange rate models seldom perform better than a random walk. Studies utilizing traditional models of exchange rate determination have either been unable to find any significant links between political risk and the nominal exchange rate (Isard 1995), or tend to be based on anecdotal, rather than quantitative, evidence (Cosset & Rianderie 1985). Moreover, the paucity of effective quantitative measures of political risk has often discouraged researchers from pursuing rigorous empirical study in this regard. As a result, it has been difficult to reconcile the intuitive belief that political events matter with the empirical realities present in the data.

In contrast to the decline of fundamentals-based models has been the concomitant rise in the popularity of atheoretical approaches to modeling the exchange rate. These non-fundamentals-based models include the Markov regime-switching model applied by Engel & Hamilton (1990), estimation via nonparametric estimators (Diebold & Nason 1990), together with cointegration analysis, popularized by Baillie & Bollerslev (1989). Despite their superior performance in modeling nominal exchange rate movements, these models fail to deliver an economically-sound explanation for the exchange rate.

This paper is motivated by the failure of the basic monetary model in predicting significant shifts in the exchange rate and the success of the Markov switching model. To that effect, it seeks to take advantage of the Hamilton (1989) regime-switching model in predicting transitional probabilities of the exchange rate as a basis for estimates of dichotomous exchange rate regime changes. Given this additional information, it will then attempt to match the predicted regime switches with the possibility of increased political risk. In particular, it will apply a two-step procedure. First, a Markov switching regression is applied to a panel of 25 economies with floating exchange rate regimes. The estimated transition probabilities obtained from this full-sample smoother are then used to identify regime switches. These switches are then used as observations for the dependent binary variable in a panel Probit model (Avery, Hansen & Holtz 1983), which has political risk as an independent variable, together with other control variables.

Hence, if the results from the procedure described above yield significant coefficient estimates for the political risk parameter, it can then be concluded that, given the sample of countries over the time period, there is evidence that political risk matters in the determination of large shifts in the exchange rate, or, at the very least, leads to the increased possibility of exchange rate regime changes.

The significance of political risk in such a quantitative study would thus be a strong argument in favor of explicitly incorporating the primacy of political factors into more complex theoretical models of the nominal exchange rate.

The results of the study are striking. *A priori*, we would expect that an increase in political risk would increase the probability that the exchange rate switches regime.[1] The full sample study shows that political risk exerts a (marginally) statistically significant contemporaneous effect on the nominal exchange rate (except when output is included); this is also signed as expected. Furthermore, this effect is attenuated when one-month-lagged political risk is incorporated. In other words, a deterioration (improvement) in the political environment leads to an increased (decreased) probability that the exchange rate experiences a sharp appreciation or depreciation.

Dividing the sample into representative groups, we find that contemporaneous political risk is important for developed economies, whereas for developing economies, contemporaneous political risk needs to be conditioned on the previous period's risk profile. In addition, when the developing country group is divided into pre- and post- Asian financial crisis, the learning effects inherent in currency crises become clear. Political risk, insignificant before the worldwide crises in 1997 and 1998, are now a factor in the determination of exchange rates in these economies.

The literature that applies the Markov switching model to study exchange rate behavior, although growing, can still be classified into a relatively small number of strands. One subset includes papers that are primarily concerned with nominal exchange rate behavior, while another strand applies the model in studies of the real exchange rate.[2]

Research that applies the Markov switching model to study political phenomena has likewise been scanty. Blomberg (2000) uses regime switching to uncover major patterns in the political business cycle for the U.S., thereby advancing a formal methodology as an alternative to earlier narrative approaches. Freeman, Hays & Stix (2000) attempt to draw linkages between democracy and currency markets by contrasting bilateral foreign exchange data with the effects of electoral and other political

[1] There does not seem to be any theoretical reason why the exchange rate should necessarily move in a particular *direction* in response to political risk. Although increased political risk is usually viewed as a reason for exchange rate depreciation, a deterioration in the political climate of a country might encourage the *purchase* of its currency (perhaps due to investor belief that political turmoil might lead to a country dollarizing its foreign exchange at a higher rate than presently), hence leading to an appreciation. We abstract from such concerns here and simply consider cases where there is a change in the regime, regardless of its direction.

[2] An example of each is Kaminsky (1993) and Sarantis (1999).

factors; their results largely support the finding that democratic politics affects the exchange rate. Finally, Bonomo & Terra (1999) estimate the exchange rate disequilibrium level with the Markov model, testing for the influence of political economy variables on transition probabilities for the case of Brazil.[3]

Although similar in design, the present work will differ from these studies in three notable aspects. First, it is not the purported aim of this study to examine the *predictive power* of the Markov switching model. Hence, the forecasting ability of the Markov model is of little relevance. Rather, the primary aim will be to seek to establish dates for structural breaks in the historical data. Second, a "negative" result will not compromise the validity of the research, since the null hypothesis is that political events matter in the determination of the real exchange rate: a rejection of this would simply imply that, perhaps contrary to common knowledge, political events have little impact on what are regarded as fundamentals of the economy. Either way, the value of the result is in informing future work that attempts to devise realistic theoretical models of emerging market economic behavior (such as, for example, Froot & Obstfeld 1991 or Sill & Wrase 1999). Finally, the data employed will be for a large panel of both emerging and developed market economies, which has hitherto been largely unexplored by this class of econometric models.

The rest of the paper proceeds as follows. Following this introduction, section II will provide an quick overview of the theoretical monetary model with (political) risk premium, together with a discussion of the two econometric models used for the two-step estimation procedure. This is followed by a presentation of the empirical results (section III). Section IV provides an interpretation of the findings, together with some policy implications, before a final section concludes.

II. Theoretical & Econometric Model

The Monetary Model of Exchange Rate Determination with Political Risk Premia

The successes of recent empirical work in purchasing power parity (see, for example, Mark 1995 or Taylor 2002) and the stability of money demand functions (see the papers in Lütkepohl & Wolters

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[3] The effects of political risk on exchange rates have also been studied in other ways. Bernhard & Leblang (2002) argue that the bias in forward rates is explained in part by political uncertainty surrounding democratic political processes, using OLS with Newey-West robust estimators to correct for serial correlation. The effect of dynamics in the political environment on exchange rate *volatility* is the focus of the study by Lobo & Tufte (1998), who use ARCH and GARCH models to show that the electoral cycle impacts on Japanese yen, German mark, Canadian Dollar, and U.S. Dollar volatility. Finally, Frieden, Ghezzi & Stein (2001) run both OLS and fixed-effect models on a pooled sample of 26 countries in Latin America and the Caribbean and find that the rate of devaluation post-election is significantly higher in the months following an election.

1998)[4] has spurred some renewed interest in the monetary model of exchange rate determination, which is underpinned by these two key assumptions. This subsection will outline the key features of this model, which is the basis for the empirical model to follow.

Consider an economy with real money demand characterized by an LM relationship:

$$m_t - p_t = \phi y_t - \eta i_t + \varepsilon_t^m \tag{1}$$

where m_t, p_t, y_t, and i_t are the (log) money supply, price level, output, and interest rate, respectively, and ε_t^m is an i.i.d. N(0, σ^2) monetary shock. An analogous relationship holds for foreign, where foreign variables are denoted with asterisks:

$$m_t^* - p_t^* = \phi^* y_t^* - \eta^* i_t^* + \varepsilon_t^{m*} \tag{2}$$

Furthermore, the (log) nominal exchange rate e_t follows a standard PPP formulation, but with the addition of a stochastic exchange rate shock:

$$e_t = p_t - p_t^* + \varepsilon_t^e \tag{3}$$

where ε_t^e is an exchange rate shock, which for our purposes may be further decomposed into financial and political risk components:

$$\varepsilon_t^e \equiv \varepsilon_t^f + \mu \varepsilon_t^p \tag{4}$$

where μ is a parameter that captures the influence of political risk. Equations (1)-(3) then yield the familiar exchange rate equation

$$e_t = \left(m_t - m_t^*\right) - \left(\phi y_t - \phi^* y_t^*\right) + \left(\eta i_t - \eta^* i_t^*\right) + \mu \varepsilon_t^p + \upsilon_t \tag{5}$$

where $\upsilon_t \equiv \varepsilon_t^m - \varepsilon_t^{m*} + \varepsilon_t^f$ and, for ease of exposition, the parameters ϕ and η have been assumed to be equal for home and foreign. Changes in the exchange rate are then captured by:

$$\Delta e_t = \left(\Delta m_t - \Delta m_t^*\right) - \left(\phi \Delta y_t - \phi^* \Delta y_t^*\right) + \left(\eta \Delta i_t - \eta^* \Delta i_t^*\right) + \mu_0 \varepsilon_t^p + \mu_{-1} \varepsilon_{t-1}^p + \Delta \upsilon_t \tag{6}$$

[4] Two caveats need to be made here. First, evidence in support of PPP has typically required very large panels of between 10-25 countries over time periods ranging from 10 years to a century; and even so, mean reversion is typically sluggish (3-7 years) (Cheung & Lai 1998, 2000). There are clearly dissenters to the prevailing orthodoxy of long-run PPP (Engel 2000). Second, the stability of money demand appears to be a stronger stylized fact in the euro zone economies than elsewhere.

where we have allowed for the coefficients on the political risk terms to differ. Recent research on foreign exchange trading provides evidence that chartist behavior is fairly widespread (Menkhoff 1998; Chinn & Cheung 2001). If so, technical trading rules such as support levels and resistance might lead to exchange rates that display stickiness around a band (the "supports"), as well as sudden surges in the purchase or sale of a currency (when "resistance" levels are "breached"). This suggests that (6) might be modified to take into account this phenomenon.

Let $\hat{e}_t$ be a structural break in Δe_t induced by such technical trading behavior. That is, $\hat{e}_t$ is characterized by a sharp depreciation if the underlying fundamentals-based change exceeds $\Delta e_t + \delta$, and a sharp appreciation when it falls below $\Delta e_t - \delta$:

$$\hat{e}_t = \Delta e_t \pm \delta \tag{7}$$

Equation (7) can then be estimated in reduced form:

$$\hat{e}_t = \beta_0 + \beta_1 \Delta m_t + \beta_2 \Delta m_t^* + \beta_3 \Delta y_t + \beta_4 \Delta y_t^* + \beta_5 \Delta i_t + \beta_6 \Delta i_t^* + \beta_7 \varepsilon_t^p + \beta_8 \varepsilon_{t-1}^p + u_t \tag{8}$$

Markov Regime-Switching Model and Panel Probit Model

As discussed earlier, the econometric methodology employed will involve the use of both the Markov regime-switching model as well as a panel Probit model. The regime switching model implements a stationary two-state Markov switching AR (1) model, nested within the class of models explored by Engel (1994) and Engel & Hamilton (1990), to the nominal exchange rate. As a secondary step, a binary panel Probit model is estimated with the regime switches identified by the Markov regression as the dependent variable, and money supply, interest rates, output, and a political risk measure as the independent variables.[5]

The Markov chain for the evolution of the unobserved state variable s_t characterizing the regime that the exchange rate is at is given by:

$$\begin{aligned} p(s_t = 1 \mid s_t = 1) &= p_{11} \\ p(s_t = 2 \mid s_t = 1) &= 1 - p_{11} \\ p(s_t = 1 \mid s_t = 2) &= 1 - p_{22} \\ p(s_t = 2 \mid s_t = 2) &= p_{22} \end{aligned} \tag{9}$$

[5] The discussion the follows draws heavily from Engel & Hamilton (1990) and Hamilton (1994) (Markov regime switching), Green (2003) and Hsiao (1996) (panel Probit), is standard, and therefore necessarily brief. The interested reader is referred to those references for further details.

where $s_t = j$ is assumed to be drawn from a $N(\mu_j, \sigma_j^2)$ distribution, for $j = 1, 2$, thus rendering (9) a mixture distribution. The probability law for the dependent variable $\{\hat{e}_t\}$ is summarized by six population parameters,

$$\boldsymbol{\theta} = \left(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, p_{11}, p_{22}\right) \tag{10}$$

Estimation via (conditional) maximum likelihood would evaluate, for sample size T, the sample likelihood function

$$\begin{aligned} f\left(\hat{e}_1,..., \hat{e}_T;\boldsymbol{\theta}\right) &= \sum_{S_1=1}^{2} ... \sum_{S_T=1}^{2} p\left(\hat{e}_t,..., \hat{e}_T, s_t,..., s_T; \boldsymbol{\theta}\right) \\ &= \sum_{S_1=1}^{2} ... \sum_{S_T=1}^{2} \frac{\pi_j}{(2\pi_j)^{1/2}\sigma_j} \exp\left\{\frac{-\left(\hat{e}_t - \mu_j\right)^2}{2\sigma_j^2}\right\} \end{aligned} \tag{11}$$

The first order conditions would yield estimated values for μ_1, μ_2, σ_1^2, σ_1^2, p_{11}, and p_{22}. Instead of estimating these, solutions to the population parameters $\boldsymbol{\theta}$ may be obtained by the expectation maximization (EM) algorithm applied in Hamilton (1989). In this case, the estimators $\hat{\boldsymbol{\theta}}$ are:

$$\begin{aligned} \hat{\mu} &= \frac{\sum_{t=1}^{T} \hat{e}_t \cdot p\left(s_t = j \mid 1,...,\hat{e}_T;\hat{\boldsymbol{\theta}}\right)}{\gamma + \sum_{t=1}^{T} \hat{e}_t \cdot p\left(s_t = j \mid 1,...,\hat{e}_T;\hat{\boldsymbol{\theta}}\right)} \\ \hat{\sigma}_j &= \left[\frac{1}{\alpha + \frac{1}{2}\cdot \sum_{t=1}^{T} p(s_t = \mathrm{j} \mid 1,..., \hat{e}_T; \hat{\boldsymbol{\theta}})}\right] \times \\ &\quad \left[\beta + \tfrac{1}{2}\cdot \sum_{t=1}^{T} (y_t - \mu)^2 \cdot p(s_t = \mathrm{j} \mid 1,...,\hat{e}_T; \hat{\boldsymbol{\theta}}) + \tfrac{1}{2}\cdot \upsilon \cdot \mu^2\right] \\ \hat{p}_{11} &= \left[\sum_{t=1}^{2} p(s_t = 1, s_{t-1} = 1 \mid \hat{e}_1,...,\hat{e}_T; \hat{\boldsymbol{\theta}})\right] \div \\ &\quad \left[\sum_{t=1}^{2} p(s_{t-1} = 1 \mid \hat{e}_1,...,\hat{e}_T;\hat{\boldsymbol{\theta}}) + \hat{\rho} - p(s_1 = 1 \mid \hat{e}_1,...,\hat{e}_T; \hat{\boldsymbol{\theta}})\right] \\ \hat{p}_{22} &= \left[\sum_{t=1}^{2} p(s_t = 2, s_{t-1} = 2 \mid \hat{e}_1,..., \hat{e}_T; \hat{\boldsymbol{\theta}})\right] \div \\ &\quad \left[\sum_{t=1}^{2} p(s_{t-1} = 2 \mid \hat{e}_1,..., \hat{e}_T; \hat{\boldsymbol{\theta}}) + \hat{\rho} - p(s_1 = 1 \mid \hat{e}_1,..., \hat{e}_T; \hat{\boldsymbol{\theta}})\right] \end{aligned} \tag{12}$$

where α, β, and γ are Bayesian priors for the parameters of the two regimes, which ensures convergence of the likelihood function in the estimation procedure. The above methodology thus seeks to maximize, instead of (10), the generalized objective function

$$g(\hat{e}_t,...,\hat{e}_T;\boldsymbol{\theta}) = \ln p(\hat{e}_t,...,\hat{e}_T;\boldsymbol{\theta}) - \sum_{j=1}^{2}\frac{\gamma\cdot\mu_j^{\;2}}{2\sigma_j^{\;2}} - \sum_{j=1}^{2}\alpha\cdot\ln\sigma_j^{\;2} - \sum_{j=1}^{2}\frac{\beta}{\sigma_j^{\;2}} \tag{13}$$

Of key interest in this particular study are the estimates for p_{11} and p_{22}, which identify regime switches, based on $p(s_1 = 2 \,|\, \hat{e}_1,...,\hat{e}_T;\boldsymbol{\theta}) \gtreqless 0.5$.

Since the regime switches are (assumed) binary, a qualitative response model is ideal for comparing the significance of political risk. Given that the regime switch $\hat{e}_{it}$ has either occurred or not:

$$\hat{e}_{it} = \begin{cases} 1 & \text{if } \hat{e}_{it}^* > 0 \\ 0 & \text{if } \hat{e}_{it}^* \le 0 \end{cases} \tag{14}$$

Then, for a panel with N countries over a time period T:

$$\begin{aligned} &\hat{e}_{it}^* = \alpha_i + \boldsymbol{\lambda}'\mathbf{x}_{it} + \nu_{it} \quad , \quad i = 1,...,N \quad t = 1,...,T \\ &\hat{e}_{it} = \mathbf{1}\left(\hat{e}_{it}^* > 0\right) \end{aligned} \tag{15}$$

where $\mathbf{x}_{it}$ are the independent explanatory variables that influence the switching of the exchange rate to a new regime. The binary panel Probit model assumes that errors ν_{it} and individual specific effects α_{it} are independently and normally distributed with variances σ_ξ^2 and σ_α^2, respectively. The most straightforward estimation procedure would then simply estimate the sample likelihood

$$\Phi\left(\hat{e}_{it}^*\right) = \int_{-\infty}^{\infty}\frac{1}{2\pi^{1/2}}\exp\left\{\frac{-\alpha_i^{\;2}}{2}\prod_{t=1}^{T}\Phi\left[\left(\frac{\boldsymbol{\lambda}'\mathbf{x}_{it}}{\sigma^2}+\frac{\alpha_i}{\sigma^2}\right)\left(2\hat{e}_{it}-1\right)\right]\right\}d\alpha_i \tag{16}$$

where $\Phi\left(\hat{e}_{it}^*\right)$ denotes the CDF of the T-variate normal distribution. To operationalize equation (8) into the context of the econometric models above, we replace the exchange rate for country i at time t, $\hat{e}_{it}$, with a binary variable $\hat{e}_{it}^*$, which takes on unity when the exchange rate experiences a regime switch, and zero otherwise, in accordance to (14). To simplify the model further, the only foreign variables included in the $\mathbf{x}_{it}$ matrix for the empirical panel Probit model is the foreign interest rate.[6] Hence, the final econometric model for the study is

$$\hat{e}^{*}_{it} = \beta'_0 + \beta'_1 \Delta m_{it} + \beta'_3 \Delta y_{it} + \beta'_5 \Delta i_{it} + \beta'_6 \Delta i^{*}_{it} + \beta'_7 \varepsilon^{p}_{it} + \beta'_8 \varepsilon^{p}_{it-1} + u'_{it} \qquad (8')$$

III. Data and Estimation Results

Data Sources and Description

The economic data were drawn from the International Monetary Fund's *International Financial Statistics* database. Countries were included on the basis that the reported exchange rates were market values. The full list of the 25 countries in the sample is given in Appendix A. Data were monthly, beginning March 1995 and ending November 2002, for a total balanced panel sample size of 2313 (455 when output is included). For foreign country variables, U.S. data were utilized. Since monthly GDP data are generally unavailable, quarterly data were used instead, although when the panel included GDP, sample size was significantly slashed.

The political risk data is more uncommon and hence merits some elaboration. The data were from the *International Country Risk Guide* published by the Political Risk Services Group. The political risk data consist of ten measures of political risk: Government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality. Each of these measures include subcomponent measures. For example, the internal conflict measure is broken down into civil war, terrorism, and civil disorder. Each of these is scored on a scale of 0 through 4. These are then aggregated into a political risk rating, and then rescaled such that the final score, which ranges from 0 (least favorable) to 100 (most favorable). To provide an intuitive feel of how countries place on the scale, in November 2002, the United Kingdom received a score of 87.5, while Turkey and Bolivia scored 58.5 and 67.5, respectively.

Econometric Estimation

For practical purposes, the estimation procedure utilized for regime switching was closest in spirit to that of Engel & Hamilton (1990). Estimation was effected through maximum likelihood, using the EM algorithm as discussed above, with priors set at 0.2, 1, and 0.1 for α, β, and γ, respectively. The

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[6] While this deviates slightly from the theory, inclusion of the other variables do not change the results obtained (the foreign variables are generally insignificant).

code was executed in *Gauss* version 3.2, and the output for each individual country was then manually appended into the raw dataset.

Likewise, the full information maximum likelihood estimation of the unrestricted equation (14) is likely to be prohibitively intensive in terms of both time and computer power (Bertschek & Lechner 1998). The model is instead estimated using the iterative Generalized Estimating Equation (GEE) approach for panel data (Liang & Zeger 1986), which is an extension of Generalized Linear Model (GLM) estimation. The estimation was performed on *Stata* version 7.

Estimation Results

On average, the Markov switching model identified 8 structural breaks for the 25 countries in the sample. However, for developed economies (excluding Israel), the average was 6.5 structural breaks, while this figure was a higher 8.8 for developing countries.[7] This is intuitive, as one would expect that developing economies are more susceptible to large swings in their currencies. The estimated parameters for a selection of 3 countries (Japan, Korea, and Sierra Leone) are reported in Table 1 (standard deviations are given in parentheses).

(Insert Appendix B, Table 1 here)

Figure 1a, 1b, and 1c graph the relationship between the change in the exchange rate, the change in the political risk variable, and the regime switches identified by the Markov switching regression. For the case of Japan and Korea, it appears that the identified breaks correspond to some broad pattern in the political risk variable; specifically, the breaks appear to occur at or close to where there are significant changes in the political risk variable (although for the case of Japan the sharp improvement in the political climate between March and May 2001 – due to both attempts at rapprochement with Russia and North Korea by Mori in April 2001 as well as the election of Koizumi as president of Japan's ruling Liberal Democratic Party on April 24 – is not associated with any structural changes). For the case of Sierra Leone, it is difficult to note clean trends in the data. However, if one disregards the clustered breaks, the regime breaks between November 1995 and March 1997, March 1998 and May 1999, and April 2001 and December 2001 seem to be associated with significant changes in the political risk variable as well.

(Insert Appendix C, Figure 1 here)

[7] This developed country average including Israel was 12.4.

Clearly, a more quantitative approach is required to distil the truth behind the numbers. As such, we turn to formal econometric analysis.

It is useful to review the key features of the data. Summary statistics are presented in Table 2, for the full sample, as well as for developed and developing countries, and the cases when a regime switch occurs ($\hat{e}_{it} = 1$) and when it does not ($\hat{e}_{it} = 0$).

(Insert Appendix B, Table 2 here)

Three features are notable. First, exchange rate changes appear to be larger for developing as compared to developed countries (both means and standard deviations of exchange rate changes are larger for developing countries). Likewise, the developed countries' interest rates are significantly lower and less volatile than developing countries' interest rates. These distinctions between developed and developing nations are entirely reasonable, and expected. Third, changes in the exchange rate appear to be larger and more volatile in periods identified as regime changes. Again, this is little surprise here. Periods where regime switches occur are usually associated with large swings in exchange rates, as well as increased market activity.

Table 3 shows the benchmark panel Probit regression (column BI), which provide the coefficient estimates for equation (8') with contemporaneous political risk, as well as perturbations from this benchmark. These are: (BII) The benchmark model with output excluded;[8] (BIII) The benchmark model estimated without accounting for panel-specific correlation structures; (BIV) Regression (BII) without accounting for panel-specific correlation; (BV) Regression (BII) with political risk lagged one period included; (BVI) Regression (BII) with political risk lagged two periods included; and (BVII) Regression (BII) with the change in political risk instead of political risk in levels.

(Insert Appendix B, Table 3 here)

All the coefficients for political risk are correctly signed. However, except in the benchmark model (BI) and its equivalent (BIII), these are significant at 10% level or better. Likewise, even when changes in political risk are considered (BVII), political risk continues to be an important determinant of exchange rate regime switches.

[8] Although output occasionally yielded significant coefficients, dropping it did not change the qualitative results significantly, while doing so freed up many more observations (recall, output data were only available quarterly and even so, not for all countries). The tradeoff seemed excessive and hence, for the remainder of the paper, estimates are only provided for regressions excluding output.

In general, the signs of the coefficients of the monetary control variables are unstable, although these are generally insignificant at 10% level. In a sense, this is unsurprising: Given the spectacular failures of empirical exchange rate models (Meese & Rogoff 1983), one should not expect the out-of-sample performance of the basic monetary model to be particularly strong. Nonetheless, the ability of even this simple model to capture the general direction-of-change elements suggested by regime switches is entirely in accord with the findings of other researchers (Chinn, Cheung & Garcia Pascual 2002).

The estimates for (BIII) and (BIV) underscore the importance of utilizing estimation techniques that take into account the underlying correlation structures of a panel. These two specifications amount to treating the panel as a single continuous dataset, and this leads to spurious efficiency. This is clearly evidenced by the very low standard error for the political risk term in (BIV).

Taking differences of political risk is equivalent to forcing the coefficients β_7' and β_8' in (8') to equate. However, as (BVII) shows, this does not change the impact of political risk: The sign of the coefficient is stable, and it is significant at 5% level.

Adding the lagged level political risk leads to some interesting results. Doing so clearly *strengthens* the impact of contemporaneous political risk on exchange rate switching: Comparing the coefficients for political risk for specification (BV) and (BVI) with (BII), the point estimate increases by almost sixfold when one lag is included (from -0.50 to -2.91), and more than sixfold when two lags are included (-0.50 to -3.10).[9] Furthermore, the one-period lagged political risk coefficient is also significant, although its economic meaning is a little less evident. There is in fact a very natural economic explanation for this lagged term, which will be discussed below in the context of the developed and developing country subsamples.

Dividing the panel into developed and developing countries yields further insight into the nature of political risk. Table 4 summarizes the results for both developed and developing economies for four different specifications: (DI) The benchmark model without output, analogous to (BII); (DII) Regression (DI) with lagged political risk, analogous to (BV); (DIII) Regression (DI) with change in political risk, analogous to (BVII); (DIV) Regression (DI) estimated with a Logit, instead of Probit, model; and (DV) Regression (DIV) with lagged political risk.

(Insert Appendix B, Table 4 here)

For developed countries, the contemporaneous political risk variables are all highly significant, and correctly signed. Of the control variables, only the change in the foreign interest rate and the

[9] Note, however, that the standard errors for (BV) and (BVI) are also larger.

constant appear to be consistently significant up to 10% level. Lagged political risk is also significant for the second (DII) and final (DV) specifications, and changes in political risk are also significant. Moving on to developing countries, contemporaneous political risk is insignificant, *unless lagged political risk is included.* In other words, for developing countries, contemporaneous political risk needs to be conditioned on the previous period's risk profile. This is intuitively plausible: For the presumably more mature foreign exchange markets in developed countries, market participants respond rapidly and flexibly to new political information. In addition, since political events are usually regarded as less crucial to the long-run economic prospects of these economies, there is less of a need to condition foreign exchange trading on these transient events. In contrast, political interruptions and events play a more central role in emerging economies. Therefore, traders engaged in the currency markets of these economies tend to condition their actions on past information regarding political risk.

The exercise is then repeated for developing countries, but this time, the sample is further divided into pre- and post- Asian financial crisis (pre- and post-June 1997).[10] Since the sample includes only developing countries, the Logit regression (CIV) is only reported for the specification with lagged political risk variable, since this is the more plausible case, as discussed above. The results are presented in Table 5.

(Insert Appendix B, Table 5 here)

What is most striking here is the insignificance of political risk for all pre-crisis specifications, save the case with changes in money supply and interest rates, together with lagged political risk (CIV). Almost all the control variables are also insignificant for the pre-crisis period. However, for the post-crisis period, the contemporaneous political risk variable is significant for two of the four specifications (CII and CIV). Moreover, another monetary variable – the foreign interest rate – now plays a role in determining the probability of a switch in the exchange rate regime. These results hint at the fact that there are possibly learning effects inherent in currency crises, and that political risk, which did not feature in the determination of exchange rate regime switches before the worldwide crises in 1997 and 1998, is now a key influence. Therefore, in addition to correcting for misalignments of the exchange rate from fundamentals (Morris & Shin 1998), crises might also play a role in conditioning the behavior of market participants.

[10] Although the crisis began as a uniquely Asian affair in the summer of 1997 with the devaluation of the Thai baht, contagion effects quickly led to worldwide currency pressure for all emerging economies, with full-blown crises in several, notably Russia and Latin America. For a lucid discussion on the financial crises of the late 1990s, see Tirole (2002).

IV. Interpretation and Policy Implications

Although this paper has adopted a somewhat mechanistic view of the nominal exchange rate as fibrillating between successive regimes, the Markov switching behavior of the exchange rate has another natural economic interpretation: That of a currency crisis. Although not every sharp movement in the exchange rate implies a run on the currency, the use of the Markov switching model to capture the dynamics of a currency crisis has been applied with success in the study of the ERM crisis (Jeanne & Masson 2000), the Asian financial crisis (Cerra & Saxena 2002), and the Argentinean currency crisis (Alvarez-Plata & Schrooten 2003).

The primary finding of this paper – that political risk is a key determinant of the switching behavior of exchange rates – therefore hints at the need for credible theories of either nominal exchange rate determination or currency crises to include political economic factors that impact on these phenomena. Although this has been, to a lesser extent, incorporated as risk premia (for the former) and time-inconsistent or opportunistic policymaker behavior (for the latter), there has been, to my knowledge, no formal work that considers the possibility that special interest groups (akin to those of Grossman & Helpman 2001) might have on the exchange rate and how currency crises may be induced by the incongruence of their interests with that of the general populace.

In terms of policy implications that arise from the analysis, the importance of political stability in generating positive externalities for exchange rate stability suggests that governments should seek to reduce the amount of political change and upheaval taking place. Obviously, this is easier said than done. Nonetheless, policymakers can seek to minimize the influence of political events on the macroeconomy by establishing an independent central bank that does not actively intervene in currency markets, in response to calls by the fiscal authority. In that manner, political shocks are less likely to have a spillover effect on economic equilibria. Attempts to mitigate exchange rate volatility via government intervention often run into the unfortunate paradox of simply being translated into political or regulatory risk.

V. Conclusion

The relationship between political risk and foreign exchange has a long history. As Cosset & Rianderie (1985, p. 23) argue:

> "Surveys of managerial assessment of the political environment have revealed that managers rate political risk as a major factor in the foreign investment decision… [f]urthermore, these surveys have surveys have indicated that foreign investors' typical response to political risk is avoidance… [i]f political risk news has a non-trivial information content… [this] could lead…its currency's exchange rate to appreciate [or] depreciate."

This paper has systematically demonstrated that political risk plays a real and arguably important role in the determination of regime switches for the nominal exchange rate. In addition, it has argued that such risks play a contemporaneous role in developed countries with mature foreign exchange markets, while market participants in emerging economies consider not just the current political climate but also condition this on the previous period's risk profile. Finally, the study has also shown that there is some evidence that, after the Asian financial crisis of 1997, currency traders in emerging markets have learnt to better incorporate political risk into their buy and sell decisions.

The main shortcoming of the paper is that the time period of the sample (1995-2002) is relatively small. Part of this is due to limitations in political risk data. However, pending availability of such data, the study could be repeated with this larger dataset. Likewise, the somewhat limited cross-section of countries (25) has been shortchanged by the decision not to include EMU accession countries, since, if we were to include the transition period leading to the introduction of the euro, the data for these countries would have been too limited. Again, extending the dataset backwards in time should resolve this issue. Therefore, future empirical work could extend the sample to a larger set of countries, in order to reinforce (or refute) the findings here.

Clearly, an alternative methodology of attack would be to apply a Markov switching model with time-varying transition probabilities, à la Filardo (1994) and Diebold, Lee & Weinbach (1994), and employ the political risk measure as a variable in the conditioning vector that includes variables that affect state transition probabilities. The elegance of this approach notwithstanding, there are three (somewhat related) advantages to the slightly more involved two-step procedure. First, the panel Probit model allows the study to fully exploit the richer structure of the panel data set, which would be lost by individual switching regressions on each country. Second, the panel Probit also allows one to slice the data in several intuitive ways, and as will become apparent, this yields important new insights. Last, the absence of a Markov switching model for panel data (let alone one which allows for time-varying transition probabilities) precludes its use in a fashion that would give justice to the dataset. Nonetheless, future research can consider adopting this alternative strategy for a larger set of countries, building on the work of Bonomo & Terra (1999) and Cerra & Saxena (2002).

There are two additional avenues for research in which one can conceivably explore. In terms of theory, models of currency crises that incorporate both fundamentals and self-fulfilling features have yet to explicitly model the importance of political economics factors. As for empirics, one could also apply the model to real exchange rate data.

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Appendix A

Countries included in sample

Albania	Australia	Bolivia	Canada	Denmark
Gambia, The	Guatemala	India	Israel	Jamaica
Japan	Korea	Lebanon	New Zealand	Pakistan
Paraguay	Peru	Philippines	Sierra Leone	Singapore
South Africa	Tunisia	Turkey	Uganda	United Kingdom

Appendix B

Table 1: Estimated parameters of the Markov switching regressions

	Japan	*Korea*	*Sierra Leone*
μ_1	0.804 (0.481)	3.117 (3.932)	4.103 (2.825)
μ_2	-1.356 (1.496)	0.173 (0.243)	0.788 (0.384)
p_{11}	0.868 (0.113)	0.914 (0.076)	0.179 (0.189)
p_{22}	0.572 (0.241)	0.988 (0.013)	0.787 (0.098)
σ_1^2	6.135 (1.902)	215.056 (84.004)	122.894 (52.261)
σ_2^2	31.413 (16.903)	4.310 (0.782)	7.786 (2.309)
Regime switches	4	2	22
Log likelihood	-161.895	-150.876	-190.587

Notes: Standard errors in parentheses. Results of other countries available upon request.

Table 2: Descriptive statistics

	Full sample	*Developed countries*	*Developing countries*	*Regime switch*	*No regime switch*
Δ Exchange rate	0.686 (3.123)	0. 274 (2.642)	0.846 (3.277)	1.560 (5.083)	0.605 (2.861)
Home interest rate	13.702 (12.205)	5.559 (3.489)	16.866 (12.897)	12.715 (8.209)	13.793 (12.508)
Foreign interest rate	4.402 (1.427)	4.402 (1.428)	4.402 (1.427)	4.464 (1.352)	4.397 (1.434)
Log money supply (M1)	8.470 (2.389)	7.701 (2.382)	8.766 (2.325)	9.160 (2.294)	8.406 (2.388)
Log output (GDP)	8.990 (2.808)	8.450 (2.885)	9.465 (2.651)	9.882 (2.384)	8.918 (2.828)

Notes: Mean values reported, with standard errors in parentheses

Table 3: Benchmark regressions and perturbations

	(BI)	(BII)	(BIII)	(BIV)	(BV)	(BVI)	(BVII)
Log political risk	-0.947 (1.092)	-0.501 (0.277)*	-0.714 (1.066)	-1.042 (0.299)***	-2.909 (1.162)**	-3.102 (1.086)***	
1 period-lagged log political risk					2.501 (1.283)*	1.242 (1.826)	
2 periods-lagged log political risk						1.469 (1.564)	
Δ Log political risk							-2.707 (1.307)**
Δ Home interest rate	0.047 (0.043)	0.005 (0.027)	0.020 (0.057)	0.003 (0.024)	0.009 (0.023)	0.012 (0.025)	0.010 (0.025)
Δ Foreign interest rate	0.0436 (0.326)	-0.118 (0.196)	0.077 (0.322)	-0.140 (0.199)	-0.121 (0.200)	-0.133 (0.201)	-0.104 (0.201)
Δ Log money supply	-0.306 (1.600)	-0.177 (0.724)	-1.495 (1.898)	-0.534 (0.783)	-0.221 (0.723)	-0.325 (0.783)	-0.213 (0.727)
Δ Log output	-1.133 (0.553)**		-1.200 (0.523)**				
Constant	2.672 (4.777)	0.725 (1.201)	1.659 (4.660)	2.993 (1.262)**	0.333 (1.313)	0.259 (1.452)	-1.374 (0.123)
Observations	455	2313	455	2313	2288	2263	2288
χ^2	13.25	5.76	38.44	15.61	13.09	15.26	4.43

Notes: Standard errors in parentheses. * denotes significance at 10% level, ** denotes significance at 5% level, *** denotes significance at 1% level

Table 4: Regressions for developed and developing countries

	(DI)	(DII)	(DIII)	(DIV)	(DV)
Developed countries					
Log political risk	-3.558 (0.568)***	-5.774 (0.881)***		-6.547 (1.144)***	-10.503 (1.282)***
1-period lagged log political risk		2.393 (1.195)**			4.288 (1.853)**
Δ Log political risk			-3.156 (1.372)**		
Δ Home interest rate	0.035 (0.074)	-0.032 (0.088)	-0.022 (0.088)	0.076 (0.116)	-0.037 (0.153)
Δ Foreign interest rate	-0.747 (0.383)*	-0.760 (0.388)**	-0.545 (0.301) *	-1.369 (0.672)**	-1.412 (0.698)**
Δ Log money supply	1.379 (1.358)	1.248 (1.341)	1.039 (1.450)	2.390 (2.000)	2.240 (1.992)
Constant	14.158 (2.363)***	13.371 (2.682)***	-1.370 (0.309)***	26.155 (4.670)***	24.681 (4.907)***
Developing countries					
Log political risk	-0.404 (0.404)	-2.854 (1.394)**		-0.821 (0.750)	-5.729 (2.673)**
1-period lagged log political risk		2.528 (1.577)			5.132 (3.106)*
Δ Log political risk			-2.692 (1.529)**		
Δ Home interest rate	0.004 (0.030)	0.010 (0.026)	0.010 (0.026)	0.005 (0.059)	0.014 (0.051)
Δ Foreign interest rate	0.092 (0.210)	0.095 (0.212)	0.106 (0.214)*	0.193 (0.427)**	0.203 (0.433)
Δ Log money supply	-0.546 (0.853)	-0.574 (0.840)	-0.551 (0.829)	-1.057 (1.751)	-1.174 (1.713)
Constant	0.280 (1.694)	-0.036 (1.806)	-1.381 (0.127)***	0.981 (3.131)	0.066 (3.383)

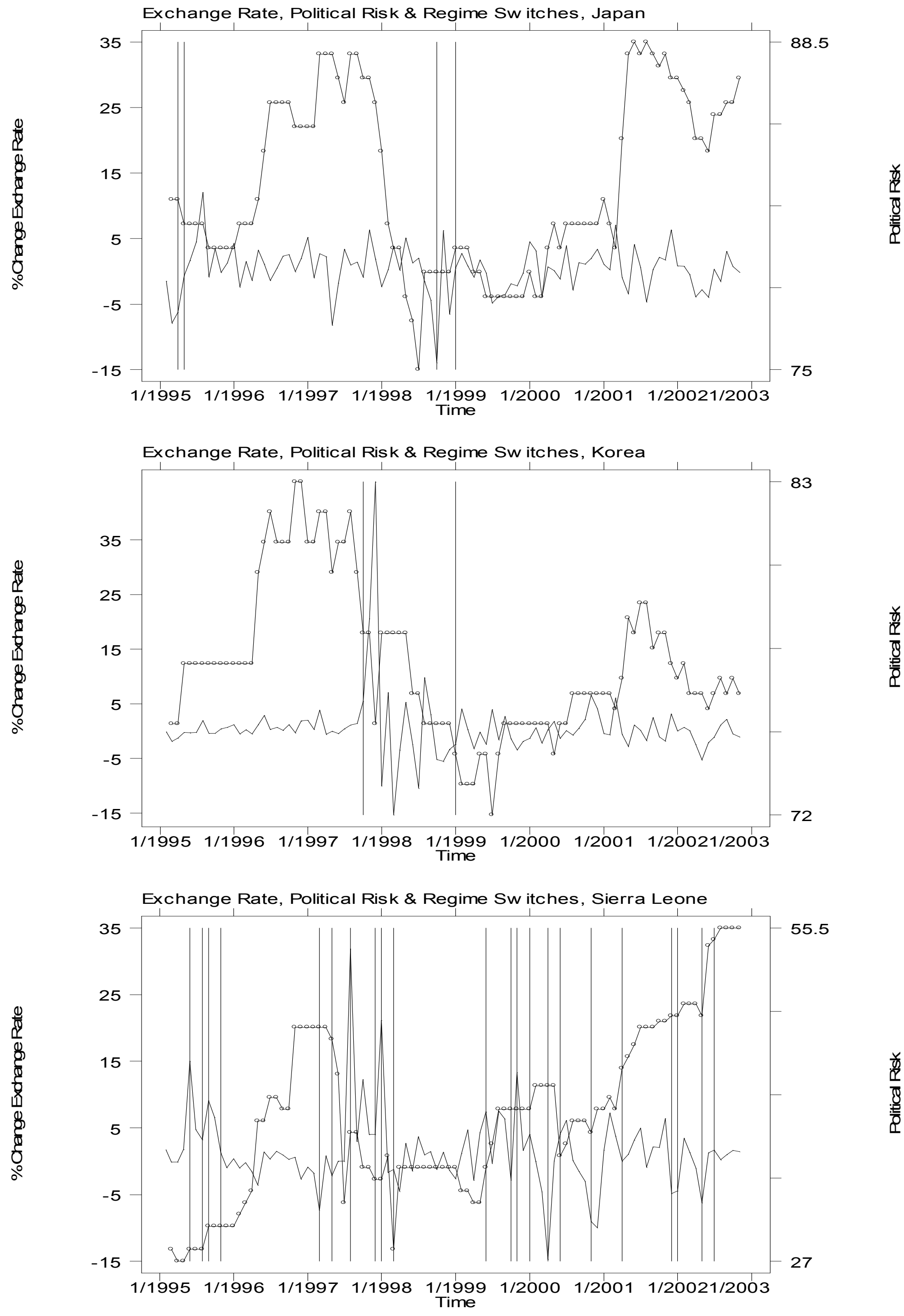
Notes: Standard errors in parentheses. * denotes significance at 10% level, ** denotes significance at 5% level, *** denotes significance at 1% level

Table 5: Regressions for developing countries, pre- and post-crisis

	(CI)	(CII)	(CIII)	(CIV)
Mar 1995-May 1997				
Log political risk	-0.687 (0.614)	0.975 (2.098)		1.859 (3.834)
1-period lagged log political risk		-1.696 (1.736)		-3.322 (3.133)
Δ Log political risk			1.599 (1.806)	
Δ Home interest rate	0.027 (0.072)	0.032 (0.068)	0.037 (0.060)	0.057 (0.131)
Δ Foreign interest rate	0.765 (2.387)	0.858 (2.414)	0.906 (2.337)	2.040 (5.170)
Δ Log money supply	1.007 (1.760)	1.005 (1.757)	1.008 (1.665)	2.183 (3.402)
Constant	1.380 (2.495)	1.532 (2.386)	-1.429 (0.155)***	3.513 (4.388)
Jun 1997-Nov 2002				
Log political risk	-0.511 (0.456)	-3.313 (1.881)*		-6.763 (3.578)*
1-period lagged log political risk		3.016 (2.200)		6.348 (4.254)
Δ Log political risk			-3.182 (2.013)	
Δ Home interest rate	-0.004 (0.026)	0.001 (0.023)	0.002 (0.024)	-0.003 (0.047)
Δ Foreign interest rate	0.107 (0.189)	0.102 (0.193)	0.111 (0.196)	0.219 (0.399)**
Δ Log money supply	-1.429 (0.941)	-1.428 (0.939)	-1.389 (0.938)	-2.957 (1.914)
Constant	0.748 (1.904)	-0.148 (2.111)	-1.373 (0.128)***	-0.668 (4.114)

Notes: Standard errors in parentheses. Constant term estimated, but not reported. * denotes significance at 10% level, ** denotes significance at 5% level, *** denotes significance at 1% level

Appendix C



Key: Smooth points are the exchange rate. Points in circles are political risk, and vertical bars denote identified regime switches

Figure 1: Exchange rate, political risk, and regime switches