THE POLITICAL ECONOMY OF INTERNATIONAL FINANCE

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Abstract

The liberalization of the international financial system during the last decades has been accompanied by debates about its stability and the consequences for domestic economic policymaking. Critics of this liberalization process fear that unrestricted capital flows dramatically reduce policymakers' room to pursue autonomous economic policies and decrease international financial stability. Others contend that despite international economic integration, governments retain significant control over their macroeconomies and still have the possibility to generate distinctive macroeconomic outcomes.

This dissertation thesis addresses several aspects of this debate about domestic policy autonomy and international financial stability. The first study presents a general framework of a financially open political economy that is used to test the proposition that governments still retain substantial room to maneuver in an economically integrated world. Our results of economic policymaking in Britain do not support the Room to Maneuver thesis. In the sample period, the British government was responsive to changes in political evaluations, and its policy choices effectively fed back into popular evaluations of government policy. Hence, a visible link from popular evaluations to policy and back to popular evaluations existed. However, this accountability mechanism worked outside the economy. The changes in policy induced by shifts in popular evaluations had no impact on inflation and economic growth. Government capacity to shape macroeconomic outcomes was limited, and popular influence over economic policy was ineffectual.

The subsequent studies analyze a particular aspect of this general model in greater detail. They focus on the interaction between governments and financial markets during currency crises, a particular facet of the policy autonomy and financial stability debate. The second study presents a stochastic, two-period signaling model of a speculative attack to analyze the effect of uncertainty on crisis outcomes. It shows that large uncertainty may trigger a speculative attack that would not occur with less uncertainty or perfect information. Uncertainty then is counterproductive because the government has to engage in a costly exchange rate defense, which reduces social welfare. Under very specific circumstances, uncertainty helps the government to gain time in a crisis situation. If the government does not implement the reforms necessary to stabilize the exchange rate in the long run, however, uncertainty delays the crisis, but does not help to resolve it.
The third study addresses the question how a government can defend its exchange rate successfully if it thinks that this is the best option. The results from an empirical analysis of speculative attacks in OECD countries during the post-Bretton Woods show that, contrary to the empirical findings by previous studies, raising interest rates increases the probability that the exchange rate peg survives the speculative attack. This result is robust to changes in model specifications, but depends on the exclusion of the crisis in Sweden in 1992. The Swedish case is highly exceptional because the Swedish government raised interest rates to far higher levels than all the other governments in the dataset. The results suggest that for low and intermediate levels of speculation, raising interest rates is effective. If speculation is exceptionally large interest rates may be ineffective because their adverse effects on the economy dominate the signal of strength that high interest rates send to market participants.

The last study addresses the question how political regime type influences the outcomes of currency crises and thus international financial stability. The empirical analysis of crisis in emerging market economies and developing countries from 1983 to 2003 shows that democratic governments have defended their exchange rates significantly more often than autocratic governments. Exceptions are oil-exporting autocracies, e.g. Kuwait and Saudi-Arabia, that – contrary to the general pattern across the other autocratic countries – always have defended their currencies. Moreover, the hazard that the exchange rate collapses during six months after an attack is smaller the greater the level of foreign exchange reserves and the smaller inflation. Real economic growth, elections and government partisanship do not influence the outcome of an attack. Democratic political regimes thus do not destabilize the international financial system as some scholars have argued. Our results suggest that its stability should increase rather than decrease, the more countries in this system become democratic.
Zusammenfassung


Chapter 1

Introduction
The liberalization of the international financial system during the past decades has been accompanied by debates about its stability and the consequences for domestic economic policymaking. Critics of this liberalization process maintain that unrestricted capital flows dramatically decrease policymakers' room to pursue autonomous economic policies. Others fear that these large financial transactions destabilize the international financial system. With the explosion of cross-border financial flows, speculation in the foreign exchange market also has increased. Accordingly, the international financial system has been shattered consistently by speculative attack against the currencies of numerous countries. Nonetheless, many researchers contend that despite international economic integration, governments retain significant control over their macroeconomies. According to this view, governments still have the possibility to generate distinctive macroeconomic outcomes and satisfy the demands of citizens to cope with the adverse effects of economic globalization.

This dissertation thesis addresses several aspects of the debate about domestic policy autonomy and international financial stability. The first study is co-authored with John Freeman and Patrick Brandt and presents a general framework of a financially open political economy. We use this framework to test the proposition that governments still retain substantial room to maneuver in an open economy. The subsequent studies analyze a particular aspect of this general model in greater detail. They focus on the interaction between governments and financial markets during currency crises, a particular facet of the policy autonomy and financial stability debate. More precisely, these studies examine how political transparency, policies and political institutions influence the outcomes of crises. Unlike in the first, more general study, I do not explicitly model the link between the polity and the government in the crisis papers, but implicitly assume that the government acts in the interest of its constituencies. The last study is co-authored with Stefanie Walter.

I use a variety of complementary theoretical and empirical research methods to address these issues. The first analysis is based on a case study design and examines British economic policymaking over time. It emphasizes the dynamics that lead to the joint evolution of macropolitical and macroeconomic processes, but does not explicitly address how these dynamics differ in other countries with other institutional settings. The third and fourth studies use a comparative, cross-section approach that attaches less importance to dynamics. It provides interesting insights how policy choices and political institutions affect crisis outcomes across countries. The statistical methods applied in these studies include Bayesian Structural Vectorautoregression, selection and different types of duration models. While the focus of these studies is mainly empirical, the second paper provides an entirely theoretical
analysis of currency crises. The game-theoretic model allows me to analyze the role of uncertainty, a phenomenon that is difficult to capture empirically, in a thorough manner and serves as a theoretical basis for the subsequent empirical analyses.

The international political economy framework of the first paper includes three basic features, a polity, a government and an economy. The polity consists of the relevant constituencies of the incumbent government, e.g. the set of voters in a democracy, who observe and evaluate the macroeconomic outcomes resulting from government policy. The government uses its policy instruments to satisfy the political demands from its constituencies. At the same time, policymaking is constrained by economic pressure from an economy with little restrictions to international trade and capital flows. The economic sector is divided into a domestic and an international economy, which are connected through international financial markets.

We use this general framework to test the proposition that governments still retain substantial room to maneuver in an open economy. Our analysis of economic policymaking in Britain from 1981 to 1997 does not support this Room to Maneuver Thesis. In our sample period, the British government was responsive to changes in political evaluations. Its policy choices effectively fed back into popular evaluations of government policy, particularly vote intentions. Hence, a visible link from popular evaluations to policy and back to popular evaluations existed. There is also evidence, consistent with theoretical work on political monetary cycles, that prices but not output increased before elections. However, net of this electoral effect, the accountability mechanism worked outside the real economy. Shifts in popular evaluations of the British government induced changes in policy that had no impact on inflation and economic growth. This implies, contrary to the work in international political economy, that government capacity to shape macroeconomic outcomes was limited and popular influence over economic policy was ineffectual.

These results suggest that the connection between the government and markets plays a particularly important role in an economically integrated world. Moreover, with the increase of international capital flows, speculation in the international financial system has increased as well. Policies that are not compatible with the interests of financial market participants thus not only are ineffectual, but also may provoke a financial crisis. As the crisis of the European Monetary System in 1992 and the Asian Financial Crisis in 1997-98 show, government behavior has serious consequences for economic and social welfare during these periods of economic turmoil. Failure to keep the exchange rate stable may induce capital flight and
damage economic development for a long period of time. Similarly, measures to stabilize the exchange rate are economically costly, depress economic growth and reduce real income.

I analyze different aspects of policymaking and government-market interactions during currency crises in greater detail. The second study examines whether uncertainty about government preferences and economic fundamentals increases economic policy autonomy and helps the government to resolve currency crises. Although economists and political scientists generally agree that transparency is desirable, governments often are reluctant to follow this advice in practice. Policymakers often believe that uncertainty enhances policy autonomy and help to manage crises. An example is the decision of the Thai government during the Asian Financial Crisis to conceal speculative pressure and to sell foreign exchange reserves hoping that confidence in the Thai Baht would return. Although the Thai government ultimately was unable to prevent the collapse of the exchange rate, these competing views raise the question under what circumstances uncertainty may be useful for policymaking, and when it is harmful.

I develop a stochastic, two-period signaling game of an exchange rate defense to answer this question. The model predicts that uncertainty can trigger a speculative attack although there would be no crisis if government policymaking were more transparent. When uncertainty increases, the probability that the government is vulnerable and that it will devalue increases as well. In such a situation, speculators attack the exchange rate to test the government’s resolve to defend. Intransparent governments that are relatively strongly committed to the fixed exchange rate have to engage in a costly defense to keep the exchange rate fixed. These costs could be avoided by reducing uncertainty about economic fundamentals and policymakers’ preferences. In this case, intransparency is harmful because the expensive exchange rate defense decreases social welfare.

Uncertainty can be beneficial if a country is facing some economic difficulties that can be fixed within a reasonable period of time. Under very specific circumstances, it may be optimal for speculators not to speculate although there is a reasonable chance of devaluation. In such a situation, there is no attack although speculators know that the government may devalue when the attack is sufficiently strong. Governments can exploit this situation and prevent a collapse of the fixed exchange rate although the peg could not be sustained under complete information. To maintain the peg in the medium and long run, however, governments have to adjust policy to leave the zone of vulnerability in the near future. If this is not the case, speculators attack in later periods and the exchange rate collapses. Thus, some
uncertainty can be helpful for policymakers, but the conditions when this is the case are quite restrictive. If these conditions are not fulfilled, attempts to defend the exchange rate will fail.

These failed defenses are particularly striking because those governments that try and fail to defend, incur the costs of both devaluation and defense, but do not enjoy the benefits of either option. The economic and social burden of a failed defense is particularly high because the government loses its long-term monetary credibility and at the same time, the economy is likely to experience a severe recession with all its negative consequences. After the failed defense in Sweden during the EMS crisis in 1992, for instance, GDP growth dropped from −0.8% in the third quarter of 1992, the quarter when the attack occurred, to −2.7% in the fourth quarter and −5.2% in the first quarter of 1993. Only almost one year after the attack, GDP growth reached pre-crisis levels again. In a large-n study, Eichengreen and Rose (2003) estimate that the cost of failing to successfully defend against an attack is about three percentage points of GDP.

The third study thus addresses the question how a government can defend its exchange rate successfully if it thinks that this is the best option. The conventional view is that raising interest rates increases the cost of speculation and thus decreases speculative pressure. Raising interest rates also signals that the government is strongly committed to the fixed exchange rate. Recent research, however, has questioned the effectiveness of high interest rates to defend the fixed exchange rate. Theoretical models even suggest that raising interest rates may increase rather than stop speculation. In an empirical analysis of exchange rate defenses, Kraay (2003) finds no support for the view that high interest rates help to defend a fixed exchange rate against an attack. Similarly, he does not find evidence that raising interest rates may decrease the probability of a successful defense.

I reassess the predictions in the literature about the determinants of currency crisis outcomes in OECD countries during the post-Bretton Woods era. The empirical analysis is based on a less restrictive definition of crises than in previous research to distinguish between the short- and medium-term effectiveness of exchange rate defenses. The empirical results show that, contrary to previous findings, raising interest rates increases the probability that the exchange rate peg survives the speculative attack. This result is robust to changes in model specifications, but depends on the exclusion of the crisis in Sweden in 1992. The Swedish case is highly exceptional because the Swedish government raised interest rates to far higher levels than all the other governments in the dataset. The results suggest that for low and intermediate levels of speculation, raising interest rates is effective. If speculation is exceptionally large, as in Sweden 1992, interest rates may be ineffective because their adverse
effects on the economy dominate the signal of strength that high interest rates send to market participants. Among the political variables, only pre-election periods and central band independence have some influence on the outcome of an attack.

While the empirical analysis of OECD crises yields only limited evidence that politics affects crisis outcomes in industrialized democracies, existing research suggests that the differences may be large across different political systems. Some scholars argue that democratic governments are significantly more likely to devalue their currencies in response to exchange rate pressure than autocratic regimes. These studies of the interwar period imply that democratic rule has had a destabilizing effect on the international financial system and, by implication, promoted the economic and political turmoil at that time. Other studies, however, have shown that during the last decades, democracies have been less likely to fall victim to a speculative attack than autocratic regimes. According to these findings, democracies promote rather than undermine international financial stability.

The last study that is co-authored with Stefanie Walter addresses this puzzle and examines how political regime type influences the outcomes of currency crises in emerging market economies and developing countries from 1983 to 2003. We use a version of the theoretical model from the previous studies to examine the different theoretical mechanisms that lead to the competing hypotheses in the literature. It shows that democracies devalue more often if the effect of democracy on the costs of devaluation dominates its effect on the costs of defense, and vice versa. The model also suggests that the probability of an attack may increase, the more intransparent the political regime, independent of government commitment to the exchange rate peg. Because autocracies generally are less transparent than democracies, autocratic governments may be attacked more often than equally committed democratic governments.

The results of the empirical analysis shows that democratic governments have defended their exchange rates significantly more often than autocratic governments. Exceptions are oil-exporting autocracies, e.g. Kuwait and Saudi-Arabia, that – contrary to the general pattern across the other autocratic countries – always have defended their currencies. We conduct several robustness tests and analyze whether the results change when we control for other domestic political variables that might affect government decisions in democratic countries, such as elections and government partisanship. We do not find any effect of these variables on crisis outcomes. The impact of political regime type on outcomes is not influenced by these additional variables. Democratic political regimes thus do not destabilize
the international financial system. Our results suggest that its stability should increase rather than decrease, the more countries in this system become democratic.
2.1 Abstract

Many studies of the Room to Maneuver make no provision for popular evaluation of policy. They assert rather than demonstrate popular satisfaction with policy choices and macroeconomic outcomes. We present a framework that explicitly models channels for popular preferences to influence policies and outcomes. Our results for economic policymaking in Britain do not support the Room to Maneuver thesis. In our sample (1981-1997) the British government was responsive to changes in political evaluations, and its policy choices effectively fed back into popular evaluations of government policy. However, this accountability mechanism worked outside the real economy. Shifts in popular evaluations induced changes in policy but had no impact on inflation and economic growth. Government capacity to shape macroeconomic outcomes was limited and popular influence over economic policy was ineffectual. This form of accountability probably existed because British citizens had difficulty gauging the real impacts of their government’s policies.
2.2 Introduction

Most scholars now agree that, despite globalization, national governments have substantial room to maneuver in economic policy and macroeconomic outcomes. By implication, elected officials are accountable for their decisions. Through political participation, citizens evaluate the policies of their representatives and hold them accountable for those policies.

This wisdom rests on very weak footings. Studies of the room to maneuver make no provision for popular evaluation of policy: they assert rather than demonstrate popular satisfaction with policy choices and macroeconomic outcomes. Most omit channels for popular preferences to feed back into policies and outcomes. Thus we lack a good understanding of the causal chains that connect policy choices to macroeconomic outcomes, to popular evaluations, and then back again to policy choices. Extant research fails to draw distinctions between short- and long-term consequences of policy choice (dynamics), and to provide any estimates of the magnitudes and durations of policy outcomes. Without scientifically sound estimates of these outcomes, we have no idea how much, if any, room to maneuver democratic governments retain.

We develop a framework that addresses these issues. It is genuinely interdisciplinary since it endogenizes both the open economy and the polity. We use current research—especially work in new open macroeconomics, government approval research and the political economy of financial markets—to identify this model. We then extract three competing arguments about the causal chains that connote popular sovereignty over the economy. Using a Bayesian structural time series model we test these arguments. The testbed for our analysis is the United Kingdom, a political economy, distinctive for being highly open to trade and finance and producing a high degree of clarity of responsibility for its governments. If political accountability exists anywhere in the OECD, it ought to exist in this critical case (see Mosley 2000, for example).

Our results do not support the Room to Maneuver thesis or its application to the UK. They are only partly consistent with past research about the existence of political accountability in open economies. In our sample (1981-1997) the British government was responsive to changes in political evaluations, specifically sociotropic economic expectations. Its policy choices fed back into popular evaluations of government policy, particularly vote intentions. Hence, a visible link from popular evaluations to policy and back to popular evaluations existed. There is evidence, consistent with theoretical work on political monetary
cycles (e.g., Lohmann 1999) that prices but not output increased before elections. However, net of this electoral effect, the accountability mechanism worked *outside* the real economy. Shifts in popular evaluations of the British government induced policy changes that had no impact on inflation and economic growth. This suggests, contrary to past research, that government capacity to shape macroeconomic outcomes was limited and popular influence over economic policy was ineffectual. This form of accountability probably existed because British citizens had difficulty gauging the real impacts of their government’s policies.

2.3 The Room To Maneuver and Political Accountability

Researchers now agree that despite economic globalization, governments retain significant control over their macroeconomies. Studies show that, contrary to earlier pessimistic predictions, tax rates and public sectors’ sizes have not been converging in advanced industrialized countries (Bernauer 2000; Bernauer and Achini 2000). Although there is some indication that taxation of mobile capital decreased slightly, the extent of these changes is rather small (Swank and Steinmo 2002). Garrett and Mitchell (2001) and Quinn (1997) find a positive relationship between financial openness and tax rates. Mosley (2000) concludes that governments in Britain and in OECD countries retain flexibility in a large number of policy areas when they commit to low-inflation and low-deficit policies. These studies imply that governments satisfy the demands of citizens to cope with the adverse effects of globalization.

None of them demonstrates that citizens are content with governments’ responses to globalization. For a number of reasons, citizens may be dissatisfied with policy making and outcomes. International capital flows may limit governments’ abilities to use interest rates to manage their economies. Thus citizens may become increasingly dissatisfied with monetary policies and macroeconomic outcomes. A complete analysis of room to maneuver has to show that governments not only have the capacity to resist market forces and manage their macroeconomies, but also that publics are satisfied with the policy choices of their governments.

Evidence suggests that many citizens are not satisfied with their governments’ policies. Majorities in European countries do not think that their governments have enough control over macroeconomic outcomes (European Commission 2003). Table 1 shows that almost half of the French and British populations do not believe that their governments have
great influence over the domestic economy (Freeman 2006; Hellwig 2006a; 2006b). Existing research does not answer the question why citizens lose their faith in their governments’ capacity to shape economic developments when these governments are generating economic outcomes that citizens’ desire.

Table 2.1: British and French Evaluations of Room to Maneuver

<table>
<thead>
<tr>
<th></th>
<th>Great Britain</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent N</td>
<td>Percent N</td>
</tr>
<tr>
<td>A great deal</td>
<td>9 210</td>
<td>5 143</td>
</tr>
<tr>
<td>Quite a lot</td>
<td>44 1037</td>
<td>37 1106</td>
</tr>
<tr>
<td>Not very much</td>
<td>38 891</td>
<td>42 1278</td>
</tr>
<tr>
<td>Hardly any</td>
<td>5 122</td>
<td>11 339</td>
</tr>
<tr>
<td>Don’t know</td>
<td>3 73</td>
<td>5 144</td>
</tr>
<tr>
<td>Total</td>
<td>99 2333</td>
<td>100 3010</td>
</tr>
</tbody>
</table>

Political scientists and economists have given a part of the needed analysis. Political scientists provide deep insight about the polity while ignoring the effects of politics on economic developments. Economic voting models help us understand how the economy and economic expectations affect government popularity and vote intentions. Economists, however, typically look at the workings of the economy and effects of monetary and fiscal policy without provisions for political accountability. Their analyses of optimal economic policies are based on the idea that the government knows and maximizes the utility of the representative consumer / voter. Such explicit utility-based welfare analysis implies that consumers, who from a political science perspective are voters, are satisfied with government policy choices by definition as long as the government follows the optimal rule.

This lack of interest in the endogenous relationship between the polity and the economy has serious implications for the model specifications. Economic models are incomplete for analyzing political accountability because they do not allow for feedback from citizens’ preferences to policymaking. Similarly, political models do not assess the impact of policy choices induced by popular evaluations on economic developments, which is an

1 The specific questions are: “In today’s worldwide economy, how much influence do you think British governments have on Britain’s economy?” [Britain]; “In your opinion, does globalization still leave French government room to maneuver in the economy?” [France]. Data for Britain are from Heath el al. (2002) and data for France are from Centre d’Etudes de la Vie Politique FranHansie (CEVIPOF), Centre d’Information des Donnes Socio-Politiques (CIDSP) and Centre de Recherches Administratives, Politiques et Sociales (CRAPS) 2001, French National Election Study, 1997. Ann Arbor, Michigan: Inter-university Consortium for Political and Social Research.
important aspect of accountability. Models that neglect the polity or the economy miss an important aspect of politics and economics. Recent literature shows that economic agents account for political information and that politics affect economic developments. Political uncertainty increases exchange rate volatility and affects economic welfare. Political institutions mediate the impact of political uncertainty on exchange rates (Bernhard and Leblang 2006).

To assess the degree of political accountability that exists in an open economy, we employ a framework that addresses these issues. We construct genuine political economy models that allow for endogeneity between the polity and the economy and thus for political accountability, but also for dynamic analysis of accountability’s macroeconomic consequences. The Bayesian structural time series model presented here captures the causal claims of competing theories about the room to maneuver. The model allows us to 1) test arguments about the degree of political accountability that exists in open economy democracies and 2) gauge the consequences of this accountability, if it indeed exists, in terms of its size and duration on the macroeconomy.

2.4 Theory

2.4.1 Political Accountability

Models of economic voting are a natural starting point for analyzing the connections among popular evaluations, government policy and economic outcomes. In these models, voters continuously evaluate the economic outcomes of government policy and hold policymakers accountable for them. If the economy is performing well (poorly) then voters reward (punish) governments and support for the governing party increases (decreases). The key economic variables measuring the state of the economy are unemployment, inflation, interest rates and the exchange rate (e.g., Hibbs 1982; Sanders 1991).

Recent scholarship emphasizes voters’ subjective rather than objective evaluations (Clarke et al. 2000; Clarke and Stewart 1995; Clarke et al. 1998; Sanders 1991; 2005). The literature proposes several indicators of subjective evaluations reflecting citizens’ assessment of macroeconomic outcomes and government policy. These indicators include personal economic and financial expectations (Sanders 1991; 2005); personal and national economic retrospections (Kiewiet and Rivers 1985); and, forward-looking assessments of economic
forecasts rather than past outcomes (MacKuen et al. 1992). Clarke and Stewart (1995) assess these competing indicators and find that personal expectations subsume the personal retrospections, but not national expectations or national retrospections.

Despite this shift from objective to subjective economic evaluations of the economy, political scientists are aware that "economic forces appear to influence electors' attitudes towards the economy in two different, if complementary ways" (Sanders 1991: 238). Objective economic variables such as interest rates and taxes influence personal economic expectations. These subjective evaluations then are transmitted to approval through various channels. Economic evaluations affect vote intentions both directly and indirectly via prime minister performance.

How the economy affects government support depends on the political systems of the respective country. Lewis-Beck (1988) finds that economic developments affects approval strongest in Britain, less in Germany, France and Spain, and least in Italy. Powell and Whitten (1993) explain these differences with the varying ability of citizens to hold political actors responsible for economic outcomes in each political systems. In countries with less clarity of responsibility (i.e countries with coalition governments) economic outcomes have less influence on political support (see, Anderson 2000; Whitten and Palmer 1999).

This evaluation process leading to citizens' final assessment of macroeconomic outcomes and policies is at the heart of the room to maneuver. Citizens continuously monitor objective economic developments to form an overall, subjective evaluation of their nation's and their personal future. If room to maneuver exists, governments should take account of popular evaluations and use their policy instruments to manage the publics' economic expectations.

2.4.2 The Open Economy

Models of open-economy macroeconomics based on intertemporal utility and profit maximization yield diverging predictions about the effectiveness of public policy. The role that these models assign to monetary policy decisively depends on their assumptions about market rigidities (imperfect competition and sticky prices). Models with perfect competition and flexible prices predict that monetary policy has no significant effect on output. In contrast, models with price rigidities and imperfect competition suggest that unanticipated expansionary monetary shocks lead to increases in output (Galí 2003; Galí and Monacelli 2005). Under imperfect competition, firms set prices above marginal costs making it
profitable for them to increase output at preset prices as long as shocks are small enough that marginal revenue does not fall below marginal cost.

The perceived mismatch between predictions of flexible prices / perfect competition models and empirically observable effects of monetary policies on macroeconomic outcomes motivated the shift to models with sticky prices and monopolistic competition. Empirical research comes to different conclusions about the impact of monetary policy. Christiano, Eichenbaum, and Evans (1996) find that monetary policy has large effects on output. In contrast, Sims and Zha (2006) estimate relatively weak effects of unexpected monetary policy changes on the real economy. They find that most variation in monetary policy is from policymakers’ responses to the changing state of the economy, and that the effect of unanticipated policy changes is much smaller than theoretical models with nominal rigidities suggest.

Recent research in open macroeconomics with nominal rigidities focuses on how domestic monetary policy affects other countries’ economic performance. Contrary to the claim that loose monetary policies increase domestic output at the expense of foreign welfare, it finds that unexpected domestic monetary expansion may increase domestic and foreign output. This result depends on the extent of import price “pass through” from the exchange rate to domestic consumer prices.\(^2\) If the degree of pass through is large, exchange rates play an allocative role because depreciations of the domestic currency lead to a shift of foreign demand towards domestic goods. Thus, domestic money supply shocks can have real effects that last beyond the time frame of price rigidities and increase both domestic and foreign output.\(^3\) When there is less pass through, surprise depreciations do not alter the relative prices of foreign and domestic goods. Exchange rate movements affect the real economy through an income effect because the domestic currency value of revenues from exports changes.

Empirical studies offer some evidence of the importance of policy shocks for economic outcomes in an open economy model with sticky prices. Open economy vector

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\(^2\) The degree of exchange rate pass through depends on the price setting behavior of firms. Pass through is large if producers set prices in their home currency (Obstfeld and Rogoff 1995). Pass through is small if firms set prices in the purchaser’s currency (Betts and Devereux 2000). The latter requires that firms are able to segment markets and the law of one price does not hold.

\(^3\) As Obstfeld and Rogoff (1995) demonstrate for a two-country model, money supply shocks can induce short-run wealth accumulation via the current account. When money supply increases, the exchange rate falls initially and switches world demand toward domestic products. Domestic residents experience a short-run increase in relative income and save part of this to smooth consumption over time. In the long-run, net positive investment income inflow allows a permanent consumption level above domestic output.
autoregressions (VAR) show that monetary contractions in the United States are followed by sharp, persistent increases in nominal and real exchange rates (Clarida and Gali 1994; Eichenbaum and Evans 1995). Consistent with these sticky price models, monetary policy has significant effects on both domestic and foreign output (Betts and Devereux 2001; Faust and Rogers 2003; Kim 2001).

2.4.3 Connecting the Polity and the Economy: Competing Views of Popular Accountability

Research in political science and economics provides insights into the polity and the economy, but the connections between them in open democratic systems are not well understood. The political monetary (business) cycle literature generally studies closed economies and equates popular accountability with electoral politics. How fast governments react to changes in popular evaluations is usually an assumption in a formal model rather than an empirical question. There is consensus that these reactions are inflationary, but policy has little lasting effect on the real economy (Lohmann 1999). This research provides few results about the speed and magnitude of policy outcomes in open democracies.

Uncertainty about the existence and impacts of political accountability in open economies is central to room to maneuver debate. The debate centers on several aspects of the political economy. The first is whether political shocks have direct or indirect impacts on public policy. Shocks in political variables may directly affect interest rates or they may affect exchange rates and then the changes in exchange rates (indirectly) affect interest rates. The second is the speed of reaction of political and economic actors to unexpected political and economic shocks. If foreign exchange traders react instantly to political shocks, and governments react to exchange rate changes with a delay, then there is a (indirect) lagged effect of politics on policy. Although market participants can anticipate the government’s reaction when they observe a political shock, they might be unable to adjust immediately because of nominal economic rigidities. Finally, the amount of political accountability in open economies depends on the magnitude and the duration of the political, policy and economic effects. If political shocks lead to sharp but short-lived changes in policy, then their impacts disappear quickly and there is little political accountability.

Freeman and Houser (1998) and Houser and Freeman (2001) present dynamic stochastic general equilibrium models that combine the polity and the economy, but this model is for closed economies.
To address which political shocks affect the economy and with what speed, magnitude and duration, we identify three possible causal chains. The first chain claims that governments have no room to maneuver in an open economy. The second, presents an alternative where governments respond to changes in popular evaluations of macroeconomic outcomes, but the effects of government policy in an open economy are small or nonexistent. Hence, there is no feedback from policy to macroeconomic outcomes to popular evaluations. The third, corresponds to the room to maneuver thesis: elected governments still have the capacity to influence macroeconomic outcomes and they use this room to move in a manner that reflects citizens' preferences. Thus there is a complete loop from citizen evaluations to policy to macroeconomic outcomes back to citizen evaluations.

The first causal chain implies that government is slow to react to political shocks or is inattentive to popular preferences. Political shocks have little or no subsequent effect on policy. Suppose governments react to shocks in popular evaluations with a delay. This can occur for a number of reasons. For instance, government decision-making is time consuming because policy changes require consultations with relevant actors and careful evaluation of policy alternatives. Under this scenario, the government decision-making process is at least as slow as the private sector price adjustment mechanism. Both the financial and real sectors observe the shock in popular evaluations and anticipate the government's reaction to this shock. The result is slightly higher prices without an impact on output. When public officials believe that economic agents will thwart their efforts to alter macroeconomic outcomes they do not attempt to satisfy citizens' wishes. The reaction of government to political shocks is so minimal (nonexistent) that popular preferences are not satisfied. Room to maneuver is ruled out in this case.

The second chain implies that governments react immediately to political shocks but the effect of policy quickly disappears. The impact of policy on the economy is not lasting for two reasons. Foreign exchange markets incorporate political information in investment decisions and anticipate the policy change when observing political shocks. Thus, policy variables and the exchange rate react immediately to political shocks. Although this drop in the exchange rate has initial positive effects on output, this disappears in the medium run. Expansionary monetary policy partially increases domestic output at the expense of foreign economies. Foreign governments react to the domestic policy change and take measures to offset this shift of world demand toward domestic products. Moreover, if the exchange rate decreases, then prices increase in the medium and long run, so the effect of policy on the open economy disappears.
The immediate and lagged effects of decreasing interest rates on subjective evaluations and political approval are small or not existent in this second case. First, these variables may not react to policy instantaneously (Sanders 1991). The delayed impact of low interest rates on political variables is offset as voters infer from a declining exchange rate that future inflation will rise. Voters then expect a decrease in real wages, depressing same-period subjective economic expectations. At times, the exchange rate has a symbolic value reflecting the overall strength of a country (Hibbs 1982). A falling exchange rate then has negative, contemporaneous effects on evaluation of government policymaking. Finally, the effect of policy on the real economy does not persist and policy change does not have lagged effects on either subjective or objective political evaluations. Policy reflects citizens’ preferences but it is not able to bring about citizens’ preferred macroeconomic outcomes. There is no meaningful room to maneuver in this case.

In the third causal chain government is a responsive and an effective actor in the political economy. Government constantly monitors citizens’ preferences through opinion polls, voting and political participation, and reacts instantaneously to changes in political evaluations. If the government learns that the public is dissatisfied with the economy, it adjusts policy immediately to alter economic outcomes consistent with citizens’ preferences. Government policy is effective because the domestic real economy adjusts to political shocks only slowly. Economic rigidities imply that government—if it reacts fast enough—can lead the real economy and effectively respond to changes in political evaluations. Although private actors, such as firms and wage setters, anticipate the government’s reaction to a political shock, they are bound by contracts and cannot adjust prices instantaneously. When economic actors in the real sector adjust with a delay the effect of government policy on output is strong and persistent (Galí 2003).

International economic integration reinforces the effect of policy on the economy. Unanticipated monetary expansions have a positive and lasting impact on foreign economies. Thus, foreign demand for domestic goods increases over time strengthening the duration and magnitude of economic growth (Betts and Devereux 2001; Kim 2001). The unanticipated policy change feeds back to popular evaluations. Lower interest rates immediately increase subjective personal and national economic expectations and has an instantaneous, positive impact on government support (Sanders 2005). The effect of policy on approval persists because citizens benefit from the improving macroeconomic conditions. In this third view, political accountability exists in an open economy because government reacts quickly to
No Accountability Model

Policy Response Model

Accountability Model

Figure 2.1: Competing Models of Political Accountability
shocks in approval and its policy changes are substantial in magnitude and effective (because of rigidities and market imperfections). In this sense, government retains room to maneuver.

Figure 2.1 summarizes the predictions of the three competing causal chains. The white arrows mean there is a weak, delayed, or no effect from one variable to another. The grey arrows imply that there is a strong and persistent effect. In the first, or No Accountability Model, government does not react to changes in political evaluations. In the second, or Policy Response Model, the government reacts to shocks in evaluations. This policy change does not influence economic developments and there is no feedback. In the Accountability Model, government reacts to changes in political evaluations. Evaluations and the economy adjust when the government changes policy.

2.5 Research Design

2.5.1 Case and Data

We test the competing claims about political accountability in open economies using multivariate time series analysis of monthly economic and political data for the United Kingdom from 1981 to 1997. This case is well suited for this analysis since Britain has a high clarity of responsibility and a history of openness to trade and capital flows. Mosley (2000: 751) argues that British elections in the 1990s were meaningful contests between parties with contending views about how Britain should exploit its room to maneuver in the world economy.

Compared to other industrialized democracies, the British system largely concentrates political power in the hands of the central government. Its majority-plurality electoral system produces single-party governments that are fairly independent of other political actors. Unlike countries where two or more coalition partners participate in government, there is little hidden bargaining among the parties during the policy formulation process that makes it difficult for voters to assign the final policy decision to a single, specific political player. The absence of vertical division of power and the unicameral legislature offer political opponents few opportunities to alter government policies (for further discussion of clarity of responsibility in Britain, see Powell and Whitten 1993).

Moreover, the British government had full control over economic policymaking during the period of analysis. During the first half of the 1990s, the incumbent Conservative
Party blocked efforts to delegate monetary policy to an independent central bank. Between 1970 and 1997 the Bank of England was one of the least independent in the industrialized world. The Bank was granted greater independence after the Labour Party’s victory in the May 1997 general election (Bernhard 2002: chapter 7). Even after this date the Bank was gauging public satisfaction with its performance through its inflation attitudes survey. The British government also was analyzing its accountability to Parliament. Finally, while British monetary policy may have followed those of other European countries during the crisis of the early 1990s, in our sample period, it was largely unconstrained by the European Monetary System.

Measures of economic openness show that by late 1970s Britain was open to trade and capital flows. By Quinn’s (2000) openness indicators, the British government had lifted nearly all restrictions to capital mobility and trade by 1979. The current and capital account openness measures reach their maximum values in 1979 and remain there until 1999 when the indicator ends. Quinn’s measures also show that Britain was an open economy in relative terms. The indicator of overall openness using both current and capital account openness increases from 3.5 in 1950 to the maximum value 14 in 1979. Average overall openness in OECD countries varies from 4.2 in 1950 to 9.7 in 1979 and 13.4 in 1999.

We use monthly data from November 1981 to April 1997. The political time series are from the Gallup Organization (King and Wybrow 2001). Vote intentions ($VI_t$) capture the percentage of voters who respond that they intend to vote for the incumbent party. Prime ministerial approval ($PM_t$) measures the percentage of respondents who are satisfied with the performance of the incumbent Prime Minister. Subjective personal expectations ($PE_t$) are the difference between the proportion of people who expect that their personal financial situation will improve during the next year and the proportion of people who think that their situation will deteriorate. Subjective sociotropic expectations ($SE_t$) capture the difference between the proportion of people who expect the national economic situation will improve and the proportion of people who think that the situation will worsen. To capture electoral dynamics,


6 We did a number of tests to examine whether UK and German interest rates are cointegrated. The results of these tests were ambiguous for the first half of the sample, specifically until German unification in 1990 and the EMS crisis in 1992. In the second half, we did not find evidence that UK and German interest rates were cointegrated. Similarly, the tests suggest that the series were not cointegrated for the whole sample.
we use an electoral counter taking (resetting to) the value 1 in the month after each British
general election and increasing linearly to the next general election. We also estimated
specifications without such a counter and with three counters for the different electoral
periods in our time period.7

The economic series are from the International Financial Statistics (IFS) from the
IMF (CD-ROM version). The exchange rate is the monthly average of the $/£ nominal
exchange rate (IFS line rf); it corresponds to the number of U.S. dollars per British Pound
(XRt). Following the macroeconomic literature, we use the British and U.S. Indices of
Industrial Production (IFS line 66) to measure monthly domestic and foreign output (IIP, and
USIIP). The domestic and foreign price levels (CPIt and USCPIt) are from the British and
U.S. Consumer Price Indices (IFS line 64). Domestic and foreign monetary policies (IR, and
USIRt) are the monthly average of short-term interest rates in the two countries (IFS line
60b).8

2.5.2 Model and Structural Identification

To test the competing claims about the degree of political accountability in open
economies, we use Bayesian Structural Vector Autoregressive Regression (B-SVAR) models.
These are appropriate for a problem like ours where model scale, endogeneity, persistence,
and specification uncertainty are present at the same time. B-SVAR models subsume more
familiar models like VARs, ECMs, and VECMs allowing for sounder statistical inferences,
e.g., the avoidance of knife-edge inferences about unit roots.9 Details of the general B-SVAR
model are described in the appendix.

In a B-SVAR model, our discussion of competing causal accounts of political
accountability is represented by different contemporaneous and lagged relationships among
the variables. The political and economic literatures imply a core set of relationships between
variables within the polity and the economy. Each competing causal account (chain) implies
different contemporaneous relationships across the polity and economy: the immediate
impact of political shocks on economic variables and the immediate impact of economic

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7 Thus our model reveals any political dynamics that exist beyond the episodic impacts of
elections. We report tests of the alternative specifications of the electoral counter below.
8 Bernanke and Blinder (1992) show that short-term interest rates are a good indicator of
monetary policy.
9 Brandt and Williams (2007) and Freeman et al. (1989) are introductions to multiple time
series analyses in political science. For an application, see Williams (1990).
shocks on political variables. Inferences about the direction, magnitude, and duration of shocks in key variables can be made on the basis of the impulse responses of the B-SVAR models. These impulse responses reveal the combined impact of contemporaneous and lagged relationships between the political and economic variables in the three structural specifications.

Table 2.2 represents the contemporaneous relationships among the variables for the three competing models. The core model represented in the upper part of Table 2 implies a causal nexus with no political accountability. Each row in this table corresponds to an equation capturing the contemporaneous effect of the column variable on the row variable. Empty cells are restrictions that mean the column variable is assumed to have no contemporaneous impact on the row equation. The X's represent “free parameters” meaning that the respective column variable can have an immediate impact on the row equation. The three competing causal chains imply different X’s at the intersections of the polity and economy, the grey-shaded fields in the upper right and lower left of the three model specifications in Table 2.2. The core model—in all three causal chains—implies structural specifications in the non-shaded rectangular fields on the upper left and lower right of each model specification in Table 2.2.

We rely on government approval research in Britain (Clarke et al. 2004; Sanders 2005) to identify the core political model in the lower right corner of each model in Table 2.2. The literature suggests that a lower-triangularized, contemporaneous order of SE_t, PE_t, PM_t, and VI_t, is appropriate. The single-equation models of government approval used by researchers imply that both sociotropic and personal subjective economic expectations affect approval and vote intentions contemporaneously (Clarke and Stewart 1995; Clarke et al. 1998). These political models suggest that Prime Minister (PM) satisfaction instantaneously influences vote intentions. At the same time, PM satisfaction is weakly exogenous to vote intentions implying that there is no contemporaneous effect of VI_t on PM_t (Clarke et al. 2000; Clarke and Stewart 1995). These models also imply that citizens learn about objective economic indicators in the Production sector only with a delay (Clarke et al. 1998; Sanders 1991).

10 These models generally regress approval or vote intentions on the contemporaneous values of subjective expectations. Sanders (1991) uses a three month lag for personal expectations. Sanders (2005) introduces personal expectations without a lag.

11 Sanders (1991) and Clarke and Stewart (1998) present models of vote intentions and government approval that include objective economic indicators. These variables are lagged at least one period implying that there is no contemporaneous influence of the Production sector on vote intentions.
Following empirical models in macroeconomics, we divide the open economy into three sectors of equations that differ in terms of how fast they adjust to shocks in the other variables (Leeper et al. 1996). Variables in the “Information Sector” adjust to shocks instantaneously and include financial markets. These markets process new information about changes in other sectors very quickly. For all three competing causal chains the Information Sector reacts instantaneously to shocks in the macropolity (Bernhard and Leblang 2006). We do not require that policy is weakly exogenous. The “Policy Sector” represents the government reaction functions and specifies the variables to which policymakers respond immediately. Variables in the “Production Sector”, economic output and prices, adjust sluggishly to shocks in other variables.

We rely on work by Cushman and Zha (1997) and Sims and Zha (2006) to specify the speed of adjustment of the specific variables in the open economy. The exchange rate adjusts immediately to all domestic and foreign economic variables. As these authors note, governments have immediate access to information on the exchange rate and monetary policy of other governments. However, policymakers do not observe data on output and prices within the same month and therefore they only react with a delay to shocks in those variables (Cushman and Zha 1997: 437-438; Sims and Zha 2006: 249). Open economy models are distinguished from closed economy models by variables that are likely to respond to changes in the foreign economy. Thus changes in U.S. monetary policy lead to an immediate reaction of the British government, but not the opposite. Similarly, the British Production Sector responds to the U.S. Production Sector, but not vice versa (Cushman and Zha 1997: 438). The resulting matrix of contemporaneous economic relationships is in the upper-left rectangular field of the models in Table 2.2.12

The three competing causal accounts depicted in Figure 2.1 now can be represented as three distinct contemporaneous specifications, or three distinct contemporaneous causal structures in B-SVAR models. The identification of the polity-economy intersections (the

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12 The Cushman/Zha identification does not allow for contemporaneous responses of policy to changes in the Production sector. This allows governments to respond to shocks to output and prices. There can be a lagged relationship between production variables and policy where the countries respond to output and prices with a lag because this information is received later.
### Table 2: Contemporaneous Relationships for No Accountability, Policy Response and Accountability Models.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Variable</th>
<th>XR, IR, USIR, CPI, IIP, USCPI, USIIP</th>
<th>SE, PE, PM, VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Accountability Model</td>
<td>Information XR,</td>
<td>X X X X X X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td></td>
<td>Policy IR,</td>
<td>X X X</td>
<td>X X</td>
</tr>
<tr>
<td></td>
<td>Policy USIR,</td>
<td>X</td>
<td></td>
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<tr>
<td></td>
<td>Production CPI,</td>
<td>X X X X X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Production IIP,</td>
<td>X X X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Production USCPI,</td>
<td>X X</td>
<td></td>
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<td></td>
<td>Production USIIP,</td>
<td>X</td>
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<td></td>
<td>Macropolicy SE,</td>
<td></td>
<td>X</td>
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<td></td>
<td>Macropolicy PE,</td>
<td></td>
<td>X X</td>
</tr>
<tr>
<td></td>
<td>Macropolicy PM,</td>
<td></td>
<td>X X X</td>
</tr>
<tr>
<td></td>
<td>Macropolicy VI,</td>
<td></td>
<td>X X X X</td>
</tr>
</tbody>
</table>

| Policy Response Model | Information XR, | X X X X X X X X | X X X X X |
| | Policy IR, | X X X | |
| | Policy USIR, | X | |
| | Production CPI, | X X X X X | |
| | Production IIP, | X X X | |
| | Production USCPI, | X X | |
| | Production USIIP, | X | |
| | Macropolicy SE, | | X |
| | Macropolicy PE, | | X X |
| | Macropolicy PM, | | X X X |
| | Macropolicy VI, | | X X X X |

| Accountability Model | Information XR, | X X X X X X X X | X X X X |
| | Policy IR, | X X X | |
| | Policy USIR, | X | |
| | Production CPI, | X X X X X | |
| | Production IIP, | X X X | |
| | Production USCPI, | X X | |
| | Production USIIP, | X | |
| | Macropolicy SE, | A | X |
| | Macropolicy PE, | A | X X |
| | Macropolicy PM, | A | X X X |
| | Macropolicy VI, | A | X X X X |

Note: Each model block specifies the contemporaneous relationships and restrictions for an associated B-SVAR model (A_0 matrix)
grey-shaded areas) in the upper part of Table 2.2 represents the idea that political accountability does not exist in open economies. The distinguishing feature of this “No Accountability Model” is the restriction that the government does not react immediately to political shocks. The cells representing the influence of the Macropolity on monetary policy in the upper right corner are blank. Similarly, there is no impact of policy on the polity, as the cells for the impact of government policy on the Macropolity in the lower left corner of the No Accountability specification are empty.

The second model in Table 2.2 modifies the upper right hand block of the No Accountability model. This modification represents the “Policy Response Model” that allows the government to react immediately to political shocks, but with no contemporaneous feedback through the Macropolity. The specification in the middle of Table 2 shows the modification of the matrix of contemporaneous relationships that allow the government to respond to political shocks but leaves the zero restrictions in the lower left of the core model intact. The R’s in the second model of Table 2.2 represent the four additional free parameters in the Policy Response Model in comparison to the No Accountability Model.

The third “Accountability Model”—the model that is necessary for any Room to Maneuver—allows for additional free parameters relative to both the No Accountability and the Policy Response models. This model holds that governments react immediately to political shocks and that policy choices are immediately evaluated and feedback through the Macropolity. The A’s in Table 2 represent the additional free parameters that are necessary to allow for such contemporaneous government reaction and feedback. The Accountability model thus has four (eight) more free parameters than the Policy Response (No Accountability) models.

2.6 Results

We estimated B-SVAR models based on the three structural identifications. Each model employs a separate equation for each of the 11 endogenous variables. Each equation includes 6 lagged values of each of the 11 variables, a constant, and a single exogenous covariate that is an election trend counter for the UK. The interest rate, exchange rate, and political variables enter the model as proportions and the other economic variables enter the model in natural logarithms. Since the model is Bayesian, we employ an informed prior for

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13 This specification was chosen based on AIC and F tests.
Bayesian SVARs (Brandt and Freeman 2006a; 2006b; Sims and Zha 1998). The model is estimated using a Markov chain Monte Carlo (MCMC) Gibbs sampler proposed by Waggoner and Zha (2003a). For details, please see the Appendix.

We use the log marginal data density (MDD) to assess the posterior model fit of the three models. The log MDD measures the log density for the sample data under each model. The log MDDs are 8419 for the No Accountability model, 8432 for the Policy Response model and 8478 for the Accountability model. The best log MDD is one with the largest value, or the results for Accountability model. The log MDD differences are log Bayes factors that describe the weight of the evidence for or odds of one model versus another (Kass and Raftery 1995). The log Bayes factor is (8432 - 8419 =) 13 for the Policy Response model versus the No Accountability Model, and (8478 - 8419 =) 59 for the Accountability model versus the No Accountability model. The log Bayes factor of the Accountability model versus the Policy Response model is (8478 - 8432 =) 46. These large positive values are strong evidence that the Policy Response model is preferred to the No Accountability model and the Accountability model to both of the others.

One should not judge the explanatory power of a Bayesian SVAR solely on these fit statistics (Brandt and Freeman 2006b). The main inferential tool should be impulse response analysis—analyzing the speeds and magnitudes of adjustment of policy to politics and adjustment of politics to policy over time. Impulse responses trace out the dynamic responses to shocks to the various equations in the political-economic system. This is critical to establishing the macroeconomic consequences of any political accountability that might have existed in Britain in this period. In a B-SVAR model, the initial responses follow a contemporaneous causal structure based on the structural identification for each model. The evolution of dynamic response of a shock to an equation is then traced out using the reduced form representation of the model that employed over 10,000 different sets of these hyperparameter. The prior employed here is among the best fitting from the sensitivity analysis. Other hyperparameter values yield qualitatively similar inferences to those reported here and thus we believe that the model is not sensitive to the prior.

14 The hyperparameter values for the prior are set at standard reference values which correspond to the beliefs revealed by political scientists like Clarke, Stewart and Sanders and by macroeconomists like Sims and Zha. The values are $\lambda_0=0.6$, $\lambda_1=0.1$, $\lambda_2=0.1$, $\lambda_3=0.05$, $\mu_5=5$, $\lambda_5=5$. We also conducted a sensitivity analysis using the reduced form representation of the model that employed over 10,000 different sets of these hyperparameter. The prior employed here is among the best fitting from the sensitivity analysis. Other hyperparameter values yield qualitatively similar inferences to those reported here and thus we believe that the model is not sensitive to the prior.

15 The log MDD is the log (posterior) probability of the sample data generating process. Maximizing this measure is similar to minimizing the mean squared error of the residuals in a regression, which is the same as maximizing the probability of the parameters that generate the data. If a model fits well, the joint posterior probability of the sample data and thus the log MDD is high.
form dynamics of the estimated model. All of the dynamic responses presented here are median estimates in percentage points over 12 months with 68% (pointwise) highest posterior density regions (Brandt and Freeman 2006b).\textsuperscript{16}

Figures 2.2 and 2.3 present impulse responses that trace out the responses of the key policy and political variables in the three models.\textsuperscript{17} Of interest are three sets of responses for each model. The first, are the responses of the policy variable UK interest rates (IR\textsubscript{x}) to shocks to the political variables sociotropic expectations (SE\textsubscript{x}), personal expectations (PE\textsubscript{x}), prime ministerial satisfaction (PM\textsubscript{x}) and vote intentions (VI\textsubscript{x}). These responses summarize the causal linkages between popular evaluations of government and government policy. The second, are the responses of these four political variables to shocks in the UK interest rate and the exchange rate. These responses summarize part of the causal chain from economic policy to popular evaluations.

Figure 2.2 presents the responses of UK interest rates to the shocks in the four political variables. Each graph traces out the response of UK interest rate equation in the three models to a (positive) one standard deviation shock to the respective political variables.\textsuperscript{18} The solid lines are the responses from the No Accountability model; dashed, for the Policy Response model; and dotted, for the Accountability model. For the No Accountability model, a shock in sociotropic expectations (SE\textsubscript{x}) lead to a brief, positive response in interest rates, while for the Policy Response model this same shock causes interest rates to decline. In the Accountability model, surprise increases in sociotropic expectation lead to a positive and long lasting increases in interest rates. The Accountability model result is most plausible, since expectations that the economy will expand put pressure on policymakers to raise interest rates (to stave off inflation).

The response of UK interest rates to surprise increases in subjective personal expectations (PE\textsubscript{x}) generally is negative. For the No Accountability model, interest rates decline with a 68% confidence region that is below zero. For the Policy Response and Accountability models, the median responses are negative, but the confidence regions always include zero. Thus, omitting endogenous interest rate responses to personal expectation shocks leads to the incorrect inference that interest rates respond negatively when in fact there

\textsuperscript{16}These 68% confidence regions (approximately one standard deviation around the median response) are better summaries the central tendency of the responses (Sims and Zha 1998).

\textsuperscript{17}The full impulse responses are available upon request. There are 3 x (11 x 11) = 363 of them.

\textsuperscript{18}These are one standard deviation of the residuals from the equations in the B-SVAR model.
is likely no response. Models that assume that the policy is exogenous of the polity are subject to an endogeneity error and produce biased inferences about the response of policy to politics.

Figure 2.2: Responses of UK interest rates to innovations in the political variables for the three models. The solid lines are the median responses from the No Accountability model; dashed, for the Policy Response model; and dotted, for the Accountability model. Responses include 68% pointwise empirical error bands to assess uncertainty.

In the No Accountability and Policy Response models, innovations in prime ministerial satisfaction (PM,) lead to increases in UK interest rates after about 6 months. When the endogeneity of interest rates to prime ministerial approval is included as in the Accountability model, this effect disappears with a large confidence region that now includes zero. Thus the introduction of the accountability chain into the model leads to estimating a null effect. A shock in vote intentions leads to an initial decline in interest rates that lasts from 4-6 months in the No Accountability and Policy Response models. The Accountability model shows vote intentions have less effect on interest rates; the confidence region for the response of interest rates to a shock in vote intentions always includes zero.

The results in Figure 2.2 have two implications for the room to maneuver debate. First, in the No Accountability and Policy Response models (without accountability), policy appears responsive, but in an anomalous direction. This is because the contemporaneous relationship between prime ministerial approval and policy is omitted from these models. Thus, models assuming that the economy is weakly exogenous to politics generate spurious findings of policy responsiveness. Second, the means by which the public influences the direction of interest rates in the UK are innovations in sociotropic expectations. Interest rates
react positively in an immediate and sustained way to changes in the public's economic expectations.

The other dynamics of interest for evaluating political accountability are the response of the four political variables' equations to changes in interest and exchange rates. The response of the political variables to changes in policy show that there is feedback from economic policy to the public and that the public can evaluate economic policy. Figure 2.3 presents the responses of the four political variables to (positive) shocks in exchange rates and UK interest rates. The left (right) column of Figure 2.3 presents the responses to the exchange rate (UK interest rate) shocks. A positive shock in the exchange rate (XR) is a surprise appreciation of the dollar. Such exchange rate shocks lower sociotropic and personal expectations with a lag in the No Accountability and Policy Response models. The responses of prime ministerial satisfaction and vote intentions to exchange rate shocks are positive and small in the No Accountability model. For the Policy Response model, prime ministerial satisfaction responds weakly positively, but the response of vote intentions has a confidence region spanning zero. In contrast, the Accountability model political responses to a positive exchange rate shock are all more uncertain with 68% error bands spanning zero. This is evidence that the political responses to shocks in the exchange rate in the Accountability model causal chain are highly uncertain. The responses in this first column of Figure 2.3 mean that positive exchange rate innovations have weak to null effects on politics and do not translate into policy changes in the UK in this period.

In contrast, the responses of the political variables to interest rate shocks (IR) — direct evidence of accountability — are consistent with public evaluation of economic policy. The sociotropic expectations, personal expectations, and prime ministerial satisfaction equations do not respond to interest rate innovations in any of the models. For the No Accountability and Policy Response models where no contemporaneous accountability or endogenous feedback from policy to politics is specified, shocks to interest rates produce no lagged change in vote intentions. The response of the vote intentions equation in the Accountability model provides direct evidence of reactions to policy (both in terms of specification as well as voter control of politics). For the accountability chain that allows for contemporaneous endogeneity from policy to vote intentions, a positive one standard deviation shock to interest rates leads to a decline in vote intentions. This drop is large and constant at nearly -0.05 points for each of the twelve months in the response horizon. Cumulatively this is a substantial change, since it means that over 12 months it accounts for more than half a point change in vote intentions.
Figure 2.3: Responses of political variables to innovations in UK interest rates and the exchange rate (XR) for the three models. The solid lines are the median responses from the No Accountability model; dashed, for the Policy Response model; and dotted, for the Accountability model. Responses include 68% pointwise empirical error bands to assess uncertainty.

The responses of the political variables to exchange rate and interest rate shocks in Figure 2.3 show that policy changes generate a response in the public evaluations of government. But the causal mechanism by which this is apparent is only visible in a model that explicitly allows for contemporaneous accountability. As with the responses of interest rates to the political variables in Figure 2.2, assuming that there is exogeneity from the economic policy variables to the political variables as in the No Accountability and Policy Response models lead to findings that politics does not respond to policy when, in fact,
allowing for contemporaneous effects, interest rate innovations lead to changes in vote intentions.

A key link in the economic-politics causal chain in the Room to Maneuver debate is the impact of policy on the real economy and of the real economy on the political variables. Figure 2.4 shows the responses of UK CPI, and IIP, to changes in UK interest rates. These responses are central to economists' claims about the effects of policy in the presence of price stickiness and nominal rigidities. All three models produce the same inferences for an increase in UK interest rates. Positive interest rate increases lead to small (less than 0.0002%) increases in prices and output with confidence regions spanning zero. This is consistent with Sims and Zha (2006) who found relatively weak effects of unexpected monetary policy changes on the real economy.

Figure 2.4: Responses of UK Production Sector to innovations in UK interest rates (IR) for the three models. The solid lines are the median responses from the No Accountability model; dashed, for the Policy Response model; and dotted, for the Accountability model. Responses include 68% pointwise empirical error bands to assess uncertainty.
The final component of the accountability causal chain is the impact of the real economy on the polity. Earlier political science work showed that the impacts of the real economy were small relative to the impacts of the expectational, approval and vote intention variables all the while assuming that economy was exogenous of the polity. In our models with endogenous economic and political linkages, the impacts of the real economy can be evaluated after accounting for the documented endogenous relationships for the economic policy and politics.

Figure 2.5: Responses of political variables to innovations in UK CPI and IIP for the three models. The solid lines are the median responses from the No Accountability model; dashed, for the Policy Response model; and dotted, for the Accountability model. Responses include 68% pointwise empirical error bands to assess uncertainty.
Figure 2.5 shows the responses that address the impact of the real economy on the polity. Responses of the political variables are traced out for shocks to British CPI, and IIP. These variables are unresponsive to innovations in real output, as shown by the non-responses to IIP, innovations in the second column. The impacts of price innovations or inflationary pressures (positive CPI, shocks) vary widely across the three models. For the No Accountability model, there are no political responses to inflationary shocks (the median and 68% bands are right on zero). In the Policy Response model, one standard deviation increases in prices lead to a nearly two point long-run decline in sociotropic expectations with a confidence region below zero over twelve months. In the short term, inflationary pressures lead to a three-month decline in personal expectations after which the error bands span zero. After that, they mimic the inference of the Accountability model and show no response to price innovations.

These inflation effects are not produced in the Accountability model where inflationary pressures generate Macropolity Sector responses with error bands including zero. Prime ministerial approval does not respond to price changes in any model. Domestic price increases lead to no responses in vote intentions for the No Accountability and Policy Response models since the confidence regions include zero. The Accountability model vote intention response to price innovations moves in the correct direction, but has a confidence region that includes zero. The Policy Response model assumes that the Macropolity Sector is weakly exogenous of the real economy and policy. Including contemporaneous policy endogeneity—as in the Accountability model—the real effects of inflation on the polity are zero.\(^9\)

An alternative analysis of the impact of politics on the economy could be the election counter variable in the models. Each of the 11 equations includes an exogenous election counter measuring the effects of elections in the system.\(^{20}\) This covariate possibly is assuming the role of the election and political dynamics in the models. Figure 2.6 presents the Bayesian posterior density estimates for the reduced form election counter coefficients for each of the

\(^9\) We have normalized all of the shocks in all of the equations to be positive. While this is useful for interpretation of individual responses, the full system and A(0) specifications have shocks that vary in sign across the equations. Allowing negative shocks produces the same inferences as reported here.

\(^{20}\) We also estimated models without the electoral counter and with separate counters for each election period. With no counter and separate counters, the test statistics still suggest that we should prefer the Accountability model over the other models. While there are minor changes in the accountability links, there is still no evidence that accountability affects the real economy.
11 equations for each of the three structural specifications. Since the models were estimated using the natural logs of most of the economic variables and the other variables are measured as proportions, the scale of change in these variables is between zero and one. The density estimates for the election counters in Figure 2.6 are identical across the three model specifications. For each additional month closer to the election, the exchange rate and interest rates drop. The densities for the election effects in the exchange rate and interest rate equations do not include zero. A similar, but substantively smaller result is seen for US prices and output.

The political variable equations respond much more strongly to the election run-up. All of the political variable equations have election counter coefficients with densities that do not include zero. The impacts of the election counter on the Macropolity variables' equations are two to three orders of magnitude larger than the effect of the election counter on the information, policy and production variables. Contrary to arguments that government support exhibits a downward trend during the (whole) incumbency of a government (Paldam 1986; Sanders 2005), our election counter shows that support for the government increases in the run-up to an election. Our counter differs from a time trend measuring this cost of ruling, however, because the latter is not reset to zero after a general election. The results for our counter reflect the idea that before national elections support for the incumbent government generally increases. This does not exclude the possibility that costs of ruling exist over the whole period of incumbency.

Substantively these results demonstrate two facts about accountability and the Room to Maneuver debate. First, the impulse results are for models where the exogenous election counter covariate is included. So the dynamics of accountability in Figures 2.2-2.5 are net of the electoral trends. Second, the exogenous election counter effects are consistent with Lohmann’s (1999) model of political monetary policy accountability. Lohmann’s model predicts that prices, but not output respond to election cycles. The election counter densities support these predictions. However, the nonelectoral dynamics reveal no lasting real, macroeconomic effects of political accountability (Figure 2.4). In this sense, political accountability exists outside the real economy: this condition for the room to maneuver is not met.

21 The reduced form coefficients are those coefficients from the model in the appendix where the endogenous relationships have been accounted for in the model’s estimated $A(0)$. They are found by post-multiplying equation (1) in the appendix by $A(0)^{-1}$. 
Figure 2.6: Reduced form posterior density estimates for the election counter coefficient in each B-SVAR equation of the models. The solid lines are the responses from the No Accountability model; dashed, for the Policy Response model; and dotted, for the Accountability model. Note that the three sets of lines are present in the graph and identical. Vertical lines are at zero when zero is within the range of the density plot.
2.7 Conclusion

Scholars repeatedly point to Britain as a case where the government enjoyed significant room to maneuver during the period of analysis (e.g., Mosley 2000). Thus, political accountability existed in that the British government effectively used this room to maneuver and continuously produced economic outcomes consistent with the wishes of British citizens.

Our results are only partially consistent with this argument. We find that British governments reacted to changes in subjective expectations about future national economic development. The public can induce changes in government policy and thus exerts some influence over policymaking. Voters then reward the government for its policies and the proportion of citizens intending to vote for the incumbent government increases. But there is no evidence that the government can effectively influence real economic outcomes. Therefore the accountability mechanism works outside the real economy. In terms of the full relationship between the economy and the polity described in Figure 2.1, there is no transmission of policy through the economy to popular evaluations. The links from policy to the economy and from the economy to popular evaluations are missing.

There are several explanations for our finding. One, is that British citizens rewarded their government for policies that affected their personal situation more than for impacts on the macroeconomy. But like Clarke et al., (2004) we included a variable for Personal Expectations (PE). In the Accountability model it shows no response to exchange or interest rate policy (Figure 2.3). Another explanation is "group attribution bias." Conservatives may credit their government for outcomes that are not the result of monetary policy. But then Labour supporters ought to disapprove of macroeconomic outcomes and this should counterbalance the positive evaluations of their Tory counterparts. Yet, we find in the Accountability model that the vote intentions of the British electorate as a whole respond as expected to interest rate shocks (Figure 2.3). The most plausible explanation is that British citizens simply have trouble gauging the efficacy of monetary policy. They approve of the policies but simply are not able to determine if they have their intended impacts. This is not surprising when one realizes that economists continuously debate the effectiveness of monetary policy and of well-established relationships like the impact or minimum wage laws on employment (Blinder and Krueger 2004, fn. 39). As Table 1 shows, some British citizens...
suspect that their government’s policies are ineffective. An interesting question is whether more and more of them question their government’s room to maneuver.
2.8 Appendix: Empirical Approach

The Bayesian structural vector autoregression (B-SVAR) model employed here is a multivariate time series model of the form

\[ y(t)A(0) + \sum_{j=1}^{p} y(t-j)A(j) = Z(t)D + e(t), \]

for \( t = 1, \ldots, T \). \( A(0) \) is an \( m \times m \) matrix defining the contemporaneous relationships among the endogenous variables, \( y(t) \) is an \( 1 \times m \) vector of the endogenous variables at time \( t \), \( A(j) \) are the \( m \times m \) matrices of the structural coefficients for the lagged endogenous variables \( y(t-j) \) at lag \( t-j \), \( Z(t) \) is an \( 1 \times k \) matrix of the exogenous variables (including a constant), \( D \) is a \( k \times m \) matrix of the structural coefficients for the exogenous variables and \( e(t) \) is an \( 1 \times m \) vector of structural shocks that are distributed \( e(t) \sim N(0, I) \) where \( I \) is \( m \times m \). In this notation, the equations are the columns, so the \( A(0) \) matrix is the transpose of those in Table 2. Two sets of coefficient matrices need to be distinguished. The first, are the coefficients for the lagged or past values of each variable, \( A(j), j = 1, \ldots, p \). These describe how the dynamics of past values are related to the current values of each variable. The second, are the contemporaneous relationships, (the "structure") among the variables, \( A(0) \). The matrix of \( A(0) \) coefficients describes how the variables are interrelated to each other contemporaneously (the time "0" impact). The free parameters in these \( A(0) \) structures are defined in Table 2.

Since this is a structural model, numerical methods are needed to solve for the parameters. We employ a Bayesian prior in this estimation, detailed below.

Prior and Posterior

The prior for the \( A(0) \) and \( A(j) \) parameters is specified for (column major) vectorized \( a(0) = \text{vec}(A(0)) \) and \( a(+) = \text{vec}(A(\cdot)) \) where \( A(\cdot) \) is a column major stacking of the parameters \( A(j), j = 1, \ldots, p \). The prior has the form

\[ p(a) = p(a(0)) q(a(\cdot), P) , \]

where \( p(a(0)) \) is the normal prior for \( a(0) \) scaled by the reduced form error covariance, \( q(\cdot, \cdot) \) is a normal prior for \( a(\cdot) \) with mean \( a(\cdot) = 0 \), and \( P \) is the prior covariance matrix for \( a(\cdot) \).

The prior covariance of the regression parameters \( A(\cdot) \) are scaled using the Sim-Zha prior (Sims and Zha 1999). This prior is centered on a random walk specification for the dynamics and allows the variance of parameters for higher order lags to decay or have smaller
variance than the earlier lags. Each element of the diagonal of $P$ is the prior covariance for one of the structural parameters. These prior variances are defined by

$$P_{j,k,i} = \left( \frac{\lambda_0 \lambda_1}{\sigma_k^2} \right)^2,$$

the elements of $P$ corresponding to the $j$'th lag of variable $k$ in equation $i$. The overall prior covariances are scaled by the value of the error covariance, $\sigma_k$ from univariate AR($p$) regressions of each variable on its own lags. The hyperparameter $\lambda_0$ sets an overall tightness across elements of the prior on $A(0)$, where $\Sigma = A(0)^{-1} A(0)^{-1}$ which relates the reduced form error covariance $\Sigma$ to the contemporaneous structural relationships in $A(0)$. The hyperparameter $\lambda_1$ controls the tightness of the beliefs about the random walk prior or the standard deviation of the coefficients on first lags (since $j^{33} = 1$ in this case). The $j^{33}$ term allows the variance of the coefficients on higher order lags to shrink as the lag length increases. The constant in the model has a separate prior variance of $(\lambda_0 \lambda_0)^2$. The exogenous variables are given a separate prior variance proportionate to a parameter $\lambda_5$ so that the prior variance on the coefficients of any exogenous variable is $(\lambda_0 \lambda_0)^2$. Two additional hyperparameters, $\mu_5$ and $\mu_6$, are used to scale a set of $m+1$ dummy observations in the model. The hyperparameter $\mu_5$ is the prior precision of the sum of the AR coefficients in the VAR. This captures a belief about whether the average lagged value of a variable $i$ better predicts variable $i$ than the averaged lagged values of a variable $j$ not equal to $i$. Larger values of this hyperparameter correspond to higher precision (smaller variance) about this belief. This allows for correlation among the coefficients for variable $i$ in equation $i$, reflecting a belief that there are as many units as endogenous variables for sufficiently large $\mu_5$. The hyperparameter $\mu_6$ is the prior precision of the initial observations. If this parameter is greater than zero, one believes that the prior precision of the coefficients in the model is proportionate to the sample correlation of the variables. For trending series, the precision of this belief should depend on the variance of the pre-sample means of the variables and the possibility of common trends among the variables. To be more specific, as $\mu_6$ becomes larger and larger the prior places more weight on a model with a single common trend and intercepts close to zero.

The posterior density for the model parameters is formed by combining the likelihood for equation and the prior

$$\Pr(A(0), A(+)) \propto q(Y|a(+), a(0)) q(a(+), P) p(a(0))$$ (4)
where \( p(Y! a(+), a(0)) \) is the multivariate normal likelihood for the model in equation (1) and \( Y \) is the matrix of endogenous variables in the model. See Brandt and Freeman (2006b) for details.

**Gibbs sampler**

The Bayesian posterior estimates for this model are obtained by combining the prior and the posterior information. This is done in several steps as detailed in Brandt and Freeman (2006b) and Waggoner and Zha (2003a). Posterior estimates of \( A(0) \) and \( A(+) \) are found by a Markov chain Monte Carlo (MCMC) Gibbs sampler algorithm for the structural model. All results reported here are based on a Gibbs sampler burn-in of 5000 draws and a final posterior sample of 50000 draws. Inspection of the posterior densities and Geweke test diagnostics for the model parameters indicate that the posterior samples are converged.

**Normalization and impulse responses**

Details about the impulse response computations can be found in Brandt and Freeman (2006a). The responses presented here are based on the posterior sample of the B-SVAR model. The impulse responses are computed by translating the structural model into a reduced form model as described in Brandt and Freeman (2006b). The reduced form version of the model is derived from the SVAR model (equation [1]) by post-multiplying the full model by \( A(0)^{-1} \).

The impulse responses depend on the estimated \( A(0) \) for the B-SVAR model, since the contemporaneous reduced form error covariance and impulse responses are determined by \( A(0)^{-1} \). The reported results use the likelihood preserving normalization of the \( A(0) \) draws in Waggoner and Zha (2003b). This normalization maps the \( 2^n \) possible modes of the posterior to an unique \( A(0) \). This normalized set of \( A(0) \) draws does *not* imply the innovations are all positive shocks in the structural model since positive shocks to one equation might imply negative shocks to another equation. While we have changed the signs of shocks to the equations to be positive for interpretation, such shocks in one equation may imply negative shocks to another equation in the system. This is most important for interpreting the responses in Figure 2.3 where positive shocks do not have the same direction of impact on the responses of the equations.
3.1 Abstract

Although economists agree that transparency is desirable, governments often are reluctant to follow this advice in practice. Policymakers insist that uncertainty enhances policy autonomy and helps to manage crises. I use a two-period signaling model of a speculative attack to analyze the effect of uncertainty on crisis outcomes. The analysis shows that large uncertainty may trigger a speculative attack that would not occur with less uncertainty or perfect information. Thus, uncertainty is counterproductive because the government has to engage in a costly exchange rate defense, which reduces social welfare. Under very specific circumstances, uncertainty helps the government to gain time in a crisis situation. If the government does not implement the reforms necessary to stabilize the exchange rate in the long run, however, uncertainty delays the crisis, but does not help to resolve it.
3.2 Introduction

Although researchers agree that transparency in monetary policy is desirable and beneficial, governments generally are reluctant to follow this advice in practice. Policymakers often retain private information about their true intentions and economic positions. They believe that this uncertainty provides some room to pursue more autonomous policies than when markets are perfectly informed about governments. This raises the question under what circumstances uncertainty may be useful for policymaking and thus for social welfare. Or does less transparency always lead to socially inferior outcomes?

This study analyzes theoretically how uncertainty influences the emergence and outcomes of currency crises. I present a stochastic, two-period signaling game that allows for such an analysis. In the model, speculators are uncertain about government commitment to the fixed exchange rate and learn about the policymaker's type from government behavior. When speculators attack the fixed exchange rate, governments can raise interest rates to defend the peg. The costs of a defense depend on the size of the attack, which in turn depends on the ex-ante probability of devaluation. To examine the effect of transparency, I assess how speculation and crisis outcomes differ when uncertainty about government commitment to the exchange rate increases symmetrically for different types of governments.

The model predicts that uncertainty can trigger a speculative attack although there would not be a crisis if government policymaking were more transparent. When uncertainty increases, the probability that the government is vulnerable and that it will devalue increases as well. In such a situation, speculators attack the exchange rate to test the government's resolve to defend. Less transparent governments that are relatively strongly committed to the fixed exchange rate have to engage in a costly defense to keep the exchange rate fixed. These costs could be avoided by reducing uncertainty about economic fundamentals and policymakers' preferences. In this case, low degree of transparency is harmful because the expensive exchange rate defense decreases social welfare. This result corresponds to the view that opaque policymaking enforces or even generates financial crises (Haggard 2000).

Uncertainty can be beneficial if a country is facing some economic difficulties that can be fixed within a reasonable period of time. When the costs of defending depend on the size of the attack and therefore the probability of devaluation, it may be optimal for speculators not to speculate although there is a reasonable chance of devaluation. Suppose the probability of devaluation is relatively small implying that the optimal amount of speculation is small as
well. Low speculative pressure makes it easier for governments to keep the exchange rate fixed because the interest rate necessary to defend decreases with speculation. When it is easy to defend, the probability of devaluation is even smaller, and so on. In such a situation, there is no attack although speculators know that the government may devalue if the attack were sufficiently strong.

Governments can exploit this situation and prevent a collapse of the fixed exchange rate although the peg could not be sustained under complete information. To maintain the peg in the medium and long run, however, governments have to adjust policy so as to be able to leave the zone of vulnerability in the near future. If this is not the case, speculators attack in later periods and the exchange rate collapses. Thus, some uncertainty can be helpful for policymakers, but the conditions when this is the case are quite restrictive. This is consistent with the result by Lahiri and Végh (2003) who suggest that high interest rates may delay a crisis, but if the government does not take the opportunity to adjust policy, the defense will fail.

3.3 Motivation

Theoretical and empirical research has demonstrated the importance of transparency in policymaking for economic welfare. If the public is uncertain about the true preferences of policymakers, conservative central bankers need to raise interest rates to a higher level to achieve low inflation than under complete information (Vickers 1986). Moreover, when market participants are uncertain about the intentions of policymakers and thus future policies, financial market volatility increases considerably. For instance, political events cause less turbulence in foreign exchange markets in politically transparent emerging market economies than in countries with less transparent institutions (Hays et al. 2003). In countries that are economically vulnerable, political uncertainty enforces economic turmoil and increases the probability of a financial crisis (Haggard 2000: chapter 2).

1 By raising interest rates, conservative central bankers can separate themselves from bankers that put less weight on price stability. This signaling mechanism that leads to low inflation is costly because high interest rates reduce economic output.

2 Recent research has shown that political uncertainty also significantly affects the economy in mature democracies. Uncertainty about election outcomes and thus future policies increases financial market volatility (Bernhard and Leblang 2006). During election periods and times of cabinet negotiations and government instability, the systematic deviation of forward exchange rates from future spot rates increases (Bernhard and Leblang 2002). Political institutions mediate this effect of uncertainty on financial markets (Freeman et al. 2000).
The role of transparency is particularly prevalent in emerging market economies. Generally, governments in the developing world have not adopted the stricter transparency rules that are now standard in most industrialized countries. International economic organizations, such as the IMF, keep urging these countries to develop more transparent institutions because intransparency may cause or at least enforce financial crises. However, many governments insist on retaining private information, which should provide some room to pursue more autonomous policies than when markets are perfectly informed about governments. Moreover, policymakers often believe that uncertainty can help to overcome critical situations that, under complete information, would lead to a more serious crisis. Two anecdotes from the Asian financial crisis in 1997-98 illustrate the practical implications of this controversy and the potentially arising dilemma for governments.

When the Thai currency came under attack in late 1996 and early 1997, the Bank of Thailand tried to conceal speculative pressure and sold foreign exchange reserves forward hoping that confidence in the Thai Baht would return. The heavy attacks in May 1997 ultimately forced the Thai government to float the currency in July 2007. In August, the Bank revealed that the swap commitments essentially depleted their stock of reserves. As a result, the Thai currency plummeted from one all-time low to the next during the subsequent months. The public acknowledgment of low reserves was a precondition for the rescue package provided by the IMF. The decision to force the Thai government to disclose this information immediately, as requested by the U.S. Treasury, was not uncontested within the IMF. The critics feared that the IMF program designed to stabilize the Thai currency would be ineffective because market participants may question that the program is sufficient to resolve the crisis. Accordingly, the Thai exchange rate dropped from 32 Baht per U.S. Dollar on

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3 There are still considerable differences in transparency across industrialized countries, however. Until recently, the ECB has not published its inflation forecasts and does not publish the minutes of the meetings of the Governing Council. Although the public learns the policy decisions of the Council immediately after the meeting, it remains uninformed about the positions and voting behavior of the individual Council members. The Bundesbank published the minutes after 30 years, and the Federal Reserve Bank does so after a period of three weeks.

4 In the IMF Board meeting on August 20, 1997, Executive Director Gregory Taylor stated that “... [he does] not dispute the general case for transparency in policymaking. The practical issue here, however, is that Thailand has to traverse an extremely delicate transition from the current unsustainable position to a more secure one. During this transition, it is vital that market confidence be maintained. ... Publishing the figures may well trigger a reassessment by the market.” (Gregory Taylor, quoted in Blustein 2003, p. 80-81)
August 20, 1997, when the information was made public, to 56 Baht per U.S. Dollar on January 12, 1998.

Compared to the Thai government, authorities in Hong Kong were much more transparent about the domestic economic situation and actions taken during the Asian crisis. The crisis hit the Hong Kong dollar in October 1997, and the Hong Kong Monetary Authority spent huge amounts of reserves and raised interest rates to defend their currency. The currency board arrangement also required that short-term interest rates automatically increased when large amounts of capital flow abroad. When high interest rates destabilized stock markets, e.g., the Hang Seng Index dropped by 10.4% on October 23, 1997, the government intervened and bought large quantities of stocks. All these actions and financial data were made public. In this case, the transparent and rigorous interventions of the Hong Kong Monetary Authority convinced markets about government commitment to the peg, and the Hong Kong dollar remained stable.

These two examples point to some unresolved issues about the optimal degree of transparency. The Hong Kong example suggests that transparency helps to resolve crises in a manner that is in the interest of the public. In Thailand, disclosure of public information worsened rather than improved the economic situation. Although the Thai crisis was primarily caused by policies inconsistent with the fixed exchange rate, the positions of the Thai government and some IMF officials suggest that the crisis may have been less severe if the government had not revealed information about low reserves immediately and gained time to implement reforms. Proponents of transparency, such as U.S. Treasury officials, contend that this strategy would have delayed and deteriorated the crisis.

While the theoretical literature analyzing uncertainty and transparency in day-to-day monetary policy is fairly well developed, only few models exist that analyze the role of uncertainty and credibility in the context of currency crises and exchange rate defenses. Drazen and Masson (1994) extend the original model of monetary policymaking under uncertainty by Vickers (1986). They show that when the costs of signaling are persistent across periods, tough policies may increase rather than decrease the probability of a devaluation. Bensaid and Jeanne (1997) present a war of attrition model where raising interest rates may enforce speculation because speculators know that high interest rates are costly for the government. The interest rate defense thus leads to a collapse of the peg unless domestic economic conditions improve for exogenous reasons. Both the Drazen and Masson model and the Bensaid and Jeanne model offer plausible explanations for a number of well-known failed defenses, as in Sweden during the EMS crisis in 1992.
In a series of articles, Drazen (1999; 2000; 2003) reassesses the role of signaling during currency crises. In the original model (1999), high interest rates signal commitment to the fixed exchange rate and thus help to defend the peg. In the extended version (2000; 2003), the signaling effect of high interest rates varies depending on what speculators know about the government. If speculators are uncertain about the government’s fiscal position, high interest rates decrease the probability of devaluation. If speculators are uncertain about the level of reserves available to governments, raising interest rates may signal that reserves are low and thus that devaluation is likely.

These studies emphasize various important aspects about transparency, but do not analyze the effect of differing degrees of uncertainty. Uncertainty in these models is assumed to be constant as represented by the distribution of government types. The authors do not analyze whether market agents choose different strategies when government policymaking becomes more or less opaque, i.e. when the variance of the distribution of government types increases or decreases. Other theoretical studies focusing on exchange rate defenses, such as Lahiri and Végh (2003; 2005), do not analyze uncertainty at all. It is thus unclear how the behavior of speculators and the outcome of an attack vary when government transparency changes.

A recent strand of research has used global games to analyze the impact of heterogeneous information on the emergence of crises. Morris and Shin (1998) find that if market participants do not know what other actors in the market know, the probability of an attack increases. An attack then may occur when uncertainty about government fundamentals is not that large, but actors are uncertain about the information that other actors hold. Leblang and Satyanath (2006) show empirically that the likelihood of an attack is greater when political institutions increase the heterogeneity of information that is available to speculators. Recent research analyzes the role of public signaling in these games. Government signaling may (but does not necessarily) be counterproductive and lead to a “policy trap”, i.e. a situation where speculators coordinate their speculative activities in response to a public signal and the currency crisis becomes self-fulfilling (Angeletos et al. 2006).

Although the global games models yield very valuable insights, relaxing the assumption of common knowledge comes at an expense. The technical difficulties that have to be solved when actors hold heterogeneous beliefs do not (yet) permit an extension of global

5 For an overview of global games, see Morris and Shin (2003).
6 In an extension of the Morris/Shin model, Chan and Chiu (2002) find that more heterogeneity will decrease rather than increase the probability of an attack.
games to multiple periods. The global games thus are essentially static and do not capture the dynamics of a crisis. I thus assume that speculators have identical beliefs about government types. This is not implausible if we think of the relevant players during crises as a small number of large financial institutions, rather than a market that is populated with an infinite number of isolated speculators. The multiple-period model presented below shows that for those cases where less transparency may produce socially superior results, this beneficial effect only lasts for a limited period of time, a result that complements the insight from the static or single-period global games.

3.4 The Model

3.4.1 Model Setup

In this section, I present a two-period signaling game of an exchange rate defense similar to Drazen (1999). My analysis differs from Drazen’s in several respects. First, I assume that speculators are risk-averse, which allows me to explicitly derive the minimum interest rate that is necessary to defend, given a specific size of speculative pressure. Second, I extend Drazen’s analysis and explicitly derive a parametric solution of the model. The subsequent analysis of differing degrees of uncertainty is based on this solution.

In the model, the government has private information about its type, i.e. its commitment to the fixed exchange rate. Government types are continuous, i.e. \( \theta \in [\theta, \bar{\theta}] \) where the random variable \( \theta \) denotes the value that the government attaches to the exchange.

Moreover, Corsetti et al. (2004) show that the presence of large traders significantly affects the behavior of small traders and may increase the probability of a crisis. This effect is particularly strong when the large trader takes its decision first and small traders can observe the large trader’s choice. The model here could also be interpreted as a game between the government and a large trader that plays a dominant role during the crisis period, e.g. as George Soros during EMS crisis in 1992.

To avoid infinite speculation with risk-neutral speculators, Drazen assumes that the costs of speculation increase exponentially when the government raises interest rates. The effect of this ad-hoc specification is similar to risk aversion, but implies that governments have to raise interest rates to infinity to reduce speculative pressure to zero. The setup used here yields the intuitively plausible result that speculation stops when interest rates are greater than the rate of return from devaluation, weighted by the probability that this devaluation will occur.

Drazen focuses on the equilibrium conditions of the model and a general derivation of the equilibrium probabilities of devaluation, which is sufficient to analyze the signaling effect of high interest rates. For an analysis of changing degrees of uncertainty, a parametric solution is more useful.
rate peg. The distribution of $\theta$ reflects how much information about its type the government shares with speculators. If the variance of $\theta$ increases, speculators become more uncertain about the government's true commitment to the exchange rate.

Each period of the game has two stages, a speculation stage and a government response stage. At the beginning of the first stage, a random economic shock, $\eta$, occurs, which is observed by both speculators and the government. The shock can be negative, decreasing the value of the exchange rate peg, or nonnegative, implying the opposite. After observing the shock, speculators decide how much of their initial wealth, $W_0$, they will invest into speculation against the fixed exchange rate. To speculate, they exchange amount $S_{i,1}$ into foreign currency, where $0 \leq S_{i,1} \leq W_0$. Speculators receive domestic interest $i$, on the funds that are not transferred abroad. For simplicity, I assume that foreign interest rates are zero.

After observing the initial amount of speculation, $S_{i,1}$, the government can use its policy instrument to influence the amount of speculation in the second stage of each period. Since the government controls the domestic interest rate, $i \in [0, \infty)$, it can directly influence the utility of speculation. After the government sets the new interest rate, speculators choose a new amount of speculation, $S_{i,2}$, for the second stage. The exchange rate peg collapses if speculation does not cease until the end of the period. Thus in order to defend, the government has to raise interest rates to high levels, $i''$, making speculation unprofitable and stopping speculation in the second stage of each period. If the government does not raise interest rates to reduce speculation, the exchange rate has to be devalued by an exogenous amount, $\delta$. Market participants can then exchange their money back at the new exchange rate and receive more domestic currency than what they transferred abroad. Figure 3.1 illustrates the structure of the complete information version of the game for period $t$ graphically.\textsuperscript{10}

The government faces a trade-off between the costs and benefits of keeping the exchange rate fixed. The exchange rate peg primarily serves as a commitment device, i.e. the government keeps the exchange rate fixed to gain long-run anti-inflationary credibility. Thus, the major benefit of a fixed exchange rate thus is low inflation. If market participants believe that the government ensures monetary stability in the future, expected and therefore actual inflation is low. In contrast, devaluation raises doubts that the government will keep inflation low in the future, increasing expected and actual inflation. The cost associated with a peg is

\textsuperscript{10} In the incomplete information version, nature draws a government type $\theta$ from the distribution of types at the beginning of the first period.

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Figure 3.1: Structure of the Complete Information Version of the Game in Period $t$
the limited ability to offset negative economic shocks, e.g. unexpected reductions in economic growth, in the short run. Under a flexible exchange rate, governments can reduce the effects of such shocks with an unanticipated monetary expansion, a possibility that is restricted under a fixed exchange rate. Similarly, unexpected devaluations increase output and lower unemployment, while raising interest rates to defend the exchange rate against an attack depresses growth.  

To model this situation, the single-period utility of the government is

\[ U^G(\theta, i_t, \eta_t) = \begin{cases} 
\theta - \gamma i_t + \eta_t & \text{if } \delta_t = 0 \\
0 & \text{if } \delta_t = \delta.
\end{cases} \]  

(1)

where \( \delta_t \) represents the exchange rate behavior in period \( t \). Hence, the costs of keeping the peg are increasing in the choice variable \( i_t \). The parameter \( \gamma \) reflects how much a specific interest rate level affects government utility. Similarly, the costs of keeping the peg increase when a negative shock occurs and decrease when a positive shock occurs. Note that \( \eta_t < 0 \) represents a negative shock and \( \eta_t \geq 0 \) a nonnegative shock. Therefore, the utility of the exchange rate peg diminishes the higher the government has to raise interest rates to keep the exchange rate fixed, and the worse economic circumstances as represented by the shock in period \( t \).

The government devalues if the utility of keeping the exchange rate peg falls below zero. Equation (1) thus implies that a devaluation is more probable the more negative the economic shock \( \eta_t \), the higher the interest rate level necessary to defend the peg, \( i_t^H \), and the lower the value that the government attaches to the peg, \( \theta \). If observable indicators suggest that government commitment to the peg is relatively low and therefore the probability of devaluation is high, a sufficiently large shock can trigger an attack. From a first-period perspective, the expected utility of the exchange rate peg in both periods is

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11 This argumentation follows the logic of New-Keynesian models of the macroeconomy which assume the presence market frictions, such as price rigidities and monopolistic competition (Galí 2003; Galí and Monacelli 2005). With such frictions, unexpected changes in monetary policy have a strong effect on economic output. Governments thus can use monetary policy to offset the adverse effects of economic shocks by increasing money supply under flexible exchange rates or by devaluing the exchange rate under fixed rates. The resulting inverse relationship between inflation and growth is represented by the expectations-enhanced Philips Curve as used by Obstfeld (1996), for instance.
If the government devalues in the first period, the government cannot fix the exchange rate in the second period, i.e. the total utility for the government is zero.

The model implicitly comprises many previous political studies of exchange rate policy. In countries with relatively large export-oriented sectors, $\theta$ is lower because devaluation shifts world demand towards domestic goods (Frieden 1991; 1994). Large values of $\gamma$ suggest that the government weights the interests of workers more relative to those of capital (Alesina 1987; Hibbs 1977; Leblang and Bernhard 2000) and thus experiences high costs of defense. Finally, unstable governments that may face cabinet dissolution in the near future have a shorter-time horizon and therefore a lower discount factor, $\beta$ (for an analysis how government stability affects market behavior, see Leblang and Bernhard 2000).

I assume that all speculators have identical information about government characteristics and economic circumstances. Speculators thus can be modeled as a single representative actor. Speculators earn domestic interest $i_t$ on the wealth invested into domestic assets. The government thus exerts direct control over the returns of speculators’ assets. If the exchange rate collapses, the domestic currency value of the amount exchanged abroad, $S_{t,p}$, increases depending on the size of devaluation. Depending on which state occurs, total wealth at the end of the period is

$$W_{t,j}^{\text{def}} = (W_{0,t} - S_{t,j})(1 + i_t) + S_{t,j}$$

$$W_{t,j}^{\text{dev}} = (W_{0,t} - S_{t,j})(1 + i_t) + S_{t,j}(1 + \delta).$$

The expected utility of speculation then is

$$EU^S(S_{t,j}) = p_t u(W_{t,j}^{\text{dev}}) + (1 - p_t) u(W_{t,j}^{\text{def}})$$

where $p_t$ is the probability of devaluation in period $t$.

The expected utility function (5) implies that risk-neutral speculators always invest their whole wealth into speculation even if the probability of devaluation is only slightly greater than zero. To see this, insert (3) and (4) into (5) and take first-order conditions with
respect to $S_{i,j}$\textsuperscript{12}. To avoid this situation, speculators in this model are strictly risk-averse. To model the risk-aversion of speculators, I use a log-utility function.\textsuperscript{13} The utility of state $j$ then is $u(W^j) = \ln W^j$.\textsuperscript{14}

The optimal amount of speculation for risk-averse speculators can be found by maximizing the expected utility function for $S_{i,j}$:

$$\arg\max_{S_{i,j}} p_{i} \ln W_{i,j}^{\text{dev}} + (1 - p_{i}) \ln W_{i,j}^{\text{def}}$$

Speculation then is given by

$$S_{i,j} = \begin{cases} 0 & \text{if } i_{t} = \delta p_{t} \\ W_{0,t} \cdot \left(\frac{(p_{t} - \delta_{t})(1 + i_{t})}{(1 - \delta_{t})}\right) & \text{if } i_{t}(1 + \delta)/(1 + i_{t}) > \delta p_{t} > i_{t} \\ W_{0,t} & \text{if } i_{t}(1 + \delta)/(1 + i_{t}) \leq \delta p_{t} \end{cases} \quad (6)$$

Equation (6) shows which proportion of their initial wealth speculators exchange into foreign currency. Speculative pressure rises when the probability of devaluation, $p_{t}$, increases and when the domestic interest rate, $i_{t}$, decreases. The government thus can directly influence speculative pressure by manipulating the domestic interest rate. To stop speculation,\textsuperscript{12} Risk-neutrality implies that $u(W_{\text{dev}}) = W_{\text{dev}}$ and $u(W^{\text{def}}) = W^{\text{def}}$. With risk-neutrality, speculation would be zero only if that the probability of devaluation is exactly zero as well and if we assume that speculators only speculate if expected utility is strictly greater than the initial wealth $W_{0,t}$.

\textsuperscript{13} Empirical evidence suggests that logarithmic risk preferences are largely consistent with the behavior of market agents. Mankiw and Shapiro (1986) and Epstein and Zin (1991) present estimation results showing that risk preferences do not differ statistically from the logarithmic specification.

\textsuperscript{14} Drazen (1999; 2000) and Kraay (2003) assume that speculators borrow money to speculate and pay interest on the borrowed amount. Moreover, speculators are risk-neutral, but have convex cost functions. The latter feature implies a concave expected utility function having the same effect as the assumption of risk aversion. There are several reasons why I prefer the setup chosen in this model. First, when speculators borrow money, but the government does not devalue (i.e. raises interest rates), speculators have to pay back more than they borrowed implying that technically they go bankrupt. This means that we cannot use certain expected utility functions with risk-aversion, such as a log-utility, because we cannot take the logarithm of negative wealth. Second, in a model where speculators borrow money, speculation cannot be zero as long as there is a slight probability of devaluation. To stop speculation, governments have to raise interest rates to infinity, which is implausible. As we will see below, it is possible to easily derive the minimum interest that is necessary to defend in the model presented here.
governments must raise domestic interest rates to the level $i_i^{H}$ that reduces speculation to zero, $S_i' (i_i^{H}, p_i) = 0$. Therefore, the minimum interest rate necessary to defend the fixed exchange rate is

$$i_i^{H} (p_i) = \delta p_i.$$  
(7)

Equation (7) implies that in order to stop capital outflow, the government has to compensate speculators for the profits they would make if the exchange rate peg collapsed. Speculators transfer their money back if interests on domestic capital are at least as high as the weighted rate of return from devaluation. The weighted rate of return is the proportion of devaluation evaluated by the probability that this devaluation will occur. Since raising interest rates is costly for the government, the costs of a defense and thus the probability of devaluation increase when speculative pressure rises.

3.4.2 Equilibrium

In this section, I derive the conditions that characterize the Perfect Bayesian equilibrium (PBE) of this game. The subsequent section then presents the explicit solution and discusses the resulting equilibrium probabilities and strategies in detail. In a PBE, a player’s strategies must be optimal given the other players’ strategies and the player’s beliefs about the other players’ types. At information sets along the equilibrium path, players update their beliefs using Bayes’ rule given the equilibrium strategies of the other players.\(^\text{15}\)

At the end of each period, speculators choose an optimal amount of speculation, $S_{i,2}$, as described by equation (6). Since the government anticipates this, it knows that to defend the exchange rate, interest rates must be raised at least to level $i_i^{H}$ as defined by equation (7). The government then is indifferent between devaluation and defense if the utility of defense, i.e. of raising interest rates to $i_i^{H}$, equals the utility of devaluation, which is zero. This marginal government type that is indifferent in period two can be found by solving

$$U^G (\hat{\theta}_2, i_i^{H}, \eta_2) = 0.$$  
(8)

\(^{15}\) The PBE does not impose restrictions on out-of-equilibrium beliefs. The role of out-of-equilibrium beliefs will be discussed in the next section.
for $\hat{\theta}_2(p_2)$. Recall that the minimal interest rate necessary to defend is increasing in the probability of devaluation, and the cost function is increasing in the minimal interest rate. Hence, the marginal government type $\hat{\theta}_2(p_2)$ that is indifferent between devaluation and defense also increases when the probability of devaluation becomes larger. In other words, if the probability of devaluation increases, it is more costly for governments to defend and therefore more governments devalue.

At the beginning of the second period, speculators update their beliefs about the true government type based on government behavior in the first period. If the government defends in the first period, speculators learn that the government is relatively strongly committed to the fixed exchange rate. They can infer that government commitment is greater than commitment of the marginal type in period one, $\hat{\theta}_1(p_1)$, i.e. the government type that is indifferent between devaluation and defense in the first period. Thus, the probability of devaluation in period two, $p_2$, is the conditional probability that the true government type is smaller than the marginal type, $\hat{\theta}_2(p_2)$, given that the government defended in the first period,

$$p_2 = \Pr\left( \theta < \hat{\theta}_2(p_2) \mid \theta > \hat{\theta}_1(p_1) \right).$$

This conditional probability is formed using Bayes' rule. The learning effect implies that the distribution of possible government types in the second period is truncated at $\hat{\theta}_1(p_1)$ and only includes those government types that are greater than $\hat{\theta}_1(p_1)$. Note that $\hat{\theta}_2(p_2)$ and therefore the right-hand side of equation (9) depends on the probability of devaluation, $p_2$. To find the second period probability as a function of the exogenous parameters, we need to solve equation (9) for $p_2$.

In period one, the government is indifferent between devaluation and defense if the expected utility of a defense is equal to the expected utility of devaluation. The marginal type can be found by solving

$$U^C(\hat{\theta}_1, i_1^*, \eta_1) + \beta E_t \left[ \max\left\{ 0; U^D(\hat{\theta}^*_2, i_2^*, \eta_2) \right\} \right] = 0 \tag{10}$$
for $\hat{\theta}(p_1)$. Equation (10) reflects the fact that in the first period, the government is uncertain about the state of the economy in the future. Economic performance may improve for exogenous reasons or deteriorate further, possibly offsetting another attack that eventually leads to a collapse of the fixed exchange rate. The expected utility of defending in the first period thus depends on the probability distribution of the economic shock in the second period. If a large, negative shock is likely, then more governments will devalue because the expected utility of defending the peg in the first period decreases. If economic performance is likely to improve, then more governments will defend because the probability that the peg will survive in the second period is greater.

The probability of devaluation in the first period, $p_1$, is the probability that the true government type is smaller than the marginal type for the first period, $\hat{\theta}(p_1)$,

$$p_1 = \Pr\left(\theta < \hat{\theta}(p_1)\right)$$

Again, the right-hand side of equation (11) depends on the first period probability of devaluation, $p_1$. To find this probability as a function of the exogenous parameters, we need to solve equation (11) for $p_1$. Equations (9) to (11) provide a complete description of the equilibrium of the game.

### 3.5 Equilibrium Strategies and Probabilities

This section discusses the equilibrium strategies and probabilities for those governments that keep the exchange rate fixed when there is no negative shock. This is the case if $\gamma \delta < (1 - \beta q_2)\eta/(1 - q_1)\beta$. Equilibrium behavior as described in the propositions below thus refers to situations when a negative shock has occurred. Those governments that devalue without a negative shock are not relevant in this context. If the governments is too weak to keep the peg when no or a positive shock occurs, the exchange rate cannot survive in the short and medium run anyway. As we will see below, uncertainty can only help intermediate, but never obviously weak governments to stabilize its currency.

For simplicity, the distribution of the economic shock, $\eta$, is discrete. A negative shock, $-\eta$, occurs with probability $q_1$, and positive shock, $\eta$, with probability $q_2$. The shock equals zero with probability $1 - q_1 - q_2$. Negative shocks have the same size in both periods.
The same applies to positive shocks. Government types are distributed uniformly over the interval \([\theta, \bar{\theta}]\).

It is useful to discuss the behavior of speculators and the government under complete information before examining the incomplete information case. When there is no uncertainty about government preferences, speculators foresee how the government reacts to an attack of a given size. If the government is strongly committed to the fixed exchange rate, speculators will not attack because they can anticipate that the government would defend. If the government is weakly committed to the exchange rate peg, speculators invest all their wealth into speculation and the government devalues. Under complete information, there is no attack that fails.

Governments are strongly (weakly) committed if they attach greater (less) value to the fixed exchange rate than the marginal government type. The marginal type is the government that is indifferent between devaluation and defense in period \(t\) and is given by

\[
\hat{\theta}^c(\eta = -\eta) = \gamma \delta + \eta
\]

and

\[
\hat{\theta}^c(\eta = -\eta) = (y + \gamma \delta)/x
\]

for the second and first period respectively, where \(x = 1 + (1 - q)\beta\) and \(y = (1 - \beta q_2)\eta\). Equations (12) and (13) imply that \(\hat{\theta}^c(\eta = -\eta) < \hat{\theta}^c(\eta = -\eta)\) when a negative shock occurs in both periods. More governments defend in the first than in the second period since governments in the first period expect to receive future, discounted benefits. Proposition 1 summarizes the complete information equilibrium. The proof is in the Appendix.
PROPOSITION 1: Suppose $\eta_t = -\eta$. Then the following strategies and beliefs describe a Nash equilibrium to this game under complete information for period $t$. If $\theta > \hat{\theta}^c(\eta_t = -\eta)$, speculators do not speculate, $S^*_i = 0$. The government defends the exchange rate, $i_t = \bar{i}$. The devaluation probability is zero, $p_t = 0$, and the exchange rate remains fixed, $\delta_t = 0$. If $\theta < \hat{\theta}^c(\eta_t = -\eta)$, speculators invest all their wealth into speculation, $S^*_i = W_{0,t}$. The government does not defend the exchange rate, $i_t = 0$. The devaluation probability is one, $p_t = 1$, and the exchange rate peg collapses, $\delta_t = \delta$.

Under incomplete information, the outcome of the game depends on the structure of prior beliefs that speculators hold about government resolve to defend the fixed exchange rate. There are three situations in every period when $\theta < \bar{\theta}$. Which situation occurs depends on the values of $\bar{\theta}$ and $\theta$ compared to the other exogenous parameters. In two cases, all governments behave in the same manner (pooling). All governments devalue, or all governments defend the fixed exchange rate. In the third case, relatively strongly committed governments defend in case of an attack, while other, relatively weakly committed governments devalue when speculators attack. There is a separation between strong and weak governments, but speculators cannot differentiate between governments within the two groups (semi-separating).

Proposition 2a describes the first situation that arises if the upper boundary of the distribution, $\bar{\theta}$, is relatively small, specifically if $\bar{\theta} < \bar{\theta}^{min}_t$ for $t = 1, 2$. The threshold $\bar{\theta}^{min}_t$ corresponds to the government type that is indifferent between devaluation and defense under complete information. It is equal to the marginal type $\hat{\theta}^c(\eta_t = -\eta)$ as defined by equations (12) and (13).

PROPOSITION 2a: Suppose $\bar{\theta} < \bar{\theta}^{min}_t$. Then speculators invest all their initial wealth into speculation, $S^*_i = W_{0,t}$. The government does not raise interest rates, $i_t^H = 0$, and devalues the exchange rate, $\delta_t = \delta$. The ex-ante probability of devaluation is equal to one, $p_t = 1$.

The proof and a discussion of out-of-equilibrium beliefs that support this equilibrium is in the Appendix. The logic underlying the results of Proposition 2a is straightforward. Since
\(\theta_i^{\text{min}}\) and \(\hat{\theta}_i(\eta_i = -\eta)\) are equal, the condition \(\theta < \theta_i^{\text{min}}\) implies that \(\theta < \hat{\theta}_i(\eta_i = -\eta)\). In words, the upper boundary of the distribution of possible government types, \(\theta\), is lower than the marginal government type under complete information, \(\hat{\theta}_i(\eta_i = -\eta)\). Although speculators do not know the exact type of the government, they know that the highest possible government type is less committed to the exchange rate peg than the minimum government type that defends under complete information. The situation thus corresponds to the setting as described in the second part of Proposition 1. Speculators know that the government will devalue if they attack with maximum intensity, i.e. \(S_{i,t} = W_{0,i}\).

Proposition 2b describes the situation that arises if the upper limit of the distribution is relatively large, i.e. \(\theta > \theta_i^{\text{max}}\), and the lower limit of the distribution is relatively small, specifically if \(\theta > \hat{\theta}_i(\eta_i = -\eta)\) for the first period, and \(\hat{\theta}_i(\eta_i = -\eta) > \hat{\theta}_i(\eta_i = -\eta)\) for the second period. The lower limit in period two corresponds to the marginal type in period one because only governments with \(\theta > \hat{\theta}_i(\eta_i = -\eta)\) survive in the first period. The distribution of types in the second period thus is truncated at \(\hat{\theta}_i(\eta_i = -\eta)\). The thresholds are given by

\[
\theta_i^{\text{max}} = \frac{y}{x}\]

and

\[
\hat{\theta}_i^{\text{max}} = \eta
\]

where \(y\) and \(x\) are defined as above. \(\theta_i^{\text{max}}\) and \(\hat{\theta}_i^{\text{max}}\) correspond to the values of \(\theta\) below which governments choose to devalue in the first and second period even if there was no attack.

In this case strong governments separate themselves from weak governments. The structure of prior beliefs suggests that the chance of facing a weak government that will ultimately devalue is large. Thus, speculators attack the fixed exchange rate. Governments that are smaller than the marginal type \(\hat{\theta}_i(\eta_i = -\eta)\) devalue while those that are greater than \(\hat{\theta}_i(\eta_i = -\eta)\) defend. The marginal type that is indifferent between devaluation and defense are defined in equations (21) and (24) in the Appendix.

\footnote{If \(p_i = 0\), speculators do not learn anything about governments in the first period since all governments keep the exchange rate fixed. In this case, the lower boundary of the distribution in period two is the same as the lower boundary in period one, \(\hat{\theta}_i(\eta_i = -\eta) = \theta\).}
PROPOSITION 2b: Suppose $\bar{\theta} > \bar{\theta}_{i_{\text{max}}}$ and $\underline{\theta} < \bar{\theta}_{i_{\text{max}}}$ in the first and $\hat{\theta}_{i_1}(\eta_1 = -\eta) < \bar{\theta}_{i_{\text{max}}}$ in the second period. Then, optimal speculation is given by $S_{i_1} = \left(\frac{\theta_{i_{\text{min}}}(1 + \theta_1)}{\theta_{i_{\text{max}}} - \theta_{i_{\text{min}}}}\right) \cdot W_{i_1}$. If $\theta < \hat{\theta}_{i_1}(\eta_1 = -\eta)$, the government does not raise interest rates, $i''_{i_1} = 0$, and devalues, $\delta_i = \delta$. If $\theta > \hat{\theta}_{i_1}(\eta_1 = -\eta)$, the government raises interest rates to $i''_{i_1} = \delta p_{i_1}$, and defends, $\delta_i = 0$. The ex-ante probability of devaluation is $p_i = \frac{(y - \theta x)}{((\bar{\theta} - \theta) x - \gamma \delta)}$ (16)

and $p_2 = \frac{(\eta_2 - \hat{\theta}_{i_1}(\eta_1 = -\eta))}{((\bar{\theta} - \hat{\theta}_{i_1}(\eta_1 = -\eta)) - \gamma \delta)}$ (17)

for the first and second period, respectively, where $x = \left(1 + (1 - q_i)\beta\right)$ and $y = \left(1 - \beta q_2\right)\eta$.

The specification of out-of-equilibrium beliefs is not necessary here because all nodes of the game are reached with positive probability. Speculators can use Bayes’ rule to form a rational belief in every situation. Finally, Proposition 2c summarizes the third situation that arises if, in addition to the upper limit of the distribution, the lower limit in each period is relatively large.

PROPOSITION 2c: Suppose $\bar{\theta} > \bar{\theta}_{i_{\text{min}}}$ and $\underline{\theta} > \bar{\theta}_{i_{\text{max}}}$ for the first, and $\hat{\theta}_{i_1}(\eta_1 = -\eta) > \bar{\theta}_{i_{\text{max}}}$ for the second period. Then, speculators do not speculate, i.e. $S_{i_2} = 0$. The government does not need to raise interest rates to defend, $i''_{i_1} = 0$, and the exchange rate remains fixed, $\delta = 0$. The ex-ante probability of devaluation is zero, $p_i = 0$.

The proof is in the Appendix. Any out-of-equilibrium beliefs sustain this equilibrium. If the government does not follow the equilibrium strategy and cannot defend in the first period, the game ends and speculators’ second period beliefs thus do not influence the outcome of the game. Proposition 2c suggests that there is no speculation and the government keeps the exchange rate fixed, although the distribution of types implies that some governments would devalue if there was a sufficiently large attack. The endogenous relationship between the devaluation probability, the optimal amount of speculation and the
minimum interest rate of defense plays a crucial role for this result. If \( \theta \) or \( \hat{\theta}_i(\eta_i = -\eta) \) increases, the probability of devaluation in the respective period decreases.\(^{17}\) The smaller the probability of devaluation, however, the easier it is for the government to defend. This is the case because small probabilities of devaluation imply that the optimal amount of speculation is small as well. Hence, the minimum interest rate necessary to defend and thus the cost of a defense decrease with the probability of devaluation (see equation (7)). When it is easier for the government to defend, the probability of devaluation is even smaller. Increasing \( \theta \) or \( \hat{\theta}_i(\eta_i = -\eta) \) thus initiates a downward spiral ultimately leading to a situation where speculators prefer not to speculate although the distribution of types includes governments that would devalue in the case of a sufficiently large attack.

### 3.6 Transparency

To discuss the costs and benefits of transparency, I analyze the effect of different degrees of uncertainty and compare equilibrium behavior and crisis outcomes with the complete information case. Throughout the whole section, I set \( \eta = 1 \) and \( q_1 = q_2 = 1/3 \). Figure 3.2 illustrates the complete information equilibrium for the parameter values listed on top of the figure. The graph shows that the weakly committed governments always devalue while the strongly committed governments always keep the exchange rate fixed. More governments defend in the first than in the second period because future, discounted benefits from the exchange rate peg are relatively high at the beginning of the game. Since these benefits diminish when the final period approaches, more governments find it optimal to devalue in later periods. The points where \( p_1 \) and \( p_2 \) drop from one to zero correspond to the marginal types \( \hat{\theta}_1^c(\eta_1 = -\eta) \) and \( \hat{\theta}_2^c(\eta_2 = -\eta) \), respectively.\(^{18}\)

The impact of uncertainty on behavior and outcomes differs substantially depending on the position of the true government type, \( \theta \). I examine three situations for period one. In the first situation, the true government type is greater than the minimum government type that defends under complete information, \( \hat{\theta}_i^c \). It is thus greater than the point where \( p_1 \) drops from one to zero in Figure 3.1. Specifically, I assume that \( \theta = \hat{\theta}_i^c + z \) with \( z > 0 \). Recall from the

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\(^{17}\) When \( \theta \) or \( \hat{\theta}_i \) increases, the mean of the distribution becomes larger implying that the expected government type is tougher.

\(^{18}\) For the remainder of the section, I use the term \( \hat{\theta}_i^c \) for \( \hat{\theta}_1^c(\eta_1 = -\eta) \) and \( \hat{\theta}_2^c \) for \( \hat{\theta}_2^c(\eta_2 = -\eta) \). The same applies to all other critical values that are necessary to describe the equilibrium.
previous section that $\hat{\theta}_1^c = \bar{\theta}_1^{\min}$. The condition $\theta = \hat{\theta}_1^c + z$ thus implies that $\theta = \bar{\theta}_1^{\min} + z$. The second case reflects the situation where the true government type is smaller than the marginal government type under complete information, i.e. $z < 0$. At the same time, I assume that the true government type is closer to $\bar{\theta}_1^{\min}$ than to $\bar{\theta}_1^{\max}$ which requires that $z > -\gamma \delta / 2x$. In the third situation, the true government type is closer to $\bar{\theta}_1^{\max}$ than to $\bar{\theta}_1^{\min}$, i.e. $z < 0$ and $z < -\gamma \delta / 2x$.

Figures 3.3 through 3.5 illustrate how the probability of devaluation changes for the three situations when uncertainty increases symmetrically. For all three figures, I set $\bar{\theta} = \theta + \epsilon$ and $\theta = \theta - \epsilon$. The variable on the x-axis, $\epsilon$, thus denotes the size of uncertainty. If $\epsilon = 0$, then there is no uncertainty since $\bar{\theta} = \theta = \theta$. Greater $\epsilon$ reflect a greater variance and therefore higher uncertainty. Figure 3.3 illustrates the case where $\theta$ is greater than $\hat{\theta}_1^c$ and $\epsilon$ increases from zero to $\theta$. Figures 3.4 and 3.5 show the equilibrium probabilities when $\theta$ is smaller than $\hat{\theta}_1^c$ for the same range of $\epsilon$.

$19$ From equations (13) and (14), we know that the distance between $\bar{\theta}_1^{\min}$ and $\bar{\theta}_1^{\max}$ is $\gamma \delta / x$. Thus, $\theta$ is closer to $\bar{\theta}_1^{\min}$ if $z > -\gamma \delta / 2x$ and closer to $\bar{\theta}_1^{\max}$ if $z < -\gamma \delta / 2x$.

$20$ The results also apply to the second period for true types that are positioned in the same manner around the second period marginal type under complete information.

$21$ With $\bar{\theta} = \theta + \epsilon$ and $\theta = \theta - \epsilon$, the variance of $\theta$ is $\frac{1}{3} \epsilon^2$ since government types are assumed to be distributed uniformly across $[\bar{\theta}, \bar{\theta}]$. Greater $\epsilon$ thus implies a higher variance.
Figure 3.3: Equilibrium Probability for $z > 0$

Figure 3.4: Equilibrium Probability for $z < 0$ and $z > -\gamma\delta/2x$
Figure 3.5: Equilibrium Probability for $z < 0$ and $z < -\gamma \delta /2x$

Figure 3.3 shows that large uncertainty about governments can generate social losses that do not occur when uncertainty is small. Since $z > 0$, the true government type is greater than the marginal type under complete information. If there is no uncertainty, no speculative attack will occur in the first period and the exchange rate peg will remain stable. With greater uncertainty the distribution of types includes more weakly committed governments. The ex-ante probability that the government devalues thus becomes strictly positive when uncertainty is large. Specifically, for $\varepsilon > (y + \gamma \delta)/x + z$, $\theta$ decreases below $\theta^\text{max}$ and Proposition 2c applies. For the example in Figure 3.1, the ex-ante probability of devaluation increases beyond 36%, compared to zero when speculators are perfectly informed. Large uncertainty may trigger an attack, and governments have to raise interest rates to defend the exchange rate.

Figure 3.4 represents a situation where some uncertainty can be beneficial. Since $z < 0$, the peg always collapses under complete information. When uncertainty increases, however, the probability of devaluation drops from one to zero. If $-z < \varepsilon < (y + \gamma \delta)/x + z$, then speculators do not attack and the exchange rate remains fixed although under complete information, the government would have to devalue. The reason is that for this range of uncertainty, $\theta > \tilde{\theta}^\text{min}$ and $\theta > \theta^\text{max}$, i.e. Proposition 2b applies. When uncertainty increases even further, the ex-ante probability of devaluation increases again. For large $\varepsilon$, $\theta < \theta^\text{max}$ as in Figure 3.3. Nonetheless, since $p_1 < 1$, speculation is less intense than under complete information and, contrary to the complete information case, the exchange rate peg may
survive the attack. In this situation, uncertainty may be useful because the peg survives and the government gains some time to adjust policy.

Finally, Figure 3.5 illustrates a situation where uncertainty makes only little difference. This is the case when government commitment to the fixed exchange rate is small. For most regions of $\varepsilon$, the ex-ante probability of devaluation is one. Unless $\varepsilon > -z$, speculators know that the government will devalue if they attack with full intensity since $\bar{\theta} < \bar{\theta}_1^{\text{min}}$ and Proposition 2a applies. For very large amounts of uncertainty, the probability of devaluation decreases below 60%. The size of the speculative attack decreases, but weakly committed governments still devalue. In this situation, the role of uncertainty has no significant impact on the outcome of the currency crisis.

The discussion of the three different cases suggests that under very specific circumstances, some uncertainty helps to successfully manage a crisis episode. In particular, governments that are relatively strongly committed to the peg, but for some reason dropped into the zone of vulnerability, can benefit from a small amount of uncertainty. To ensure that the exchange rate peg survives in the long run, however, this requires that the government has enough political strength to implement unpopular reforms necessary to leave the zone of vulnerability within a reasonable period of time. The model predicts that more governments devalue in the second than in the first period if a negative shock occurs. Uncertainty thus only helps to effectively sustain the peg if the government makes an effort to be better positioned in later periods. Otherwise, speculation is likely to resume after some time, and the peg will ultimately collapse. This corresponds to the result by Lahiri and Végh (2003) who show that an interest rate defense can delay a crisis, but if the government does not take the opportunity to adjust policy, the defense will fail.22

The model’s implications regarding the optimal degree of uncertainty yield some answers to the questions raised in the second section about transparency during the Asian Financial Crisis. The results imply that delayed disclosure of information about reserves stock could have helped the Thai government to manage the crisis in a more favorable way in the short run. Although market participants knew that the Thai government was in a fairly weak

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22 Ozkan and Sutherland (1995) discuss when governments are more likely to adjust policy. Alternatively, governments can wait for “good news” (Bensaid and Jeanne 1997). The peg can survive in the long run when economic circumstances improve for exogenous reasons. It is possible that no or a positive shock occurs in the second period. Uncertainty thus can help to stabilize the fixed exchange rate during limited periods of economic decline until the economic situation improves.
position, they did not realize that it was in such bad shape.\textsuperscript{23} When the government disclosed all the information, the situation switched to a complete information situation with a Thai government that was too weak to sustain the exchange rate at the level before all the information was made public.

Whether obscuring the true position of the government would have saved the Thai bath in the long run is questionable, however. This would have been the case only if the government had been willing to implement the reforms necessary. This is unlikely because the government was politically too weak to survive radical economic reforms (Blustein 2003: 81). As the model suggests, governments that fall within the zone of vulnerability can only survive if they improve their economic position over time. Thus, it is unlikely that delaying the crisis in this particular situation would have helped because the Thai government was unwilling and unable to implement unpopular measures.

More generally, the situations where uncertainty is useful as implied by the model are very special. It is not sufficient to blur the true situation, but the government must be able to actively implement reforms during the near future. When a country becomes vulnerable for exogeneous reasons, e.g. after a series of negative economic shocks, uncertainty can help to stabilize the exchange rate peg during a crisis situation. When a country falls into the zone of vulnerability for endogenous reasons, e.g. because its government systematically pursues policies that are inconsistent with a fixed exchange rate, then intransparency is unlikely to be useful. Even if the government is able to stop speculation initially, these governments usually will be unable to implement the reforms necessary to stabilize the exchange rate in the long run. In this case, uncertainty delays the crisis, but does not help to resolve it.

\textbf{3.7 Conclusion}

This theoretical analysis of speculative attacks establishes under which circumstances uncertainty may be beneficial for social welfare and when it is costly. The model suggests that, contrary to the prevalent view in economic and political research, intransparency can be beneficial for social welfare under very specific circumstances. However, policymakers have

\textsuperscript{23} Only when the Thai government disclosed the information about reserves stocks, “market experts realized the full extent of depletion in Thailand’s reserves, and they questioned whether the IMF-led rescue was sufficient to provide the hard currency the country needed to meet its pending foreign obligations. Referring to the newly disclosed swap commitments, Donald Hanna, the Asian regional economist at Goldman, Sachs and Co., to the Asian Wall Street Journal: “I think everybody was surprised.” “(Blustein 2003: 80).
to be aware that the room to maneuver that they gain from uncertainty is small. Intransparency does not allow governments to pursue policies that are inconsistent with a fixed exchange rate over a longer period of time. In this case, uncertainty is counterproductive because it reduces pressure to adjust policy and thus increases the probability of a large crisis.

Besides the normative questions addressed in this article, the model provides theoretical explanations for some established empirical results. Empirical research has shown that exchange rate pegs of autocracies are attacked more often than those of democracies (Block 2003; Leblang 2003). At the same time, case study research suggests that autocratic governments defend their exchange rate more often than democratic governments (Eichengreen 1996). The model provides a potential explanation for these contradictory findings. Taking into account that autocracies are less transparent than democracies (Rosendorff and Vreeland 2006), the model predicts that autocracies that are strongly committed to the peg are attacked more often than democracies of the same type. It is possible that the effect of regime type on the reaction to crises disappears if we account for the possibility that autocracies are more likely to be selected into the sample of crises. Future empirical research should examine this proposition.

The model also confirms the empirical findings by Hays et al. (2003) that intransparency can be economically costly. It shows that exchange rates of intransparent regimes may be attacked although policymakers are strongly committed to the fixed exchange rate. Governments then have to engage in a costly defense reducing social welfare. With more transparency, market participants would have known that the government will defend and would not have attacked the peg.
3.8 Appendix: Proofs

To keep the notation simple, I use the terms $\hat{\theta}_t^c$ for $\hat{\theta}_t^c(\eta_t = -\eta)$ and $\hat{\theta}_t^l$ for $\hat{\theta}_t^l(\eta_t = -\eta)$ throughout the appendix unless indicated differently.

Proof of Proposition 1

To prove that strategies in period 2 are optimal given beliefs, suppose there is a government $\theta$ with $\theta < \hat{\theta}_2^c$ implying that $p_2 = 1$ and therefore $S_{21}^* = W_{0.2}$. To defend, the government has to raise interest rates to $i_2^H = \delta$. The utility of defending for government $\theta$ then is $U^G(\theta, i_2^H) = \theta - \gamma \delta - \eta$, which is smaller than zero since $\theta < \gamma \delta + \eta$. The utility of devaluation is $U^G(\theta, i_2^L) = 0$. Thus we have $U^G(\theta, i_2^H) < U^G(\theta, i_2^L)$ implying that it is optimal for government $\theta$ to devalue.

To prove that beliefs are optimal given strategies, suppose there is another $p_2'$ with $p_2' < 1$. This implies that the minimum interest rate to defend is $i_2^H = \delta p_2'$. Hence for $p_2' < 1$ we get a new marginal type $\hat{\theta}_2^c'$ with $\hat{\theta}_2^c < \hat{\theta}_2^c$. Governments that satisfy $\hat{\theta}_2^c' < \theta < \hat{\theta}_2^c$ will defend in case of an attack although these governments devalue if $p_2 = 1$. Speculators thus receive less when $p_2' < 1$ proving that $p_2 = 1$ is optimal given the strategies of the government.

Now suppose there is another government $\theta'$ with $\theta' > \hat{\theta}_2^c$ implying that $p_2 = 0$ and therefore $S_{21}^* = 0$. To defend, the government does not have to raise interest rates, i.e. $i_2^H = i_2^L$. The utility of defending for government $\theta'$ then is $U^G(\theta', i_2^H) = \theta' - \eta$, which is greater than zero since $\theta' > \gamma \delta + \eta$. Thus it is optimal for government $\theta'$ to defend.

To proof that beliefs are optimal given strategies, suppose there is another $p_2'$ with $p_2' > 0$. This implies that the minimum interest rate to defend is $i_2^H = \delta p_2'$. The utility of defending for government $\theta'$ then is $U^G(\theta', i_2^H) = \theta' - \gamma \delta p_2' - \eta$. This is greater than zero since $\theta' > \gamma \delta + \eta$, and the government defends. Since the government always defends, $p_2 = 0$ which contradicts our initial assumption that $p_2 > 0$.

The proof that government strategies and beliefs are optimal for period 1 is analog to the prove for period 2 and will not be repeated here. The main difference for period 1 is that we have to derive the first-period expected utility for the marginal government type $\hat{\theta}_1^c$ first.
Since first-period governments expect to receive future, discounted benefits from keeping the peg, more governments defend in the first than in the second period if a negative shock occurs. To see this, suppose that the opposite were true and more governments defended in the second than in the first period, i.e. \( \hat{\theta}_1^c > \hat{\theta}_2^c \). Then all governments that survive after a negative shock in the first period will keep the peg in the second period. Therefore, the expected utility of a defense from a first-period perspective is

\[
E_1U^G(\theta, i_1^H) = (1 + \beta)\theta - \gamma \delta - (1 + \beta(q_1 - q_2))\eta
\]

Setting (18) equal to zero and solving for \( \theta \) yields the first period marginal type \( \hat{\theta}_1^c \) under the assumption that \( \hat{\theta}_1^c > \hat{\theta}_2^c \). Inserting \( \hat{\theta}_1^c \) and \( \hat{\theta}_2^c \) into \( \hat{\theta}_1^c > \hat{\theta}_2^c \) and solving for \( \gamma \delta \) yields a contradiction showing that first-period governments always defend more often than second-period governments.

Since more governments defend in the first than in the second period, the first-period marginal type devalues in the second period if a negative shock occurs. Moreover, we are interested in those governments that keep the exchange rate fixed when there is no shock in the second period. Thus, the expected utility of defending for the marginal type in the first period is

\[
E_1U^G(\theta, i_1^H) = (1 + (1 - q_1)\beta)\theta - \gamma \delta - (1 - \beta q_2)\eta
\]

Setting (19) equal to zero and solving for \( \theta \) yields the first period marginal type

\[
\hat{\theta}_1^c = (y + \gamma \delta)/x
\]

where \( x = 1 + (1 - q_1)\beta \) and \( y = (1 - \beta q_2)\eta \).

**Proof of Proposition 2a**

Suppose there is a government \( \theta \) with \( \bar{\theta} < \bar{\theta}_2^{\min} \) implying that \( p_2 = 1 \) and \( i_2^H = \delta \). Since \( \theta \in [\bar{\theta}, \bar{\theta}] \) and \( \bar{\theta}_2^{\min} = \gamma \delta + \eta \), \( \bar{\theta} < \bar{\theta}_2^{\min} \) implies that \( \theta < \bar{\theta}_2^{\min} \) and therefore \( \theta < \gamma \delta + \eta \). The
utility of defending then is \( U^G(\theta, i_2') = \theta - \gamma \delta - \eta \), which is smaller than zero since \( \theta < \gamma \delta + \eta \).

The utility of devaluation is \( U^G(\theta, i_1^t) = 0 \). Thus, we have \( U^G(\theta, i_2') < U^G(\theta, i_1^t) \) implying that it is optimal for the government to devalue.

To prove that beliefs are optimal given strategies, suppose there is another \( p_2' \) with \( p_2' < 1 \). This implies that the minimum interest rate to defend is \( i_2' = \delta p_2' \). Hence for \( p_2' < 1 \), we get a new threshold \( \bar{\theta}_2^\text{min}' \) with \( \bar{\theta}_2^\text{min}' < \bar{\theta}_2^\text{min} \). Governments that satisfy \( \bar{\theta}_2^\text{min}' < \theta < \bar{\theta}_2^\text{min} \) will defend in case of an attack although these governments would devalue if \( p_2 = 1 \). Speculators thus receive less when \( p_2' < 1 \) proving that \( p_2 = 1 \) is optimal given the strategies of the government.

The proof for period 1 is analog to the proof for period 2 and will not be repeated here. The concept of PBE also requires that we specify out-of-equilibrium beliefs for the situation where the government does not play the strategies specified by PBE in period 1. Since PBE does not restrict out-of-equilibrium beliefs, speculators can hold beliefs that differ depending on the nature of the shock at the beginning of period two. The following set of out-of-equilibrium beliefs supports the equilibrium described in propositions 2a. If speculators believe that the government will always devalue after a negative shock in period two, then it is not optimal for any type of government to deviate from equilibrium behavior. Thus, \( p_2(\eta_2 = -\eta) = 1 \), \( p_2(\eta_2 = 0) \geq 0 \) and \( p_2(\eta_2 = \eta) \geq 0 \) support the equilibrium.

The following out-of-equilibrium beliefs do not support the equilibrium. Suppose that speculators believe that the government will not devalue in period two if a positive or no shock occurs. And speculators believe that the probability of devaluation is less than one if a negative shock occurs in period. Then, some governments will be better off if they deviate from equilibrium behavior and the equilibrium does not hold. But this requires that speculators believe that some governments will defend in the first period although this makes them worse off that if they devalued. This assumption does not satisfy the intuitive criterion (Cho and Kreps 1987). The equilibrium thus can be sustained by refining PBE and ruling out the unreasonable out-of-equilibrium beliefs.

**Proof of Proposition 2b**

Suppose there is a government \( \theta \) with \( \bar{\theta} > \bar{\theta}_2^\text{min} \) and \( \hat{i}_1' < \hat{i}_1^\text{max} \) implying that \( p_2 = (\eta_2 - \hat{i}_1')/(\bar{\theta} - \hat{i}_1' - \gamma \delta) \) and \( i_2' = \delta p_2 \). The utility of defending then is
\(U^G(\theta, i''_2) = \theta - \gamma \hat{p}_2 - \eta\). The utility of devaluation is \(U^G(\theta, i'^L) = 0\). It is optimal for the government to defend if \(U^G(\theta, i''_2) > U^G(\theta, i'^L)\). This is the case if \(\theta > \hat{\theta}'_2\) with

\[
\hat{\theta}'_2 = \frac{\eta \bar{\theta} - \hat{\theta}'_1 \cdot (\eta + \gamma \delta)}{\bar{\theta} - \hat{\theta}'_1 - \gamma \delta}
\]

It is optimal for the government to devalue if \(U^G(\theta, i''_2) < U^G(\theta, i'^L)\). This is the case if \(\theta < \hat{\theta}'_2\).

To prove that beliefs are optimal given strategies, I start by deriving the second-period marginal type as a function of \(p_2\), \(\hat{\theta}'_2(p_2)\). Since the utility of defending is

\[U^G(\theta, i''_2) = \theta - \gamma \hat{p}_2 - \eta\]

the government is indifferent between devaluation and defense if \(\hat{\theta}'_2(p_2) = \gamma \hat{p}_2 + \eta\). The probability of devaluation then can be found by solving

\[p_2 = \Pr\left(\theta < \gamma \hat{p}_2 + \eta \mid \theta > \hat{\theta}'_1\right)\]

for \(p_2\), which yields \(p_2 = (\eta - \hat{\theta}'_1)/\left(\bar{\theta} - \hat{\theta}'_1 - \gamma \delta\right)\) when \(\theta\) is distributed uniformly across \([\bar{\theta}, \theta]\).

The proof for period 1 is analogous to the proof for period 2 and will not be repeated here. Note that \(\hat{\theta}'_1 < \hat{\theta}'_2\) if \(\hat{\theta}'_1 < \hat{\theta}'_1^\text{max}\). Moreover, \(\bar{\theta} > \bar{\theta}'_2^\text{min}\) implies that \(\hat{\theta}'_1 < \hat{\theta}'_2(\eta_2 = 0)\) if \(\gamma \delta < (1 - \beta q_1)\eta/(1 - q_1)\beta\) as assumed in this paper. Therefore, the expected utility of the first-period marginal type is

\[E_i U(\theta, i''_1) = (1 + \beta (1 - q_1)) \theta - \gamma \hat{p}_1 - (1 - \beta q_2) \eta.\]

The marginal type for period 1 is given by

\[
\hat{\theta}'_1 = \frac{(\bar{\theta} - \hat{\theta})(1 - \beta q_2) \eta - \theta \gamma \delta}{(\theta - \hat{\theta})(1 + \beta (1 - q_1)) - \gamma \delta}.
\]
Proof of Proposition 2c

Suppose there is a government $\theta$ with $\bar{\theta} > \bar{\theta}_2^{\min}$ and $\hat{\theta}_1^i > \hat{\theta}_1^{\max}$. Since $\theta \in (\hat{\theta}_1^i, \bar{\theta})$ when the government defended in period 1, we know that $\theta > \hat{\theta}_1^{\max}$ implying that $p_2 = 0$ and $i_2^H = i^L$. The utility of defending then is $U^G(\theta, i_2^H) = \theta - \eta$, which is greater than zero since $\theta > \eta$. The utility of devaluation is $U^G(\theta, i^L) = 0$. Thus we have $U^G(\theta, i_2^H) > U^G(\theta, i^L)$ implying that it is optimal for the government to defend.

To prove that beliefs are optimal given strategies, suppose there is another $p_2'$ with $p_2' > 0$. From above, we know that the equilibrium probability for the second period must satisfy $p_2' = \left(\eta - \hat{\theta}_1^i\right)/\left(\bar{\theta} - \hat{\theta}_1^i - \gamma \delta\right)$ when $0 < p_2' < 1$. However, since $\hat{\theta}_1^i > \eta$, we get $p_2' < 0$, which contradicts the requirement that $0 \leq p_2' \leq 1$. Thus, for $\hat{\theta}_1^i > \hat{\theta}_1^{\max}$, $p_2'$ cannot be greater than 0. The proof for period 1 is analog to the proof for period 2 and will not be repeated here.
Chapter 4

When Do Exchange Rate Defenses Fail? The Role of Economic Signals and Political Considerations

4.1 Abstract

Theoretical and empirical research yields ambiguous results about the influence of high interest rates and other factors on the outcome of speculative attacks. I present a two-period signaling game that models the dynamics of an exchange rate defense and derive hypotheses about the impact of several political and institutional variables on the outcomes of crises. I then test the model’s empirical implications using data on speculative attacks in OECD countries during the post-Bretton Woods era. The estimation results from duration and selection models show that, contrary to the empirical findings by previous studies, raising interest rates decreases the hazard that the peg collapses during six months after the attack. The main exception is the crisis in Sweden in 1992 when the government raised interest rates to extraordinary levels and then devalued. Governments devalue more often in the aftermath of elections. Central bank independence decreases the hazard that the peg collapses.
4.2 Introduction

During the last decades, the international financial system has been shattered consistently by speculative attacks against the currencies of numerous countries. In these crisis situations, government behavior has serious consequences for economic and social welfare of the country's citizens. If the government gives up the fixed exchange rate and devalues, this decision destroys the government's monetary policy credibility. In the worst case, this may induce capital flight and damage economic development for a long period of time. Sometimes, the pre-crisis welfare level is reached only several years later. If the government defends the fixed exchange rate, economic growth generally slumps, and workers suffer from reduced income or even lose their employments.

Many well-known crisis episodes illustrate that both defenses and devaluations occur quite frequently. Examples of such successful defenses are Hong Kong during the Asian Financial Crisis in 1997, Argentina in 1995, France during the EMS crisis in 1992, or Greece in May 1994. At the same time, many governments take costly efforts to defend their exchange rate, but eventually give up and devalue. Among the most spectacular failed defenses is Sweden in 1992 and Thailand in 1997. In both cases, the government raised short-term interest rates to extraordinary levels (above 500% in Sweden, more than 1000% in Thailand) to stop capital outflows, which seemed to work initially. Within a two-month period, however, speculation resumed in both countries, and both governments decided to float the currency.

The failed defenses are particularly striking because these governments incur the costs of both devaluation and defense, but do not enjoy the benefits of either option. Hence, the economic and social burden is particularly high when governments try, but fail to defend because the government loses its long-term monetary credibility and at the same time, the economy is likely to experience a (potentially severe) recession with all its negative consequences. For an empirical illustration, GDP growth in Sweden dropped from −0.8% in the third quarter of 1992, the quarter when the attack occurred, to −2.7% in the fourth quarter and −5.2% in the first quarter of 1993. Only almost one year after the attack, GDP growth reached pre-crisis levels again. In a large-n study, Eichengreen and Rose (2003) estimate that the cost of failing to successfully defend against an attack is about three percentage points of GDP.
These stylized facts raise the question which factors systematically influence the outcome of currency crises. Specifically, if a government mounts a costly defense, when is it successful and when does it fail? The conventional view is that governments can defend their exchange rate against speculative attacks by raising interest rates. High interest rates increase the cost of speculation implying that the government can stop speculative activities if it is willing to raise interest rates to sufficiently high levels. Raising interest rates also signals that the government is strongly committed to the fixed exchange rate. The combined effect of high interest rates on speculators’ profits from speculation and beliefs about government commitment makes the interest rate an effective policy tool to defend the exchange rate.

Recent research has questioned the effectiveness of high interest rates to defend the fixed exchange rate. Theoretical models even suggest that raising interest rates may increase rather than stop speculation. Drazen and Masson (1994) show that tough policies intended to signal commitment and to gain monetary credibility may be counterproductive if the negative effects of these policies are persistent. Similarly, Bensaid and Jeanne (1997) demonstrate that high interest rates increase rather than decrease expectations of devaluation when raising interest rates is costly. Drazen (2000; 2003) shows that if speculators are uncertain about the level of currency reserves that the government has at its disposal, an interest rate defense can signal that the stock of reserves is low. Lahiri and Végh (2003; 2005) find that raising interest rates may delay a crisis, but speculation increases if interest rates are raised beyond a certain point.

Empirically, the effect of interest rates and the determinants of outcomes of speculative attacks in general are unclear. Kraay (2003) finds no support for the view that high interest rates help to defend a fixed exchange rate against an attack. Similarly, there is no evidence that raising interest rates may decrease the probability of successful defense as suggested by the theoretical models discussed in the previous paragraph. Apart from interest rates, Kraay examines the impact of various economic variables, such as reserve levels, the strength of the banking system, real exchange rate overvaluation, economic growth and the presence of capital controls on the outcome of currency crises. None of these variables shows a statistically significant impact on the probability of a successful defense.

In this paper, I empirically reassess the predictions in the literature about the determinants of currency crisis outcomes in OECD countries. This study complements the existing research in two respects. Unlike Kraay, I also examine the effect of political and institutional variables on currency crisis outcomes in the industrialized world. Although the theoretical literature highlights the importance of governments’ political willingness to defend
in these countries (Obstfeld 1994; 1996), the empirical economics literature has neglected this aspect.¹ Research in political economy suggests several empirically observable measures of political willingness to defend, specifically government partisanship, election periods and central bank independence. Based on a game-theoretic model, I derive hypotheses about the impact of these variables on the success of an interest rate defense and crisis outcomes in general. I then test the model’s implications using quantitative data on speculative attacks in OECD countries during the post-Bretton Woods era.

Second, I use a combination of duration and selection models to analyze speculative attacks. This procedure allows for a comprehensive analysis of crises encompassing both the emergence and outcomes of attacks. The empirical model thus takes into account two potential methodological problems of existing research. First, empirical research primarily concentrates on the government’s immediate reaction to an attack. Using such a restrictive operationalization of crisis outcomes, it is not possible to distinguish between the short- and long-term effectiveness of exchange rate defenses.² To avoid these strong assumptions about the length of crises, I examine the survival of a fixed exchange rate during several months after an initial attack. Second, datasets of crises are censored because only relatively weakly committed governments are selected into the sample. The estimations results therefore may be biased if we do not correct for this non-random sampling.³

The empirical results show that, contrary to the findings by Kraay (2003), raising interest rates increases the probability that the exchange rate peg survives the speculative attacks.¹ The large majority of observations in Kraay’s (2003) sample are attacks on currencies of OECD countries. As many researchers suggest, crises in these countries generally are caused by doubts about government political willingness to defend the peg rather than economic fundamentals. As an example, the European countries that were attacked during the 1990s had foreign reserves stocks that sometimes even exceeded the money base of the respective country (Obstfeld and Rogoff 1995, p.78). Nonetheless, Kraay only includes economic variables and neglects empirical measures of political commitment to the fixed exchange rate. Leblang (2003) is the only study that explicitly analyzes the effect of political considerations on government behavior during currency crises. His analysis is restricted to the developing world and shows that political factors significantly influence the outcome of speculative attacks in these countries.

² Leblang (2003) uses strategic probit models that account for selection problems in his sample. The strategic probit models, however, require very restrictive assumptions about the structure of a speculative attack. Leblang focuses on the reaction of the government in the immediate month following an attack. But the model in section 2 suggests that crises are not over after one month, but can last several periods.

³ Kraay (2003) uses simple probit models to estimate the probability of devaluation after a speculative attack. He thus ignores the problems that may arise from the censored sample underlying his analysis.
attack. This result is robust to changes in model specifications, but depends on the exclusion of the crisis in Sweden in 1992. The Swedish case is highly exceptional because the Swedish government raised interest rates to far higher levels than all the other governments in the dataset. The results suggest that for low and intermediate levels of speculation, raising interest rates is effective. If speculation is exceptionally large, as in Sweden 1992, interest rates may be ineffective because their adverse effects on the economy dominate the signal of strength that high interest rates send to market participants. This evidence for a non-linear relationship between interest rates and crisis outcomes is highly preliminary, however, because the Swedish case is the only one with such high interest rates in the sample underlying this study.

Among the other potential determinants of government behavior during crises, de jure exchange rate regimes, central bank independence and post-election periods show a statistically significant influence. Governments defend their exchange rate more often if they publicly announced that they fixed the exchange rate. The exchange rate peg survives more often after a crisis when the monetary authority is more autonomous because attempts to defend are more credible for these governments. Finally, governments devalue more often during post-election periods.

4.3 Theoretical Model

4.3.1 Model Setup

In this section, I present a two-period signaling game of an exchange rate defense similar to Drazen (1999). In the basic model, speculators are uncertain about government commitment to the fixed exchange rate. Governments types are continuous, i.e. $\theta \in [\underline{\theta}, \overline{\theta}]$, where $\theta$ denotes the value that the government attaches to the exchange rate peg. Government types are distributed uniformly across this interval.

Each period of the game has two stages, a speculation stage and a government response stage. At the beginning of the first stage, a random economic shock, $\eta_n$, occurs, which is observed by both speculators and the government. The shock can be negative, decreasing the value of the exchange rate peg, or nonnegative, implying the opposite. After observing the shock, speculators decide how much of their initial wealth, $W_{0n}$, they will invest into speculation against the fixed exchange rate. To speculate, they exchange amount $S_{e1}$ into
foreign currency, where \( 0 \leq S_{t1} \leq W_{0,t} \). Speculators receive domestic interest \( i_t \) on the funds that are not transferred abroad. For simplicity, I assume that foreign interest rates are zero.

After observing the initial amount of speculation, \( S_{t1} \), the government can use its policy instrument to influence the amount of speculation in the second stage of each period. Since the government controls the domestic interest rate, \( i_t \), it can directly influence the utility of speculation. After the government sets the new interest rate, speculators choose a new amount of speculation, \( S_{t2} \), for the second stage. The exchange rate peg collapses if speculation does not cease until the end of the period. Thus to defend, the government has to raise interest rates to high levels, \( i_t'' \), making speculation unprofitable and stopping speculation in the second stage of each period. If the government does not raise interest rates to reduce speculation, the exchange rate has to be devalued by an exogenous amount, \( \delta \). Market participants then can exchange their money back at the new exchange rate and receive more domestic currency than transferred abroad.

The government faces a trade-off between the costs and benefits of keeping the exchange rate fixed. The exchange rate peg primarily serves as a commitment device, i.e. the government keeps the exchange rate fixed to gain long-run anti-inflationary credibility. The major benefit of a fixed exchange rate thus is low inflation. If market participants believe that the government ensures monetary stability in the future, expected and therefore actual inflation is low. In contrast, a devaluation raises doubts that the government will keep inflation low in the future, increasing expected and actual inflation. The cost associated with a peg is the limited ability to offset negative economic shocks, e.g. unexpected reductions in economic growth, in the short run. Under a flexible exchange rate, governments can reduce the effects of such shocks with an unanticipated monetary expansion.4 This possibility is restricted under a fixed exchange rate. Similarly, in case of a speculative attack governments must raise interest rates to dampen speculation, which depresses growth. In contrast, an unexpected devaluation increases output and lowers unemployment.5

To model this situation, the single-period utility of the government is

4 New-Keynesian models of the macroeconomy suggest that in the presence of market frictions, such as price rigidities and monopolistic competition, unexpected changes in monetary policy have a strong effect on economic output (Gali 2003; Gali and Monacelli 2005). Under imperfect competition, firms set prices above marginal costs. This makes it profitable for them to increase output even at preset prices as long as monetary expansions are small enough that marginal revenue does not fall below marginal cost. Governments thus can use monetary policy to offset the adverse effects of economic shocks under flexible exchange rates.

5 The logic is the same as for unexpected monetary expansions.
where $\delta$ represents exchange rate behavior in period $t$. The costs of keeping the peg thus are increasing in the choice variable $i$. The parameter $\gamma$ reflects how much a specific interest rate level affects government utility. Similarly, the costs of keeping the peg increase when a negative shock occurs and decrease when a positive shock occurs. The utility of the exchange rate peg thus diminishes the higher the government has to raise interest rates to keep the exchange rate fixed, and the worse economic circumstances as represented by the shock in period $t$.

The government devalues if the utility of keeping the exchange rate peg falls below zero. Equation (1) thus implies that a devaluation is more likely the more negative the economic shock $\eta$, the higher the interest rate level necessary to defend the peg, $i^H$, and the lower the value that the government attaches to the peg, $\theta$. If observable indicators suggest that government commitment to the peg is relatively low and therefore the probability of devaluation is high, a sufficiently large shock can trigger an attack. From a first-period perspective, the expected utility of the exchange rate peg in both periods is

$$U^G(\theta, i, \eta) = \begin{cases} \theta - \gamma i + \eta, & \text{if } \delta = 0 \\ 0, & \text{if } \delta = \delta. \end{cases} \quad (1)$$

If the government devalues in the first period, the government cannot fix the exchange rate in the second period, i.e. the total utility for the government is zero.

I assume that all speculators have identical information about government characteristics and economic circumstances. Speculators thus can be modeled as a single, representative actor. Speculators earn domestic interest $i$ on the wealth invested into domestic assets. The government thus exerts direct control over the returns of speculators' assets. If the exchange rate collapses, the domestic currency value of the amount exchanged

$$\Pi^G = \begin{cases} U^G(\theta, i, \eta) + \beta EU^G(\theta, i, \eta), & \text{if } \delta = 0 \\ 0, & \text{if } \delta = \delta. \end{cases} \quad (2)$$

If the government devalues in the first period, the government cannot fix the exchange rate in the second period, i.e. the total utility for the government is zero.

Note that $\eta > 0$ decreases government utility and therefore represents a negative shock, and $\eta \leq 0$ a nonnegative shock.

Morris and Shin (1998) present a model where market participants have diverging information about government objectives. Since I am primarily concerned with government behavior and the resulting signaling effects rather than speculator characteristics, I assume identical beliefs across speculators.
abroad, $S_{t,j}$ increases depending on the size of devaluation. Depending on which state occurs, total wealth at the end of the period is

$$W_{t,j}^{de} = (W_{0,t} - S_{t,j})(1 + i_j) + S_{t,j} \quad (3)$$

$$W_{t,j}^{dev} = (W_{0,t} - S_{t,j})(1 + i_j) + S_{t,j}(1 + \delta). \quad (4)$$

The expected utility of speculation then is

$$EU^{S}(S_{t,j}) = p_{t} u(W_{t,j}^{dev}) + (1 - p_{t}) u(W_{t,j}^{def}) \quad (5)$$

where $p_{t}$ is the probability of devaluation in period $t$.

The expected utility function (5) implies that risk-neutral speculators always invest their whole wealth into speculation even if the probability of devaluation is only slightly greater than zero. To see this, insert (3) and (4) into (5) and take first-order conditions with respect to $S_{t,j}$. To avoid this situation, speculators in this model are strictly risk-averse. To model the risk-aversion of speculators, I use a log-utility function. The utility of state $j$ then is $u(W^j) = \ln W^j$.  

The optimal amount of speculation for risk-averse speculators can be found by maximizing the expected utility function for $S_{t,j}$. Speculation then is given by

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8 Risk-neutrality implies that $u(W_{t,j}^{dev}) = W_{t,j}^{dev}$ and $u(W_{t,j}^{def}) = W_{t,j}^{def}$. With risk-neutrality, speculation would be zero only if the probability of devaluation is exactly zero as well and if we assume that speculators only speculate if expected utility is strictly greater than initial wealth $W_{0,t}$.

9 Empirical evidence suggests that logarithmic risk preferences are largely consistent with the behavior of market agents. Mankiw and Shapiro (1986) and Epstein and Zin (1991) present estimation results showing that risk preferences do not differ statistically from the logarithmic specification.

10 Drazen (1999; 2000) and Kraay (2003) assume that speculators borrow money to speculate and pay interest on the borrowed amount. Moreover, speculators are risk-neutral, but have convex cost functions. There are several reasons why I prefer the setup chosen in this model. First, when speculators borrow money, but the government does not devalue (i.e. raises interest rates), speculators have to pay back more than they borrowed implying that technically they go bankrupt. This means that we cannot use certain expected utility functions with risk-aversion, such as a log-utility, because we cannot take the logarithm of negative wealth. Second, in a model where speculators borrow money, speculation cannot be zero as long as there is a slight probability of devaluation. To stop speculation, governments have to raise interest rates to infinity, which is implausible. As we will see below, it is possible to derive a finite minimum interest that is necessary to defend in the model presented here.
Equation (6) shows which proportion of their initial wealth speculators exchange into foreign currency. Speculative pressure rises when the probability of devaluation, \( p_t \), increases and when the domestic interest rate, \( i_t \), decreases. The government thus can directly influence speculative pressure by manipulating the domestic interest rate. To stop speculation, governments must raise domestic interest rates to the level \( i_t^H \) that reduces speculation to zero, \( S_t^*(i_t, p_t) = 0 \). The minimum interest rate necessary to defend the fixed exchange rate thus is \( i_t^H(p_t) = \delta p_t \).

The intuition of this result is straightforward. To stop capital outflow, the government has to compensate speculators for the profits they would make if the exchange rate peg collapsed. Speculators transfer their money back if interests on domestic capital are at least as high as the weighted rate of return from devaluation. The weighted rate of return is the proportion of devaluation evaluated by the probability that this devaluation will occur.

4.3.2 Equilibrium and Comparative Statics

Solving the game backwards, we can derive the government types that are indifferent between devaluation and defense. Using these marginal types, it is possible to compute the probabilities of devaluation in each period. The crucial issue is that at the beginning of the second period, speculators update their beliefs about the true government type based on government behavior in the first period. If the government defends in the first period, speculators learn that the government is relatively strongly committed to the fixed exchange rate. Specifically, they can infer that government commitment is greater than commitment of the marginal type in period one, \( \hat{\theta}_t \). This learning effect implies that the distribution of government types in the second period is truncated at \( \hat{\theta}_t \). The distribution of possible government types in the second period then only includes government types with \( \theta \in [\hat{\theta}_t, \hat{\theta}] \).

For a detailed discussion of the equilibrium concept, probabilities, strategies and the proofs, see chapter 3 of this dissertation thesis.
The outcome of the game depends on the structure of prior beliefs that speculators hold about government resolve to defend the fixed exchange rate. There are three situations in every period. First, the probability of devaluation is equal to one if $\bar{\theta}_t < \bar{\theta}_t^{\text{min}}$ for $t = 1, 2$, with

$$\bar{\theta}_t^{\text{min}} = \gamma \bar{\delta} + \eta$$  \hspace{1cm} (8)

and

$$\hat{\theta}_t^{\text{min}} = (\gamma + \bar{\delta})/x$$  \hspace{1cm} (9)

where $x = 1 + (1 - q_t)\bar{\beta}$ and $y = (1 - \beta q_t)\eta$. These thresholds correspond to the value of $\theta$ that makes governments indifferent between devaluation and defense under complete information.\(^{11}\) The logic of this result is straightforward. Suppose the upper bound of the distribution of types, $\bar{\theta}$, is lower than the minimum government type that defends under complete information. Although speculators do not know the exact type of the government, they know that the highest possible government type is less committed to the peg than the minimum government type that defends under complete information. Speculators attack with full intensity, $S_t^* = W_{0_t}$, and the government devalues.

Second, the probability of devaluation is zero if $\bar{\theta}_t < \hat{\theta}_t^{\text{min}}$ and $\theta > \hat{\theta}_t^{\text{max}}$ for the first and $\hat{\theta}_t > \hat{\theta}_t^{\text{max}}$ for the second period, with

$$\hat{\theta}_t^{\text{max}} = y/x$$  \hspace{1cm} (10)

and

$$\hat{\theta}_t^{\text{max}} = \eta$$  \hspace{1cm} (11)

There is no speculation and the government keeps the exchange rate fixed although the distribution of types implies that some governments would devalue if there were a sufficiently large attack. The reason is that if $\theta$ or $\hat{\theta}_t$ increases, the probability of devaluation in the

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\(^{11}\) Under complete information, speculators attack with full intensity, i.e. $S_t^* = W_{0_t}$, and the government devalues if $\theta < (\gamma + \gamma \bar{\delta})/x$ and $\theta < \gamma \bar{\delta} + \eta$ for the first and second period, respectively. There is no attack, i.e. $S_t^* = 0$, and the government keeps the exchange rate fixed if $\theta > (\gamma + \gamma \bar{\delta})/x$ and $\theta > \gamma \bar{\delta} + \eta$ for the first and second period, respectively. Thus, the marginal types under complete information correspond to the threshold for $\bar{\theta}$ as defined in equations (8) and (9).
The smaller the probability of devaluation, however, the easier it is for the government to defend. This is the case because for small probabilities of devaluation, the optimal amount of speculation is small as well. Hence, the minimum interest rate necessary to defend and thus the cost of a defense decrease with the probability of devaluation (see equation (6)). When it is easier for the government to defend, the probability of devaluation is even smaller. Increasing $\theta$ or $\hat{\theta}_i$ thus initiates a downward spiral ultimately leading to a situation where speculators prefer not to speculate although the distribution of types includes governments that would devalue in case of a sufficiently large attack.

Finally, if $\bar{\theta} < \theta^\text{min}_i$ and $\theta < \theta^\text{max}_i$ for the first and $\hat{\theta}_i < \hat{\theta}^\text{max}_i$ for the second period, the ex-ante probability of devaluation is

\[ p_1 = \frac{(y - \theta x)}{(B - \theta)x - y\delta} \]  

(12)

and

\[ p_2 = \frac{(\eta - \hat{\theta}_i)}{(\bar{\theta} - \hat{\theta}_i - y\delta)} \]  

(13)

for the first and second period, respectively. Overall, more governments defend than under complete information. Governments can exploit the ignorance of speculators and pretend that they are strongly committed to the peg although they would devalue if speculators knew their exact preferences. For a detailed derivation of the equilibrium and a discussion of out-of-equilibrium beliefs that support his equilibrium, see chapter 3.

Figure 4.1 illustrates some comparative statics results for the relevant model parameters. The top graph shows that the probability of a devaluation decreases when the value of the fixed exchange rate increases. The probability of devaluation never exactly equals zero since $\theta = 0$ implies that $\theta < \theta^\text{max}_i$ and $\hat{\theta}_i < \hat{\theta}^\text{max}_i$ in this example. The graph in the center demonstrates that the probability of a devaluation increases when the cost of a defense rises. As we can infer from both graphs, more governments defend in the first than in the second period. At the beginning of the game, the future, discounted benefits from the exchange rate peg are relatively high. Since these benefits diminish when the final period approaches, more governments find it optimal to devalue in later periods.

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12 When $\theta$ or $\hat{\theta}_i$ increases, the mean of the distribution becomes larger implying that the expected government type is tougher.
Figure 4.1: Comparative statics for the value of the peg, $\bar{\theta}$, cost of defense, $\gamma$, and the discount factor, $\beta$. 
The bottom graph suggests that the impact of the discount factor is small compared to
the effects of the value of the exchange rate or costs of defense. The probability of
devaluation in the first period decreases the higher the discount factor, i.e. the more the
government values the future. The effect of the discount factor also depends on the values of
other parameters. The comparative statics analysis shows that the impact of the discount
factor on the devaluation probability is smaller the greater $\bar{\theta}$. In other words, the future
discounted value of the fixed exchange rate is more important for weakly committed
governments than for strongly committed government. For the latter, the immediate (same-
period) gain from the peg is sufficient to defend the exchange rate, and therefore changes in
future discounted benefits are less relevant for these governments.

Finally, the model predicts that the probability of failed defenses is larger for
intermediate types of governments than for weakly or strongly committed governments.
When speculators attack weakly committed governments, these governments generally
devalue immediately and do not try to defend at all. When speculators test the resolve of
relatively strongly committed governments, a defense in the first period signals that further
attacks are unlikely to succeed, and speculators back down. In contrast, intermediate
governments tend to defend in first period, hoping for economic recovery in the second
period. If economic circumstances do not improve for exogenous reasons, speculation
resumes and these governments are forced off the peg in the second period. Overall, the
probability of a failed defense is relatively low. One possible reason is that the government is
perfectly informed about speculators. It is plausible that governments would fail more often to
defend the exchange rate if they were facing uncertainty as well.\textsuperscript{13}

4.3.3 Empirical Implications

The theoretical model yields several substantive and methodological implications for
empirical research. Based on the results of the comparative statics analysis, we can derive
hypotheses about the impact of empirically observable measures of the model parameters.
The theoretical model also points to some potential methodological problems in standard
empirical models of currency crisis outcomes.

\textsuperscript{13} Two-sided uncertainty would substantially complicate the model, particularly when we also
allow for economic shocks.
Two methodological implications are particularly relevant for the empirical research design. First, the model implies that attacks are not necessarily over after an initial defense, but can last several months. It is possible that speculators attack several times until they realize that the government will not devalue. In other circumstances, governments may defend initially, but devalue later after domestic economic conditions have deteriorated. Standard operationalizations of crisis outcomes that are restricted to the immediate reaction of the government thus do not capture the dynamics of crises (Kraay 2003; Leblang 2003). The theoretical model suggests that it is more adequate to measure the time span between an initial attack and the collapse of the exchange rate peg.

Second, the model suggests that empirical samples of currency crises are censored. Standard datasets of speculative attacks typically include observations where speculation has increased above a pre-specified level. These datasets thus only include crisis episodes where the probability of devaluation was greater than a specific threshold, \( \hat{p} \). By implication, all governments in the sample are relatively weakly committed, i.e. only governments with \( \bar{\theta} < \bar{\theta}(\hat{p}) \) are included in the dataset. In practice, this means that observations are selected into the dataset only if observable economic conditions deteriorate beyond a certain point and/or government characteristics suggest that political commitment to the peg is low. For an illustration, suppose that government types are distributed normally as in Figure 4.2. Since only cases with a devaluation probability greater than \( \hat{p} \) are selected into the sample, governments in the grey-shaded areas of Figure 4.2 are excluded.

Empirical estimations based on censored samples yield biased results if the errors of the selection and the outcome equations are correlated (Boehmke et al. 2006; Hug 2006). In this context, estimating the probability of devaluation without taking into account the probability of an attack may lead to incorrect inferences if the error terms of these two processes are not independent. The theoretical model above suggests that this may be the case. It emphasizes the importance of random economic shocks, \( \eta_t \), both for the emergence

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14 Calibrations of Bensaid and Jeanne's (1997) model yield that crises last several months rather than several days.
15 Examples are Eichengreen et al. (2003a; 2003b), Kraay (2003) and Leblang (2003). Eichengreen et al. (2003a) define speculative attacks as "a period of extreme pressure in the foreign exchange market" (p.128). As the theoretical model shows, speculative pressure reaches such extraordinary high levels only when the probability of devaluation is extraordinarily large.
16 I assume that \( \hat{p} = 0.3 \) in this illustration. The points \( \bar{\theta}(\hat{p}) \) and \( \bar{\theta}(\hat{p}) \) in Figure 4.2 correspond to the values of \( \bar{\theta} \) where \( p_1 = 0.3 \) and \( p_2 = 0.3 \) in the top graph of Figure 4.1.
and for the outcome of speculative attacks. Suppose we estimate two separate empirical models for the probability of an attack (model 1) and the probability of devaluation (model 2). Since we cannot systematically measure the shocks, they are part of the error terms of the separate empirical models, $\varepsilon_{1,t}$ and $\varepsilon_{2,t}$. By implication, $\varepsilon_{1,t}$ and $\varepsilon_{2,t}$ of the two models may be correlated, and the results for model 2 may be biased.

Figure 4.2: Possible selection bias in sample of speculative attacks

Research in political economy proposes a number of political and institutional variables that reflect the government’s political willingness to defend the exchange rate. Combining the insights of extant research with the comparative statics results for the model parameters, we can derive hypotheses about the expected effect of these variables. For instance, the literature generally suggests that left-wing governments put more emphasis on growth than right-wing governments (Hibbs 1977). The costs of a defense, i.e. $\gamma$, thus are higher for governments from the left. At the same time, these governments face a greater credibility problem, i.e. $\bar{\theta}$ is higher as well (Bernhard and Leblang 2002). The model thus yields competing hypotheses about the effect of government partisanship. If the effect of $\gamma$ dominates the effect of $\bar{\theta}$, then left-wing governments should devalue more often, and vice versa. If both effects are approximately equal, the impact of government partisanship is small or zero.

The predictions for the other variables are more clear-cut. Independent central bankers generally put more weight on monetary stability than the elected government (Rogoff 1985). Thus, $\bar{\theta}$ increases the more autonomous the central bank. Moreover, apolitical central
bankers are more farsighted in monetary policy, hence $\beta$ is large if the central bank is independent (Ozkan and Sutherland 1995). Finally, independent central bankers are more isolated from political pressure implying that the costs of a defense, $\gamma$, are low. Governments with independent central banks thus should defend more often. In contrast, governments should devalue more often during election periods since they are more short-sighted before elections (Ozkan and Sutherland 1995). Thus, $\beta$ is small before elections and large after elections.

4.4 Empirical Analysis

4.4.1 Data and Method

To test the hypotheses derived in the previous section, I use monthly data of OECD countries since the 1970s. The analysis is limited to this period and these countries for various reasons. First, capital flows were seriously restricted in the post-war international financial system to grant governments greater policy autonomy and to make the system less prone to attacks (Eichengreen 1996, chapter 4). Since the focus of this study is on the effect of policymaking in an economically integrated world, the analysis starts in 1974 after the breakdown of the Bretton Woods System. By that time, countries had lifted the constraints to capital and trade flows to a considerable degree. Second, the restriction to industrialized countries guarantees that the governments faced more or less similar external economic conditions. Finally, political willingness to defend the exchange rate played a particularly important role in OECD crises. The focus on industrialized countries thus ensures that the sample includes a relatively coherent set of currency crises.

Only countries with a relatively fixed exchange rate are included in the sample. The exchange rate does not have to be fully fixed because in the post-Bretton Woods System many different, intermediate types of exchange rate regimes have existed. Governments often do not fix the exchange rate entirely, but let their currency float within a pre-specified band to

\[\text{A measure of current and capital account openness by Quinn (2000) demonstrates that OECD countries were considerably open to trade and capital flows by 1970. The index varies from 0 to 14 where 14 means fully open. Average openness in OECD countries increased from 4.2 in 1950 to 13.4 in 1999. In 1970, average openness was 8.8, i.e. by 1970 average openness more than doubled, and reached exactly half of the difference between its lowest and highest level.}\]
the currency of a reference country. One of the most well known examples is the European Exchange Rate Mechanism (ERM) that specified that the exchange rates of the participating countries had to be maintained within a margin of ±2.25%.\textsuperscript{18} Speculative attacks on these intermediate exchange rate regimes occurred quite frequently as the EMS crisis in 1992-93 illustrates. During this period, speculative attacks forced several European countries to devalue their currencies (Ireland, Portugal, Spain) or even leave the ERM (Finland, Italy, Sweden, UK) ultimately leading to a widening of the band to ±15%.

To assess whether a specific exchange rate was relatively fixed, I rely on the classification of “de facto exchange rate regimes” by Reinhart and Rogoff (2004). Since actual exchange rate regimes often do not correspond to the regime that governments publicly announce, data based on the official (“de jure”) regimes, e.g. by the IMF, are misleading (Levy-Yeyati and Sturzenegger 2005; Reinhart and Rogoff 2004). The measure by Reinhart and Rogoff classifies exchange rate regimes on a 15-point scale based on both the announcements of the governments and the actual behavior of the exchange rates. Lower values imply less flexibility. For instance, 1 denotes “no separate legal tender”, i.e. a strict peg, and 13 are “freely floating” rates. Category 14 comprises dysfunctional exchange rates, i.e. “freely falling rates” during periods of hyperinflation.

My analysis includes all periods with exchange rate regimes that are classified as pre-announced crawling band that is wider than ±2%, and any stricter classification. This corresponds to all regimes equal to or below category 9 on the Reinhart/Rogoff scale.\textsuperscript{19} This threshold has theoretical and practical reasons. The sample includes all officially announced regimes with reduced exchange rate flexibility.\textsuperscript{20} At least theoretically, all these regimes can be attacked by speculators and therefore need to be included in the analysis. From a practical point of view, this threshold corresponds to the formal requirements for participation in some exchange rate systems, such as the EMS. Using a more restrictive threshold to determine

\textsuperscript{18} An exception was Italy that maintained its currency within a band of ±6%.

\textsuperscript{19} The analysis thus includes strict pegs (category 1), pre-announced horizontal pegs and bands (categories 2 and 3), de facto horizontal pegs (category 4), pre-announced crawling pegs and bands (categories 5 and 6), de facto crawling pegs and bands (categories 7 and 8) and pre-announced crawling bands that are wider than ±2% (category 9). Except for category 9, bands are defined as “narrower than or equal to ±2%” (see Reinhart and Rogoff 2004, table 5). Reinhart and Rogoff treat pre-announced regimes as less flexible than non pre-announced regimes with the same de facto flexibility because “the latter leave it to financial market analysts to determine the implicit exchange rate policy exchange rate policy” (p.26).

\textsuperscript{20} These regimes correspond to exchange rates that were classified as 1 and 2 in the “coarse grid” of the Reinhart/Rogoff classification. Regimes classified as 3 or higher on the coarse scale are not included in my analysis.
which exchange rates are fixed (see, e.g. Leblang 2006) means that important crises, such as those in Italy and Sweden in 1992, would be excluded from the analysis. Although it may be useful to use lower cut-off points in other contexts, e.g. for analyses of exchange rate regime choice in non-crisis situations, this is not adequate for this study of speculative attacks.

Speculative pressure is measured using a modified version of the index of exchange market pressure (EMP) by Eichengreen, Rose and Wyplosz (2003a; 2003b). The index is operationalized as a weighted average of changes in the exchange rate, $e_{jt}$, changes in foreign reserve levels, $r_{jt}$, and changes in interest rates, $i_{jt}$ for country $j$ at time $t$ relative to the values of interest rate changes in a reference country $k$. To ensure equal influence of the three components on the index, each of them is weighted by their country-specific volatility over the whole period of analysis:

$$EMP_{jt} = \frac{\Delta e_{jt}}{\sigma_{e_{jt}}} + \frac{\Delta(i_{jt} - i_{kt})}{\sigma_{\Delta(i_{jt} - i_{kt})}} - \frac{\Delta r_{jt}}{\sigma_{r_{jt}}}$$

The reasoning behind this index is that governments can respond to currency crises either by devaluing or floating their currency, by tightening monetary policy, or by spending foreign reserves in order to buy domestic currency. Large values of the EMP index indicate that speculative pressure is high.

To identify crises episodes, I follow the literature and define crises as those periods where the index is at least two standard deviations above its country-specific mean:

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21 Both the Italian Lira and the Swedish Krona were classified in category 8 on the Reinhart/Rogoff scale before the crisis in 1992.

22 Different versions of this indicator has been widely used in the literature. Examples are Leblang (2003) and Leblang and Bernhard (Leblang and Bernhard 2000). For an overview, see Kaminskiy et al. (1998).

23 Germany is the reference country for the European countries. The U.S. is the reference country for the rest of the world.

24 Unlike the original EMP indicator by Eichengreen, Rose and Wyplosz, I do not use changes in reserve levels compared to changes in reserves in a reference country. The reason is that using reserves in a reference country may generate "false crises" when there was a large capital inflow into the reference country. An example is the EMS crisis in September 1992 when reserve levels both in Austria (country $j$) and Germany (reference country $k$) increased. Since capital inflow to Germany was much higher than to Austria, the difference between reserve changes in both countries was negative for Austria. The original EMP indicator as proposed by Eichengreen et al. therefore generates a crisis for Austria in September 1992 despite significant capital inflows during this month.
The sample crises resulting from this definition is listed in Table 4.1. This sample includes many well-known crisis events. Examples are the EMS crisis in 1992 (encompassing the UK, Sweden, Italy, Ireland) and the attack against Greece in May 1994.

Table 4.1: List of Speculative Attacks

| AUS 1974m10 | DEN 1981m3 | GRE 1975m10 | NED 1983m3 |
| AUS 1976m12 | DEN 1982m3 | GRE 1978m6  | NZL 1974m10 |
| AUS 1982m8  | DEN 1993m8 | GRE 1979m9  | NZL 1975m8 |
| AUT 1974m4  | FIN 1977m4 | GRE 1985m10 | NZL 1980m5 |
| AUT 1977m1  | FIN 1979m11| GRE 1993m6  | NZL 1984m1 |
| AUT 1977m10 | FIN 1982m10| GRE 1994m5  | NZL 1984m8 |
| AUT 1990m12 | FIN 1983m9 | IRE 1976m10 | NZL 1985m2 |
| BEL 1981m10 | FIN 1986m8 | IRE 1976m4  | POR 1983m7 |
| BEL 1981m3  | FIN 1991m9 | IRE 1983m3  | POR 1984m2 |
| BEL 1984m3  | FIN 1992m4 | IRE 1986m8  | POR 1992m9 |
| BEL 1993m8  | FIN 1993m9 | IRE 1992m9  | POR 1993m3 |
| CAN 1978m9  | FRA 1974m1 | ITA 1974m10 | POR 1995m3 |
| CAN 1979m10 | FRA 1976m2 | ITA 1974m2  | SPA 1976m2 |
| CAN 1980m4  | FRA 1977m7 | ITA 1983m3  | SPA 1977m7 |
| CAN 1981m7  | FRA 1978m2 | ITA 1992m7  | SPA 1978m10|
| CAN 1982m3  | FRA 1981m5 | ITA 1995m3  | SPA 1982m10|
| CAN 1992m9  | FRA 1982m3 | JAP 1974m1  | SPA 1992m9 |
| CAN 1998m8  | FRA 1983m3 | JAP 1974m8  | SPA 1995m3 |
| DEN 1976m9  | FRA 1987m1 | NED 1974m4  | SWF 1981m10|
| DEN 1977m7  | FRA 1992m9 | NED 1976m6  | SWE 1982m10|
| DEN 1979m12 | FRA 1993m7 | NED 1978m10 | SWE 1992m9 |
| DEN 1979m6  | FRA 1995m3 | NED 1981m3  | UK 1992m9 |

To operationalize the dependent variable – the outcome of a speculative attack – I examine whether or not the government devalued the exchange rate during six months after a speculative attack. What counts as a devaluation depends on the type of exchange rate regime before the attack. A measure of crisis outcomes has to take into account that for stricter regimes, i.e. regimes allowing for less exchange rate flexibility, smaller changes in the exchange rate constitute a devaluation than for looser regimes. A drop in the exchange rate

25 Based on calibration exercises, Bensaid and Jeanne (1997) conclude that currency crises are more a matter of months than of days (p. 1472-1473). They refer to Moutot (1994) who suggests that crisis episodes in France during the EMS crisis lasted up to five months. I use this crisis length as a reference point for the operationalization of the dependent variable. As I will discuss below, duration models can account and correct for the possibility that a crisis may not be over after the period specified here.
may be in accordance with the rules of a relatively loose regime, such as a pre-announced band of ±5%, but does not correspond to the requirements of a stricter regime, such as an exchange rate peg that only allows for changes of ±1%. As a concrete example, if the Italian Lira dropped by 4% in early 1992, this would not be a devaluation because the ERM statutes exceptionally allowed the Lira to float within a margin of ±6%. If, however, the German Mark dropped by 4% during the same time period, this would be a violation of the commitment by the German government to maintain the Mark within a margin of ±2.25%.

To define whether an attack was successful or not, I use the same cut-off points as applied by Reinhart and Rogoff for pre-announced regimes. Accordingly, exchange rate changes are defined as devaluations if the exchange rate drops by more than 1% for pre-announced pegs. For pre-announced bands, devaluations are those situations when the exchange rate drops by more than 2%. Following Reinhart and Rogoff, de facto regimes are classified as less restrictive than a pre-announced regime of the same kind. I thus use the same thresholds for de facto pegs as for pre-announced bands. Finally, unlike in a horizontal regime, consecutive depreciations are allowed in crawling regimes. Attacks are successful in a horizontal regime if the exchange rate depreciations compared to the month of the attack exceed the threshold. For crawling regimes, devaluations occur if exchange rate depreciations exceed this threshold from one month to the next.

I use duration models to analyze the effect of the explanatory variables on the probability that a defense is successful (Box-Steffensmeier and Jones 2004). These models estimate the probability that a government defends in a specific month after the attack, conditional on not having devalued until then. I primarily use parametric models with lognormal and Weibull distribution and compare the results with those from a less restrictive, but also less efficient semi-parametric Cox model. The outcome equation is specified as a log-linear model of duration times,

\[
\log(y_{ij}) = a_0 + a_1 \Delta i_j + a_2 z_j + \epsilon_{ij}
\]

where \(y_{ij}\) measures the number of months between an attack and the collapse of the fixed exchange rate; \(\Delta i_j\) is the change in the interest rate differential from the month prior to the attack to the month of the attack; \(z_j\) is a vector including a set of economic and political variables; and \(\epsilon_{ij}\) is a random error. The errors are assumed to be type-1 extreme-valued distributed for the Weibull model and normally distributed for the log-normal model. To
identify the economic variables included in $z_p$, I rely on the theoretical and empirical literature. The political variables are those discussed in the previous section.

Besides explicitly modeling the survival of the exchange rate, duration models have the advantage that they can account for right-censoring.\footnote{Right-censoring means that we may have exchange rate pegs that survive the period of analysis, but collapse later on.} This is particularly useful for the analysis of crisis outcomes since it is unclear how long a specific crisis lasts. To solve this problem, I code those governments that have not devalued until six months after the crisis as right-censored. This allows me to apply a plausible definition of crisis length from the literature without imposing strong restrictions about the duration of a specific crisis.\footnote{See footnote 25.}

To take into account that the sample of crises is censored, I also use empirical models that captures a) the probability that a crisis occurs (selection), and b) the probability that a defense is successful given that a crisis has occurred (outcome). The selection process is modeled using a latent variable specification:

$$\log(y_{2j}^*) = b_i x_j + \varepsilon_{2j}$$

where $y_{2j}$ denotes whether a crisis occurs ($y_{2j} = 1$) or not ($y_{2j} = 0$); $x_j$ is a vector of empirically observable measures of economic conditions and government characteristics; and $\varepsilon_{2j}$ is a random error. I rely on existing research of speculative attacks (Kaminsky et al. 1998; Kaminsky and Reinhart 1999; Leblang 2002; Leblang and Bernhard 2000) to identify the set of variables included in $x_j$.

To estimate the complete model, I use an estimator by Boehmke et al. (2005; 2006) that simultaneously estimates the duration and selection processes outlined above. The estimator takes into account that the dependent variable of the outcome equation $y_{1j}$ can be observed only if a crisis occurs, i.e. if $y_{2j}$ takes the value 1. It estimates the hazard that the fixed exchange rate collapses conditional on the probability that an attack has occurred.
estimator only allows to estimate parametric models with exponential, Weibull and lognormal distributions.  

4.4.2 Results

The results for the parametric duration models are presented in table 4.2. All models are fitted in the accelerated failure-time metric. The distribution underlying the specific model is listed on top of each column. Positive coefficients imply that higher values of the respective explanatory variable increase the duration of the exchange rate peg. The substantive results remain stable when the specifications are estimated using a Cox model.

The first column of the table shows the results for a purely economic model without correcting for possible selection bias. This first test suggests that raising interest rates does not help to defend the fixed exchange rate. The coefficient for changes in the interest rate in the month of the attack shows the correct sign, but is statistically insignificant. This result corresponds to the result from Kraay (2003) who cannot find any impact of high interest rates on outcomes of speculative attacks. Diagnostics, however, imply that the crisis in Sweden 1992 has a disproportionate influence on the estimation results. During this crisis, the Swedish government raised interest rates to extremely high levels, but ultimately failed to defend and devalued several months later. To assess the magnitude of the impact of this outlier case on the estimation results, I exclude the Swedish 1992 crisis and re-estimate the same model. As we can infer from the third column in table 4.2, interest rate changes now have a strong and statistically significant influence on the probability that the exchange rate collapses. Without the outlier case, raising interest rates helps to defend the exchange rate against a speculative attack. The finding that interest rates are statistically insignificant when the Swedish crisis in 1992 is included holds for all other model specifications that I will discuss below.

To understand this results, it is important to note that the Swedish government raised interest rates to extraordinary high levels compared to the other governments in the dataset. While the average interest rate increase in the sample is 3%, the change in Swedish interest rates from August to September 1992 is 69%. None of the other governments in the dataset raised interest rates above 15%, indicating that the behavior of the Swedish government is

As an alternative, I could use strategic probit models (Signorino 1999). These models, however, impose very restrictive assumptions about the structure of a speculative attack, e.g. the length of a crisis, and are not able to account for right-censoring.
exceptional.²⁹ The adverse effect of such a high interest rate level on crisis outcomes suggests that interest rate defenses only work if the minimum interest rate that is necessary to stop speculation is not too high. In other words, for low and intermediate levels of speculation, raising interest rates is effective. If speculative pressure is exceptionally large, the minimum interest rate is exceptionally large as well. In this case, interest rate defenses are ineffective because the adverse effects of high interest rates on the economy dominate the signal of strength that interest rates send to market participants (Drazen and Masson 1994).

The second column in table 4.2 tests for this possible non-linear effect of high interest rates on crisis outcomes (including Sweden 1992). Squared interest rate changes reflect the idea of an inverse U-shaped impact as proposed by some theoretical models (see, for instance, Lahiri and Végh 2003). It is possible that high interest rates reduce the hazard of devaluation for low and intermediate levels of interest rates, but increase the probability of devaluation when interest rates are raised beyond a certain point. The results show that this is indeed the case. Both changes and squared changes in interest rates exhibit a statistically significant influence when the squared term is included. This model predicts that the hazard of devaluation decreases if the interest rate hike is less than 32% and increases for interest rate changes that are greater than 32%. This result, however, depends on the inclusion of the Swedish crisis in 1992. It is an indication that the non-linear relationship of high interest rates that some theoretical models propose may hold empirically. But it is not a reliable test of this proposition because the number of cases where interest rates reach such spectacular levels are very rare.

There are two reasons why these results differ fundamentally from Kraay’s (2003). First, I use a different measure of interest rates. To measure monetary policy, Kraay uses the discount rate from the International Financial Statistics database that is defined as an ‘end of month’ indicator. Short-term market interest rates, as used in this study, are defined as monthly averages.³⁰ Using an ‘end of month’ indicator of monetary policy is problematic

---

²⁹ I am using monthly data and therefore monthly averages for the estimations. The numbers reported here thus are low compared to stories of spectacular interest rate increases up to several hundred percent. As mentioned in the introduction, the Swedish government raised interest rates up to 500% during the 1992 crisis. Since the government increased and decreased interest rates within the same month, the IMF International Financial Statistics database reports an average of 82% for Sweden in September 1992.

³⁰ The discount rate is IFS line 60. Short-term market interest rates are IFS line 60b.
because it does not capture changes in interest rates within the same month. Moreover, short-term market interest rates better reflect overall monetary policy than the discount rate. Second, my analysis is based on a more coherent sample. Since my sample does not include medium-income countries, the types of crises included in the dataset are more comparable.

The results for the other variables in the economic baseline model show that real GDP growth and inflation prior to the attack do not affect the outcome of the crisis. The coefficient for growth implies that the lower economic growth, the more likely it is that the government will devalue. This is consistent with theoretical models of currency crises emphasizing that the political costs of a defense are particularly high when growth is low (Obstfeld 1996). The coefficient for growth, however, is statistically insignificant for all models. The coefficient for inflation is consistently negative, but not statistically significant. In a study on crises in developing countries and emerging market economies, Sattler and Walter find that inflation has a strong and positive effect on crisis outcomes in those countries (see chapter 5). This is a first indication that, on average, the causes of crises differ between OECD and developing countries. Attacks in the former set of countries are primarily caused by doubts about the government’s political commitment to the peg. Crises in the latter set of countries generally emerge when governments pursue economic policies that are inconsistent with the fixed exchange rate.

The last explanatory variable in the baseline model is the de jure exchange rate regime. The results show that governments defend more often, the less flexible the official exchange rate regime. As recent research has shown, many governments de facto tie their currency to the currency of another country without announcing this peg in public (Levy-Yeyati and Sturzenegger 2005; Reinhart and Rogoff 2004). The results imply that the loss of credibility that a government occurs when it devalues is greater for those governments that have officially announced that they fixed their exchange rate. Those policymakers that have announced a stricter peg therefore defend their exchange rate more often against an attack.

The empirical models presented do not include the ratio of reserves to the money base. Estimations including this variable produce coefficients that consistently point into the wrong

---

31 As an example, the Swedish discount rate as reported in the IFS database (line 60) does not change at all from August to September 1992. As mentioned above, Swedish short-term interest rates (line 60b) increase by 69%.

32 Crises in developing countries often are caused by weak economic fundamentals, specifically low levels of foreign exchange reserves. Crises in industrialized countries emerge because market participant have doubts about the government’s political willingness to defend rather than depletion of reserves.

33 I will return to this issue when I discuss the role of reserves in OECD countries.
direction both for reserves / M1 and reserves / M2. For some specifications, these coefficients are statistically significant suggesting that governments devalue more often the higher their reserve level. Based on these counterintuitive estimation results, I conclude that reserves do not play a role for crises in OECD countries. This is consistent with the theoretical literature suggesting that, contrary to many crises in the developing world, attacks on OECD currencies were not caused by the depletion of reserves. Moreover, the poor quality of the data for the money base, particularly during the 1970s and 1980s, pose a serious problem for empirical analyses like this one. The data for the money base are not available for several countries for certain periods, which significantly reduces the number of observations. This is particularly problematic for small samples as the one underlying this analysis. For these reasons, I decided to exclude the reserves to money ratio from the estimations. Excluding this variable does not affect the estimated impact of the other variables reported here.

Since the results of parametric duration models are sensitive to the underlying assumptions about the shape of the hazard rate, I conduct several robustness tests. First, I examined whether the results are produced by a potentially incorrect parameterization of the distribution of failure times. The fourth column in table 4.2 shows the results of a Weibull model with the same specification as the log-normal model in the third column. The key results are the same for both models, but the estimated effects of the explanatory variables on the duration of the exchange rate peg change slightly. Re-estimating the Weibull model in the proportional hazard (PH) metric shows that the results correspond to those from a less restrictive Cox proportional hazard model that leaves the particular form of the duration dependency unspecified. The results from the Cox model are not reported here.

The model fit statistics at the bottom of the table clearly select the log-normal model over the Weibull model. Both the Akaike and the Schwartz Bayesian Information Criteria

34 The so-called second-generation models emphasizing the political willingness to defend were developed in response to crises in industrialized countries. Earlier, first-generation models that focus on the role of foreign currency reserves were not able to account for the events of the 1992-93 crisis of the European Monetary System. During the 1990s, the stock of foreign reserves was large in all European countries, sometimes even exceeding the money base of the respective country (Obstfeld and Rogoff 1995, p.78). Reserves thus did not play an important role in these crises, contrary to crises in developing countries, e.g. in Mexico from 1973 to 1982 or in Argentina from 1978 to 1981.

35 The money base series often exhibit breaks that are not produced by changes in monetary policy, but by changes in definitions etc. One of many examples is France, December 1977 / January 1978. This generates fundamentally different reserves / money ratios for the different subperiods without any substantive reason.

36 In almost all cases, the data that were missing in the IMF and OECD databases were not available from national statistical offices and central banks.
Table 4.2: Duration of exchange rate peg after attack, accelerated failure-time metric

<table>
<thead>
<tr>
<th>Distribution / Variable</th>
<th>Log-normal</th>
<th>Log-normal (≈ SWE '92)</th>
<th>Log-normal (≈ SWE '92)</th>
<th>Weibull (≈ SWE '92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δir₁</td>
<td>0.008</td>
<td>0.238***</td>
<td>0.207***</td>
<td>0.221**</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.080)</td>
<td>(0.074)</td>
<td>(0.109)</td>
</tr>
<tr>
<td>(Δir₁)²</td>
<td></td>
<td>-0.004***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth₁₋₁</td>
<td>0.076</td>
<td>0.054</td>
<td>0.055</td>
<td>0.072</td>
</tr>
<tr>
<td></td>
<td>(0.050)</td>
<td>(0.047)</td>
<td>(0.047)</td>
<td>(0.046)</td>
</tr>
<tr>
<td>Inflation₁₋₁</td>
<td>-0.014</td>
<td>-0.024</td>
<td>-0.024</td>
<td>-0.010</td>
</tr>
<tr>
<td></td>
<td>(0.036)</td>
<td>(0.035)</td>
<td>(0.036)</td>
<td>(0.033)</td>
</tr>
<tr>
<td>De jure regimeₖ</td>
<td>0.363**</td>
<td>0.297*</td>
<td>0.304*</td>
<td>0.349**</td>
</tr>
<tr>
<td></td>
<td>(0.162)</td>
<td>(0.156)</td>
<td>(0.158)</td>
<td>(0.173)</td>
</tr>
<tr>
<td>CBI,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partisanshipₖ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Electionₖ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Electionₖ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.252</td>
<td>0.196</td>
<td>0.205</td>
<td>0.386</td>
</tr>
<tr>
<td></td>
<td>(0.814)</td>
<td>(0.774)</td>
<td>(0.784)</td>
<td>(0.833)</td>
</tr>
</tbody>
</table>

| Shape parameter       | σ = 1.54   | σ = 1.43               | σ = 1.46               | 1/p = 1.21          |
| N (Times at risk)      | 87 (393)   | 87 (393)               | 86 (389)               | 86 (389)            |
| Wald χ²                | 8.45*      | 19.58***               | 17.48***               | 10.94**             |
| Log Likelihood         | -108.72    | -104.51                | -103.33                | -109.26             |
| AIC / SBC              | 229 / 244  | 223 / 240              | 218 / 233              | 230 / 245           |

Notes: Robust standard errors are listed in brackets below coefficients. * indicates p ≤ 0.1; ** indicates p ≤ 0.05; *** indicates p ≤ 0.01.
<table>
<thead>
<tr>
<th>Distribution / Variable</th>
<th>Log-normal (¬ SWE '92)</th>
<th>Log-normal (¬ SWE '92)</th>
<th>Log-normal (¬ SWE '92)</th>
<th>Log-normal (¬ SWE '92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(-SWE'92)</td>
<td>0.205***</td>
<td>0.210***</td>
<td>0.211***</td>
<td>0.206***</td>
</tr>
<tr>
<td></td>
<td>(0.073)</td>
<td>(0.073)</td>
<td>(0.071)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>(Δir1)^2</td>
<td>0.037</td>
<td>0.054</td>
<td>0.043</td>
<td>0.022</td>
</tr>
<tr>
<td></td>
<td>(0.049)</td>
<td>(0.047)</td>
<td>(0.047)</td>
<td>(0.048)</td>
</tr>
<tr>
<td>log(-SWE'92)</td>
<td>-0.019</td>
<td>-0.025</td>
<td>-0.027</td>
<td>-0.022</td>
</tr>
<tr>
<td></td>
<td>(0.035)</td>
<td>(0.035)</td>
<td>(0.033)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>De jure regimei</td>
<td>0.310**</td>
<td>0.312**</td>
<td>0.297*</td>
<td>0.305**</td>
</tr>
<tr>
<td></td>
<td>(0.151)</td>
<td>(0.155)</td>
<td>(0.153)</td>
<td>(0.146)</td>
</tr>
<tr>
<td>CBIi</td>
<td>1.337*</td>
<td>1.427*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.734)</td>
<td>(0.732)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partisanshipi</td>
<td>0.107</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.194)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Electioni</td>
<td>-0.321</td>
<td>-0.301</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.433)</td>
<td>(0.439)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Electioni</td>
<td>-0.796**</td>
<td>-0.887**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.396)</td>
<td>(0.372)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.422</td>
<td>0.179</td>
<td>0.513</td>
<td>-0.141</td>
</tr>
<tr>
<td></td>
<td>(0.761)</td>
<td>(0.781)</td>
<td>(0.788)</td>
<td>(0.757)</td>
</tr>
<tr>
<td>Shape parameter</td>
<td>σ = 1.42</td>
<td>σ = 1.46</td>
<td>σ = 1.42</td>
<td>σ = 1.37</td>
</tr>
<tr>
<td>N (Times at risk)</td>
<td>86 (389)</td>
<td>86 (389)</td>
<td>86 (389)</td>
<td>86 (389)</td>
</tr>
<tr>
<td>Wald χ²</td>
<td>24.08***</td>
<td>17.91***</td>
<td>23.82***</td>
<td>31.09***</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-101.46</td>
<td>-103.18</td>
<td>-101.56</td>
<td>-99.21</td>
</tr>
<tr>
<td>AIC / SBC</td>
<td>216 / 234</td>
<td>220 / 237</td>
<td>219 / 238</td>
<td>218 / 242</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are listed in brackets below coefficients.  
* indicates p ≤ 0.1; ** indicates p ≤ 0.05; *** indicates p ≤ 0.01.
show considerably lower values for the log-normal model. This is the case for two reasons. First, I used Schoenfeld residuals to check whether the proportional hazards assumption is violated for the Weibull model (Box-Steffensmeier and Jones 2004, p.131-137). Based on the test statistics, the hypothesis that the PH assumption is not violated can be rejected at the 5% significance level for both interest rate increases and real GDP growth. Since the log-normal model does not impose the assumption of proportional hazards, this model is more appropriate.

Second, the hazard rate of the Weibull model decreases monotonically since the shape parameter of the Weibull model, \( p \), is smaller than one (Box-Steffensmeier and Jones 2004, p.25-31). This means that the hazard that the exchange rate collapses at a particular point in time, given that it has survived until then, decreases over time. The shape parameter of the log-normal model, \( \alpha \), indicates that the hazard rate of the log-normal model rises to its peak quickly and then falls (Box-Steffensmeier and Jones 2004, p.31-37). This means that the hazard that the exchange rate collapses first increases slightly and then decreases. Analyzing the hazard rate of a Cox model with the same specification confirms that this is the case. Since the log-normal model accounts for the short increase of the hazard at the beginning of the examination period, it performs better.

The models in columns 5 - 7 test the predictions of the theoretical model about the political and institutional determinants of crisis outcomes. Column 5 shows that governments defend the peg more often, the more independent the central bank. This implies that attempts to defend are more credible if a conservative central banker guarantees monetary stability in the future. Political commitment to the peg is also higher in these countries because the monetary authority is less exposed to popular pressure to devalue when the adverse economic effects of a defense become apparent. The coefficient is only statistically significant at the 10% level. Outlier analysis shows that some cases exhibit a disproportionate influence. Without these observations, the estimated impact increases, and the coefficient is statistically significant at the 5% level.

The sixth column shows that government partisanship does not have a statistically significant influence. As the theoretical model suggests, this may be the case because the higher credibility costs of devaluation that left-wing governments face outweigh the higher costs of defense of these governments. Finally, governments devalue more often after

---

Note that \( p = 1/\alpha \) for the log-normal model. When \( p \) is large, the hazard rate of a log-normal model first increases slowly and then decreases. When \( p \) is small, the hazard rate reaches its peak quickly and then falls monotonically.
Table 4.3: Duration of exchange rate peg with selection, accelerated failure-time metric

<table>
<thead>
<tr>
<th>Duration</th>
<th>Log-normal (− SWE '92)</th>
<th>Weibull (− SWE '92)</th>
<th>Log-normal (− SWE '92)</th>
<th>Weibull (− SWE '92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta t_r$</td>
<td>0.206*** (0.066)</td>
<td>0.224** (0.109)</td>
<td>0.193*** (0.065)</td>
<td>0.204** (0.100)</td>
</tr>
<tr>
<td>Growth$_{t-1}$</td>
<td>0.045 (0.047)</td>
<td>0.072 (0.045)</td>
<td>0.021 (0.050)</td>
<td>0.030 (0.045)</td>
</tr>
<tr>
<td>Inflation$_{t-1}$</td>
<td>-0.017 (0.035)</td>
<td>-0.012 (0.034)</td>
<td>-0.016 (0.032)</td>
<td>-0.011 (0.034)</td>
</tr>
<tr>
<td>De jure regime$_t$</td>
<td>0.314** (0.148)</td>
<td>0.349** (0.172)</td>
<td>0.305** (0.139)</td>
<td>0.316* (0.173)</td>
</tr>
<tr>
<td>CBI$_t$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-election$_t$</td>
<td></td>
<td>-0.708* (0.373)</td>
<td>-0.932* (0.491)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.891 (0.882)</td>
<td>0.633 (0.829)</td>
<td>-0.834 (0.852)</td>
<td>0.252 (1.010)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selection</th>
<th>Log-normal (− SWE '92)</th>
<th>Weibull (− SWE '92)</th>
<th>Log-normal (− SWE '92)</th>
<th>Weibull (− SWE '92)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth$_{t-1}$</td>
<td>0.005 (0.014)</td>
<td>0.004 (0.009)</td>
<td>0.006 (0.014)</td>
<td>0.004 (0.009)</td>
</tr>
<tr>
<td>Inflation$_{t-1}$</td>
<td>0.023* (0.014)</td>
<td>0.019** (0.009)</td>
<td>0.024* (0.014)</td>
<td>0.019** (0.009)</td>
</tr>
<tr>
<td>Overvaluation$_{t-1}$</td>
<td>-0.042* (0.024)</td>
<td>-0.018 (0.014)</td>
<td>-0.036 (0.024)</td>
<td>-0.017 (0.014)</td>
</tr>
<tr>
<td>Financial Openness$_t$</td>
<td>-0.006 (0.059)</td>
<td>0.007 (0.037)</td>
<td>-0.003 (0.060)</td>
<td>0.007 (0.037)</td>
</tr>
<tr>
<td>Contagion$_t$</td>
<td>1.521*** (0.160)</td>
<td>1.195*** (0.140)</td>
<td>1.533*** (0.157)</td>
<td>1.198*** (0.140)</td>
</tr>
<tr>
<td>CBI$_t$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-Election$_t$</td>
<td></td>
<td>0.163 (0.130)</td>
<td>0.108 (0.085)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-2.320*** (0.180)</td>
<td>-1.575*** (0.115)</td>
<td>-2.285*** (0.202)</td>
<td>-1.561*** (0.130)</td>
</tr>
</tbody>
</table>

Shape parameter

<table>
<thead>
<tr>
<th>$\sigma$ = 1.49</th>
<th>$1/p = 1.17$</th>
<th>$\alpha = 1.49$</th>
<th>$1/p = 1.10$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.339* (0.191)</td>
<td>0.088** (0.044)</td>
<td>0.227 (0.198)</td>
<td>0.098** (0.046)</td>
</tr>
<tr>
<td>N (Uncensored)</td>
<td>3365 (86)</td>
<td>3365 (86)</td>
<td>3365 (86)</td>
</tr>
<tr>
<td>LR / Wald $\chi^2$</td>
<td>127.01***</td>
<td>93.46***</td>
<td>130.37***</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-442.23</td>
<td>-463.66</td>
<td>-437.09</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are listed in brackets below coefficients.
* indicates $p \leq 0.1$; ** indicates $p \leq 0.05$; *** indicates $p \leq 0.01$. 

100
elections. This is in accordance with the empirical results of the non-crisis literature that finds that devaluations occur more often in the aftermath of elections (Blomberg et al. 2005; Klein and Marion 1997). The impact of pre-election periods is statistically not significant.

The results for the selection models in table 4.3 indicate that selection bias may influence the results of the outcome equation, but the evidence is not conclusive. The two columns on the left present a log-normal and a Weibull model with a purely economic specification. The two columns on the right show the same models including the two statistically relevant political variables from the duration models of table 4.2. The results do not change if we include the other political variables tested before. The selection equation includes two additional variables, financial openness and contagion. From a theoretical point of view, these variables do not directly influence government behavior, but affect crisis outcomes merely through their influence on the probability of an attack.

The estimated correlation between the error terms of the two equations is positive for all models. These values of rho suggest that if the probability of a crisis is greater than average, then the duration of the exchange rate peg is smaller than average. This is consistent with theoretical considerations. Although rho is statistically significant for all specifications, except the political log-normal model, the major results in the outcome equation do not change. The results between the standard Weibull and the Weibull model with selection are identical. The estimated impact of de jure exchange rate regime on the duration of the peg increases slightly for the log-normal model. The results for the political models in the third and fourth columns of table 4.3 are also nearly identical to the non-selection models.

4.5 Conclusion

This study does not confirm the results from previous empirical research that raising interest rates is an ineffective tool to defend an exchange rate peg. It shows that interest rates are effective to stop low and intermediate levels of speculative pressure. The results also

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38 Note that rho varies between −0.25 and +0.25 for the Weibull model and between −1 and +1 for the log-normal model. The smaller values of rho for the Weibull model in table 4.3 therefore do not imply a lower error correlation for the Weibull models.

39 A major problem for selection models in this context is the rare occurrence of crises. In the dataset, there are 87 crises out of 3327 country-months, which is around 2.5% of all observations. The predictive power of empirical models thus is quite low and makes it difficult to adequately correct for non-random selection into the sample of crises.
suggest that raising interest rates may be counterproductive if speculation is extremely strong. When speculative pressure is very high, the minimum interest rate necessary to defend is also high, and its adverse impact on the economy may dominate the signal of strength that high interest rates send to speculators.

Governments thus have to use interest rates cautiously when they face an attack. While raising interest rates signals strength and commitment to traders in the foreign exchange market, the government has to be aware that the domestic contractionary effects of such a defense can be severe. Governments that do not have the political strength and willingness to defend over a longer period of time should rather devalue immediately. The chances that the defense fails when the government tries to bluff should not be underestimated, and the welfare consequences of such failed defenses can be grave.

The findings about the potentially adverse effect of extremely high interest rates are preliminary, however. Future research should further investigate the impact of such spectacular interest rate hikes on the outcome of crises. Since such events are very rare, the standard large-n cross-sectional methods are unlikely to be helpful for further analyses of this question. Other types of research design could be more fruitful. A possibility is to examine two cases that match on the important explanatory variables, including the level of interest rate, but differ with respect to the success of the defense. A comparison of the Swedish crisis in 1992 with another high interest rate defense in a similar country that was successful could yield interesting insights into the mechanisms that ultimately led to the two different outcomes.
4.6 Appendix: Definition of Variables and Data Sources

Unless declared otherwise, economic data are taken from the International Monetary Fund’s *International Financial Statistics* CD-ROM (IFS), various years.

*Central Bank Independence*

Central bank independence is defined as the legal central bank autonomy and is taken from Cukierman (1992, chapter 19) and Cukierman et al. (2002). The variable is a weighted index of 16 characteristics of central bank charters regarding authority over monetary policy, relative importance of prices stability as stated in the law, procedures of appointment / dismissal of CB governors. The index is rescaled and varies from 0 to 1.

*Contagion*

If there is at least one other crisis in the international financial system within the same month, the contagion variable takes the value 1. If there is no other crisis, it takes the value 0. Crises are defined using the modified EMP index as described in the text.

*De Jure Exchange Rate Regime*

Data on the de jure exchange rate regime are from Ghosh, Gulde and Wolf (2002). The classification is based on the IMF’s *Annual Report on Exchange Arrangements and Exchange Restrictions*. The indicator varies from 1 to 15 with higher numbers denoting more flexible regimes.

*De Facto Exchange Rate Regime*

I use the indicators of de facto exchange rate regimes by Reinhart and Rogoff (2004). They classify de facto regimes based on country chronologies, (official and illegal) parallel market exchange rates, and exchange rate variability over a rolling five-year period. The indicator varies from 1 (“no separate legal tender”) to 13 (“freely floating”). Category 14 denotes “freely falling” rates (periods of hyperinflation).

*Elections*

Pre-election periods are coded 1 during six months prior to an election and 0 otherwise. Post-election periods are coded 1 during six months after an election and 0 otherwise. Data are
from Woldendorp, Keman and Budge (1998) and from the Database of Political Institutions (Beck et al. 2001).

Exchange Rate
The price of the domestic currency in terms of U.S. dollars (IFS line rf).

Financial Openness
I use the index by Chinn and Ito (Chinn and Ito 2002; 2005) measuring the degree of capital account openness. The indicator is based on the IMF’s Annual Report on Exchange Arrangements and Exchange Restrictions and includes variables indicating the presence of multiple exchange rates, restrictions on current and capital account transactions and the requirement of the surrender of exports proceeds.

Foreign Reserves / Money
Foreign Reserves are total reserves held by the central bank in U.S. dollars minus gold (IFS line 11.d). The amount of reserves is divided by the monetary aggregate M1 (IFS line 34)

Government Partisanship
Government partisanship measures overall political ideology of the incumbent government. The index is provided by Woldendorp, Keman and Budge (1998) and the Database of Political Institutions. Left-wing governments are coded –1, right-wing government are coded 1 and governments that belong to the political center are coded 0.

Inflation
Inflation is the annual percentage change in the consumer price index CPI (IFS line 64). For the estimations, we use the average inflation rates during the previous three months.

Interest Rates
I use (short-term) money market rates (IFS line 60b) as first choice and discount rates (IFS line 60) as second choice if money market rates are not available. Money market rates reflect overall monetary policy better than discount rates. Moreover, IFS line 60 (discount rate) is defined as “end of period” rate, implying that changes within a month may not be visible.
**Real Exchange Rate Overvaluation**

Real Exchange Rate Overvaluation is the difference between the real exchange rate and the long-run real exchange rate path. This path was calculated using a Hodrick-Prescott filter ($\lambda = 14400$) that isolates the long-term trend component of a series. The real exchange rate is the nominal exchange rate (IFS line rf) adjusted for differences between foreign and domestic (consumer) price levels (IFS line 64). This procedure follows Goldfajn and Valdés (1998) and Leblang (2003).

**Real GDP Growth**

Real GDP growth is the annual percentage change in real GDP. Real GDP is nominal GDP (IFS line 99b) adjusted by price levels. For the estimations, I use the average growth rate during the previous three months.
Chapter 5

Political Regime Type and Exchange Rate Defenses

Thomas Sattler and Stefanie Walter

5.1 Abstract

Political economy research suggests contradictory answers to the question whether and how a country’s political regime type influences government reactions to speculative attacks. While some studies suggest that democratic governments are more likely to devalue their currencies than autocratic governments, others imply the opposite. We present a game-theoretic model of an exchange rate defense to examine the theoretical mechanisms underlying these competing hypotheses. We test the model’s empirical implications for 106 speculative attacks in developing and emerging market economies from 1983 to 2003. The estimation results from duration and selection models show that democratic governments are significantly more likely to defend their exchange rate against speculative attacks than autocratic governments. Exceptions are oil-exporting autocracies, which in our sample always defend their pegs. The hazard of an exchange rate collapse during the six months after an attack is smaller when the level of foreign exchange reserves is high and inflation is low. Real economic growth does not influence the outcome of an attack.
5.2 Introduction

During the last three decades, widespread capital account liberalization has significantly increased the importance of international capital flows. While this development has been beneficial in many respects, it has also increased the danger of global financial crises. As the Asian Financial Crisis demonstrated, a successful speculative attack in one country can cause a chain reaction of currency crises throughout a whole region (and beyond). The prevention of such crises therefore has been the subject of much research. Most studies, however, have focused on the emergence of speculative attacks, while much less thought has been given to possible policy responses. Contrary to the belief that increasing capital mobility has decreased policymakers’ ability to defend their currencies against such pressure, empirical evidence indicates that policymakers often successfully withstand speculative pressure. Approximately every second speculative attack fails, implying that governments successfully defend their exchange rates quite frequently. This raises the question under what circumstances policymakers defend their currencies. Do certain institutional frameworks, e.g. political regime type, enhance policymakers’ ability and willingness to defend their exchange rate pegs?

Large-N analyses of crisis outcomes so far have either focused on democratic countries (Eichengreen et al. 2003a; Leblang 2003b) or disregarded political explanations completely (Kraay 2003). The political willingness to defend the exchange rate peg, however, is likely to vary across governments whose political survival depends to different degrees on the support from the population. Democratic governments have to evaluate the political costs of economic policies and outcomes much more carefully than autocratic governments. And as previous research has shown, exchange rate policy in non-crisis periods differs significantly across democratic and autocratic governments (Bearce and Hallerberg 2006).

The literature yields contradictory implications about the impact of political regime type on the choice of policy responses to speculative attacks. Drawing on evidence from the collapse of the Gold Standard in the interwar period, some scholars have argued that democratic regimes are more likely to devalue their currencies in response to exchange rate pressure than autocratic regimes (Eichengreen 1996; Simmons 1994). Looking at crises during the post-Bretton Woods era, other scholars have found that democracies seem to be less likely to fall victim to a speculative attack than autocratic regimes (Block 2003; Leblang 2003a). These results are counterintuitive. If autocratic regimes are more likely to defend their
currencies, they should be attacked less frequently than democracies. But speculators seem to
attack autocracies more often, even though some researchers predict that these attacks are
more likely to fail.

We present a game-theoretic model of an exchange rate defense to explore the
theoretical mechanisms underlying these competing hypotheses. By modeling the impact of
political regime type on speculative behavior and governments’ policy responses explicitly,
we are able to derive three competing hypotheses. First, if the effect of democracy on the
costs of devaluation dominates its effect on the costs of defense, democracies are more likely
to defend their currencies. Second, if being democratic raises the costs of defending beyond
the costs of devaluing, democracies are more likely to defend. Finally, the model also
suggests that higher regime transparency may decrease the probability of an attack. Because
autocracies generally are less transparent than democracies, autocratic governments may be
attacked more often than equally committed democratic governments. Failure to account for
this non-random selection into the samples of crises may therefore lead to biased conclusions.

We test the model’s competing predictions with data for 106 speculative attacks on the
currencies of emerging market economies and developing countries from 1983 to 2003. Our
results show that democratic governments defend their exchange rates significantly more
often than autocratic governments. Exceptions are oil-exporting autocracies, e.g. Kuwait and
Saudi-Arabia, that – contrary to the general pattern across the other autocratic countries –
always defend their currencies in our sample. These results are robust to a variety of
specifications. Controlling for other domestic political variables that might affect government
decisions in democratic countries, such as elections and government partisanship, does not
change our results. Moreover, we do not find any significant effect of these variables on crisis
outcomes. The empirical analysis also shows that high pre-crisis levels of foreign exchange
reserves and low inflation rates decrease the probability of a devaluation. Real GDP growth
has no effect on the outcome of speculative attacks.

In addition to showing the positive effect of a democratic regime type on the
probability of an exchange rate defense, our analysis also addresses a number of other
unresolved issues in the currency crisis literature. First, studies in economics have shown that
economic variables alone cannot account sufficiently for the success or failure of speculative
attacks (Eichengreen et al. 2003a; Kraay 2003). We complement the crisis literature by
analyzing the determinants of political commitment to exchange rate pegs. Second, we use a
less restrictive definition of crisis outcomes than other studies on government reactions to
attacks (Kraay 2003; Leblang 2003b). While these studies have primarily analyzed the
policymakers’ immediate reactions to attacks, we examine how long the exchange rate peg survives after the onset of a crisis. This is more consistent with the observation that crises generally last several months rather than several days. Third, we use econometric techniques that better capture the characteristics of a crisis than the methods used in earlier research. The duration models better reflect the dynamics of a crisis than the previously used probit and strategic probit analyses. We also control for potential non-random selection of crises by explicitly modeling the selection process with duration-selection models. Overall, these refinements increase our confidence in the estimation results.

5.3 Theoretical Model

5.3.1 Model Setup and Equilibrium

To examine the different theoretical mechanisms underlying the competing hypotheses on government behavior in times of heightened exchange market pressure, we develop a game-theoretic model that allows us to analyze the impact of the political regime type on crisis outcomes. For this purpose, we follow the tradition of second generation currency crisis models and emphasize the role of government commitment to the exchange rate peg and speculators’ devaluation expectations (Bensaid and Jeanne 1997; Drazen 1999; Drazen and Masson 1994; Obstfeld 1994). We start with a government that follows a pegged exchange rate regime. The extent of its commitment to the peg depends on \( \theta \), the political cost associated with abandoning the peg. Speculators are uncertain about the extent of government commitment to the exchange rate peg. Government types are continuous, i.e. \( \theta \in [\overline{\theta}, \overline{\theta}] \). Speculators’ prior beliefs about the government’s type are uniformly distributed across this interval.

At the beginning of the game, a random economic shock, \( \eta \), occurs, which is observed by both speculators and the government. The shock can be negative, increasing the costs of maintaining the exchange rate peg, or nonnegative, implying the opposite. After observing the shock, speculators decide whether or not to speculate against the country’s currency.\(^1\) If speculators decide to speculate, the government can use its policy instrument, the interest rate \( i \), to stop speculation. By raising interest rates to a high level, \( r^H \), the government can defend

\(^1\)To keep the model simple, we do not model speculator behavior explicitly. For a model that explicitly addresses the optimization problem of speculators, see chapter 3.
its exchange rate. If the government decides not raise interest rates to reduce speculation, the exchange rate has to be devalued by an exogenous amount $\delta$, and speculators realize a profit.

The government faces a trade-off between the costs of devaluing and the costs of defending the exchange rate peg. Failure to defend the exchange rate against an attack is politically costly because devaluations have adverse economic effects, put the government’s economic policy competence into question and reduce its monetary credibility.\(^2\) Defending the exchange rate is also costly, because the required monetary tightening depresses investment and growth. To model this situation, the utility of the government is

$$U^G(\theta, i, \eta) = \begin{cases} \theta - \gamma i + \eta & \text{if } \Delta e = 0 \\ 0 & \text{if } \Delta e = \delta. \end{cases}$$

where $\Delta e$ denotes the behavior of the exchange rate. The costs of keeping the peg are increasing in the choice variable $i$. The parameter $\gamma$ determines how much a specific interest rate level affects government utility. The costs of keeping the peg also increase when a shock decreases economic performance, $\eta < 0$, and decrease when the opposite is the case, $\eta > 0$. This implies that both higher interest rates and worse economic circumstances, as represented by the economic shock, decrease the government’s utility from defending the peg.

We assume that the minimum interest rate to defend is

$$i^H = \delta p. \tag{2}$$

This implies that to stop capital outflow, the government has to increase the cost of speculation such that interest on domestic capital is at least as high as the weighted rate of return from devaluation, i.e. the size of the devaluation multiplied by the probability that this devaluation will occur, $p$. In chapter 3 of this dissertation, Sattler explicitly derives equation (2) from the speculators’ optimization problem.

In equilibrium, there are three possible outcomes. In the first case, all governments devalue and therefore always attack. In a second case, all governments defend the exchange rate peg and no attack occurs. In these cases, all governments behave in the same manner. In the third case, speculators attack the peg and relatively strongly committed governments

\(^2\) Devaluations also have a positive long-run effect because they increase export competitiveness. However, governments are more likely to get blame for the negative short-run effects than credit for the positive long-run effects.
defend, while other, relatively weakly committed governments devalue. Which outcome occurs depends on the structure of speculators' prior beliefs about the government's resolve to defend the exchange rate peg, i.e. on the values of $\bar{\theta}$ and $\underline{\theta}$ compared to the other exogenous parameters.

If observable indicators of government characteristics suggest that commitment to the exchange rate is low, then speculators always attack and the government always devalues. Specifically, if speculators’ prior beliefs are such that $\bar{\theta} < \bar{\theta}^{\text{min}}$ with $\bar{\theta}^{\text{min}} = \gamma \delta + \eta$, the probability of devaluation is equal to one. In this case, speculators know that the cost of a devaluation is always smaller for the government than the cost of a defense. If the government is a strongly committed government type, i.e. if $\bar{\theta} > \bar{\theta}^{\text{min}}$ and $\Theta > \Theta^{\text{max}}$ with $\Theta^{\text{max}} = \eta$, it never devalues and the probability of devaluation is zero. Speculators anticipate this and therefore do not attack. Finally, for intermediate government types, i.e. if $\bar{\theta} > \bar{\theta}^{\text{min}}$ and $\Theta < \Theta^{\text{max}}$, speculators attack and some governments devalue while the others defend. The ex-ante probability of devaluation is $p = (\eta - \Theta)/(\bar{\theta} - \Theta - \gamma \delta)$. Governments devalue if $\Theta < \hat{\Theta}^i$ and defend otherwise, with $\hat{\Theta}^i = \gamma \delta \rho + \eta$. The term $\hat{\Theta}^i$ represents the government type that is indifferent between devaluation and defense.

The extension to multiple periods is straightforward, but substantially complicates the model. The key insights of the model also hold for multiple periods. In a multiple period model, governments can signal their commitment to the exchange rate by raising interest rates. Speculators can extract information about the government’s type from the government’s reaction to the attack. The multiple period game suggests that crises do not necessarily come to an end after one period, but can last several periods (Drazen 1999; 2000, see also chapter 3). This is consistent with calibration exercises by Bensaid and Jeanne (1997). The insight that crises can last several months will be important for the operationalization of crises and crisis outcomes in the empirical section.

5.3.2 Comparative Statics and Hypotheses

It is now possible to derive hypotheses about the impact of the political regime type on outcomes of speculative attacks. To do this, we first discuss how the regime type influences the relevant parameters in the model, specifically the costs of devaluation and defense and the extent of uncertainty about government commitment to the peg. Based on comparative statics
analysis for these parameters, we then derive three competing hypotheses that will be tested in
the empirical section.

The political economy literature suggests that exchange rate defenses are more costly
for democratic governments than for autocratic ones. The high level of interest rates required
for a successful exchange rate defense reduces growth and increases unemployment. Defenses
thus have a negative effect on large segments of the economy, most notably the nontradables
sector. Since the power of democratic governments rests on gaining the approval of a majority
of voters, democratic policymakers are less insulated from popular pressure to avoid the
painful domestic adjustment measures required for an exchange rate defense (Bearce and
Hallerberg 2006; Eichengreen 1996). This reduces their willingness to subordinate other
policy goals, such as higher economic growth, to the goal of exchange rate stability (Obstfeld
1994; 1996). In contrast, since autocratic governments generally depend on a small elite
rather than the support of broad segments of society, it is politically less costly for them to
repel a speculative attack (Eichengreen 1996). This does not mean that defenses are costless
for autocratic governments. Autocrats usually have strong relationships with the business
elite, who are opposed to extreme monetary tightening if this puts the economy into a deep
recession. Autocratic governments thus also face political costs from a defense, but the
political costs borne by democratic governments are likely to be larger.

To model this situation formally, recall from the last section that the parameter $\gamma$
reflects how much a specific interest rate level negatively affects government utility. In terms
of the model's parameters, higher costs of defense for democracies thus imply that the
parameter $\gamma$ increases with higher levels of democracy. This means that $\gamma'(r) > 0$, where $\gamma'(r)$
is the first derivative of $\gamma$ with respect to the regime type $r$. A higher $r$ denotes a more
democratic government.

Confronted with speculative pressure, governments face the dilemma that devaluing is
costly as well. First, devaluations make imported goods more expensive and cause
inflationary pressure, reducing nontradable industries' competitiveness, workers' real
incomes, and consumers' purchasing power (Broz and Frieden 2005; Frieden 1991). The
negative economic effects of devaluations are particularly strong in developing countries,
where devaluations tend to be outright contractionary (Frankel 2005). Devaluations thus have
economically painful consequences for large segments of the population. Second, the
exchange rate is a political symbol because many people see it as a symbol of the strength of a
country (Hibbs 1982). Voters also monitor the exchange rate to assess how well policymakers
are managing the economy and how healthy the economy is. A devaluation is often regarded as a broken promise and a sign of incompetent policymaking. Combined with the negative economic effects, such a signal strongly decreases governments’ popularity. Aware of this problem and dependent on voter approval, democratic governments often postpone devaluations until after the next elections (Blomberg et al. 2005; Frieden et al. 2001; Klein and Marion 1997; Stein and Streb 2004). Those who nevertheless devalue during campaign periods tend to lose their bid for re-election (Leblang 2005; Walter 2006). But devaluations decrease governments’ prospects of staying in power regardless of the electoral cycle (Cooper 1971; Frankel 2005), an effect that is about two thirds stronger in democratic, as opposed to non-democratic countries (Frankel 2005: Table H). The political cost of devaluations is consequently higher for democratic than for autocratic policymakers.3

In our model, the political costs of devaluation are represented by the parameter $\theta$. Since the exact value of $\theta$ is unknown to the speculator, we can model higher costs of devaluation by varying the upper limit of the distribution of $\theta$, i.e. $\bar{\theta}$. A higher $\bar{\theta}$ implies that the mean of the distribution of types increases and, therefore, the government’s expected costs of devaluation rise. Since we assume that the political costs of devaluation are higher for democratic governments, $\bar{\theta}$ increases with rising levels of democracy, i.e. $\bar{\theta}'(r) > 0$, where $\bar{\theta}'(r)$ is the first derivative of $\bar{\theta}$ with respect to the political regime type $r$.

While the literature indicates which types of costs policymakers incur from responding to speculative pressure, it does not specify which one of the effects prevails and which policy response democratic policymakers are therefore more likely to choose. To assess the overall impact of the regime type on the probability of devaluation, we derive $p$ with respect to $r$, which yields

$$\frac{\delta p}{\delta r} = -(\bar{\theta}'(r) - \delta \gamma'(r)) \cdot (\eta - \bar{\theta}) \cdot (\bar{\theta}(r) - \bar{\theta} - \delta \gamma'(r))^2$$

Equation (3) shows that when $r$ increases, the resulting change in the probability of devaluation depends on the relationship between $\bar{\theta}'(r)$ and $\gamma'(r)$. For $r \in [0,1]$ both the

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3 Autocratic policymakers sometimes use an exchange rate peg as a substitute for central bank independence (Broz 2002). In these instances, a devaluation causes a loss of monetary credibility, but the costs associated with this loss are long-term costs. Since we are primarily concerned with the political costs of devaluations, we place greater emphasis on short-term costs such as lower purchasing power or voter dissatisfaction.
second and third terms in equation (3) are positive and therefore do not influence the sign of
the derivative. Therefore,

\[
\frac{\partial p}{\partial r} \begin{cases} 
\geq 0 & \text{if } \theta'(r) \leq \gamma'(r) \\
< 0 & \text{if } \theta'(r) > \gamma'(r).
\end{cases}
\] (4)

A more democratic regime type increases the probability of devaluation if the regime
type’s impact on the costs of a devaluation is smaller than its impact on the costs of a defense,
and vice versa. The model thus yields two competing hypotheses about the impact of the
regime type on the probability of devaluation based on the regime type's effect on the
parameters \(\theta\) and \(\gamma\). Figure 5.1 illustrates this result graphically.\textsuperscript{4} The solid line shows how
the political regime type’s effect on the probability of devaluation changes when its impact on
the political cost of a defense \(\theta\) dominates its impact on \(\gamma\). Here, being democratic increases
the political costs of devaluation more than the political costs of defense. The implication of
this situation is that:

H1: Democratic governments are more likely to successfully defend their exchange rates
than autocratic governments.

The dashed line represents the case in which the effect of the regime type on \(\gamma\)
dominates its effect on \(\theta\). Higher levels of democracy increase the costs of devaluation less
than the costs of defense. This situation implies that

H2: Autocratic governments are more likely to successfully defend than democratic
governments.

The model implies a third possible mechanism that represents the view that exchange
rate choices are not the result of domestic political considerations (Simmons and Hainmueller
2004). In this case, the impact of regime type on government decisions about responding to a
speculative attack is negligible. Rather, the empirical finding that speculators attack the
currencies of autocratic states more frequently than those of democratic countries could be

\textsuperscript{4} We set \(\theta = 0, \eta = 1, \gamma \delta = 0.5, \theta'(r) = 1\) and \(\gamma'(r) = 0\) for the solid line. For the dashed line,
\(\theta = 0, \theta = 9, \eta = 1, \theta'(r) = 0\) and \(\gamma'(r) = 1\).
related to the degrees of transparency of the political systems, because political transparency has significant effects on foreign exchange market behavior. For example, exchange rate volatility decreases with rising levels of transparency (Hays et al. 2003). Since autocracies are generally less transparent than democracies (Rosendorff and Vreeland 2006), speculators face more uncertainty about autocrats' potential responses to speculative pressure than about democratic policymakers' potential behavior. While they can anticipate the outcome of an attack in a democratic country fairly well, this is much more difficult in non-democratic countries. To test the resolve of an autocratic policymaker to defend, market participants have to attack the currency, often resulting in failed attacks. This implies that autocratic countries may be attacked more frequently than democratic countries, regardless of their true commitment to the peg. The finding that autocracies are more likely to experience a speculative attack although they are more likely to defend thus can be reconciled when political system transparency is considered.\footnote{Although a greater degree of uncertainty means that speculators know less about the government, this does not imply that speculators attack less often. As we will show below, increasing uncertainty may increase rather than decrease the probability of devaluation from the speculators' point of view. What matters for speculators is not what they know per se, but their perceived probability of a devaluation.} To account for the impact of transparency on the likelihood of a speculative attack, we analyze how changing degrees of transparency affect

![Figure 5.1: Comparative statics results for costs of defense, $\gamma$, and costs of devaluation, $\bar{\theta}$. Higher $r$ denote more democratic regimes.](image-url)
speculators’ assessment of the probability of devaluation. The model suggests that higher
degrees of uncertainty can increase the probability of a speculative attack. To demonstrate this
outcome, we analyze the case of a strongly committed government that always defends under
complete information. In this example, the exchange rate is never attacked in a highly
transparent situation, but speculators attack when uncertainty is high.6

The government always defends under complete information if $\theta > \hat{\theta}^c$ with
$\hat{\theta}^c = \gamma \delta + \eta$. The term $\hat{\theta}^c$ corresponds to the marginal government type under complete
information, i.e. the government type that is indifferent between devaluation and defense
when there is no uncertainty.7 Under complete information the marginal type $\hat{\theta}^c$ is equivalent
to $\theta^{\text{min}}$. For our example, we assume that $\theta = \hat{\theta}^c + z$ with $z > 0$. Since $z$ is a positive number,
the government in our example is more strongly committed to the exchange rate than the
marginal government type that is indifferent between devaluation and defense. Since $\hat{\theta}^c$ and
$\theta^{\text{min}}$ are equivalent, the condition $\theta = \hat{\theta}^c + z$ implies that $\theta = \theta^{\text{min}} + z$. In the case of complete
information, speculators take this into account and therefore never attack the country’s
currency. We now introduce uncertainty by setting $\tilde{\theta} = \theta + \varepsilon$ and $\hat{\theta} = \theta - \varepsilon$. A greater $\varepsilon$ reflects
a greater variance of the distribution of types and therefore higher uncertainty. If $\varepsilon = 0$, there
is no uncertainty because the upper and lower boundaries of speculators’ prior beliefs
correspond to the government’s actual type, i.e. $\tilde{\theta} = \theta = \theta$.

Figure 5.2 illustrates the effect of increasing uncertainty on speculators’ assessment of
the probability of devaluation.8 In our example, the ex-ante probability of devaluation is zero
in a fully transparent situation because we have assumed that the government is fully
committed to the peg. Knowing for certain that the government will always defend,
speculators refrain from attacking the currency. When uncertainty increases symmetrically, however, the distribution of government types increasingly includes more and more weakly committed government types. From the speculators’ perspective, it thus becomes increasingly likely that the government might devalue in response to a speculative attack – although the government remains fully committed to defending the peg. Figure 5.2 demonstrates that higher degrees of uncertainty considerably increase speculators’ assessment of the probability of devaluation. This implies that large uncertainty can trigger an attack although the government is strongly committed to the peg.

Our analysis thus implies that higher uncertainty can produce a higher number of attacks that fail because, contrary to speculators’ expectations, policymakers successfully defend their exchange rates. Since autocracies generally are less transparent than democracies, we would expect that autocratic countries are attacked more often. As we have seen, such attacks can be unrelated to the government’s actual degree of commitment to an exchange rate peg. Hypothesis 3 summarizes the implication of this discussion.

H3: Exchange rates of autocratic countries are attacked more frequently than those of more democratic countries, even if policymakers are equally committed to their pegs.
5.4 Empirical Analysis

5.4.1 Data and Method

The previous section identified three competing hypotheses about the effect of the political regime type on crisis outcomes, which predict either a positive, a negative, or no direct, but a selection effect. To evaluate these hypotheses, we use monthly data of 52 emerging market and developing countries\(^9\) for 1983-2003. The analysis is limited to this period for two reasons. First, we start in 1983 to exclude the Latin American debt crises, which followed different dynamics than those described in our model and might hence bias our results. Second, since the focus of this study is on the effect of policymaking in an economically integrated world, we focus on the time period in which capital accounts were increasingly liberalized. Third, the dynamics surrounding speculative attacks in emerging markets and developing countries are quite different from those in developed countries (Leblang 2003b).

Speculative attacks occur in countries whose authorities intervene in the foreign exchange market to influence the behavior of their exchange rates. In fully floating regimes, the exchange rate automatically moves downward in response to pressure, so that policymakers never actually face the choice between defending and devaluing the exchange rate. For this reason, we exclude countries with floating exchange rate regimes from the sample. Intermediate regimes such as crawling pegs are included into our analysis, because at least some intervention is possible in these regimes. Since we are interested in the actual rather than the announced behavior of the authorities, we rely on the classification of "de facto exchange rate regimes" by Reinhart and Rogoff (2004). This measure classifies exchange rate regimes on a 15-point scale based on both the officially announced regime and the actual exchange rate behavior.

\(^9\) The countries are Albania, Argentina, Armenia, Azerbaijan, Bahrain, Bangladesh, Belarus, Bolivia, Brazil, Bulgaria, Cambodia, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Dominican Republic, Ecuador, El Salvador, Estonia, Georgia, Guatemala, Haiti, Honduras, Hungary, India, Indonesia, Israel, Kazakhstan, Kuwait, Kyrgyz Republic, Laos, Latvia, Lebanon, Lithuania, Macedonia, Malaysia, Maldives Islands, Mexico, Moldova, Morocco, Myanmar, Nepal, Nicaragua, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Qatar, Romania, Russia, Saudi Arabia, Singapore, Slovak Republic, Slovenia, South Africa, South Korea, Sri Lanka, Thailand, Tunisia, Ukraine, Uruguay, Venezuela, Vietnam, Yemen Arab Republic
Our analysis includes all periods with de facto exchange rate regimes that are classified as noncrawling bands that are narrower than or equal to ±2%, and any stricter classification. This corresponds to all regimes equal to or below category 11 on the Reinhart/Rogoff scale. Using a more restrictive threshold to determine which exchange rates are pegged would lead to the exclusion of important crises, such as the 1997 crisis in the Czech Republic. Although it may be useful to use lower cut-off points in other contexts this does not seem adequate for the study of speculative attacks.

We operationalize speculative attacks as proposed by Eichengreen, Rose and Wyplosz (Eichengreen et al. 1995; 1996) and define speculative attacks as periods of extreme pressure in the foreign exchange market. We use a modified version of the index and operationalize exchange market pressure (EMP) as an unweighted monthly average of standardized exchange rate changes, standardized reserve changes, and standardized changes in the interest rate differential relative to the interest rate in a stable reference country. The rationale is that governments can respond to currency crises either by devaluing or floating their currency, by tightening monetary policy, or by spending foreign reserves. Large values of the EMP index indicate that speculative pressure is high. The data needed for calculating this index is available on a monthly basis from the IMF's International Financial Statistics.

To identify crises episodes, we define crises as those periods where the index exceeds the country-specific mean by at least two standard deviations. The resulting sample of crises is listed in Table 5.1. It includes many well-known crisis events such as the Mexican Peso crisis in December 1994 or the speculative attacks on the Thai baht in 1997.

To operationalize the dependent variable – the outcome of a speculative attack – we examine whether the government devalued the exchange rate within the six months following

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10 The analysis thus includes strict pegs (category 1), pre-announced horizontal pegs and bands (categories 2 and 3), de facto horizontal pegs (category 4), crawling pegs and bands (categories 5-10) and noncrawling bands (category 11).

11 Different versions of this indicator have been used in the literature. Examples are Leblang (2003b) and Leblang and Bernhard (2000). For an overview, see Kaminsky et al. (1998). Following the suggestion by Nitithanprapas and Willett (2000) we use a modified unweighted version of the index because weighting each component by its country specific variation will lead to an understatement of unsuccessful speculative attacks on fixed exchange rates. We set the US dollar as reference currency for all countries except for the Eastern European countries. For Eastern Europe, the Deutsche Mark (until 1998) and the Euro (from 1999 onwards) are used as reference currencies. For interest rates we use (short-term) money market rates (IFS line 60b) as first choice and discount rates (IFS line 60) as second choice if money market rates are not available.
upon the initial attack.12 This variable measures both whether and how long the exchange rate was defended against a speculative attack. It counts how many months the authorities kept the exchange rate stable after the exchange rate was first attacked. If the exchange rate was not devalued during the six-month period, we count it as a successful defense. The dependent variable thus takes values 1 to 7, where 1 represents a case in which the exchange rate was devalued in the month in which it was attacked. A value of 7 represents cases in which the exchange rate was defended for at least six months after the onset of speculative pressure. Since this implies that we may have exchange rate pegs that survive the period of analysis, but collapse later on, our dependent variable is right-censored (Box-Steffensmeier and Jones

12 Based on calibration exercises, Bensaid and Jeanne (1997) conclude that currency crises are more a matter of months than of days (p. 1472-1473). They refer to Moutot (1994) who suggests that crisis episodes in France during the EMS crisis lasted up to five months. We use this crisis length as a reference point for the operationalization of the dependent variable. As we discuss below, duration models can account and correct for the possibility that a crisis may last longer than the six-month period following the attack as specified here.

Table 5.1: List of Speculative Attacks

<table>
<thead>
<tr>
<th>Country</th>
<th>Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azerbaijan</td>
<td>1999m7</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td>2002m1</td>
</tr>
<tr>
<td>Bolivia</td>
<td>1988m1</td>
</tr>
<tr>
<td>Bolivia</td>
<td>1989m8</td>
</tr>
<tr>
<td>Bolivia</td>
<td>1991m1</td>
</tr>
<tr>
<td>Bolivia</td>
<td>1993m11</td>
</tr>
<tr>
<td>Brazil</td>
<td>1998m9</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>1997m2</td>
</tr>
<tr>
<td>Chile</td>
<td>1989m4</td>
</tr>
<tr>
<td>Chile</td>
<td>1999m6</td>
</tr>
<tr>
<td>China</td>
<td>1992m12</td>
</tr>
<tr>
<td>Colombia</td>
<td>1985m4</td>
</tr>
<tr>
<td>Colombia</td>
<td>1998m6</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1983m11</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1984m11</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1991m1</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1992m7</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1998m11</td>
</tr>
<tr>
<td>Croatia</td>
<td>1997m4</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>1997m5</td>
</tr>
<tr>
<td>Ecuador</td>
<td>1995m11</td>
</tr>
<tr>
<td>Ecuador</td>
<td>1995m2</td>
</tr>
<tr>
<td>El Salvador</td>
<td>1990m5</td>
</tr>
<tr>
<td>El Salvador</td>
<td>2000m12</td>
</tr>
<tr>
<td>Estonia</td>
<td>1996m11</td>
</tr>
<tr>
<td>Estonia</td>
<td>1997m11</td>
</tr>
<tr>
<td>Guatemala</td>
<td>1999m9</td>
</tr>
<tr>
<td>Honduras</td>
<td>1990m3</td>
</tr>
<tr>
<td>Honduras</td>
<td>1992m10</td>
</tr>
<tr>
<td>Honduras</td>
<td>1993m7</td>
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<tr>
<td>Honduras</td>
<td>1994m6</td>
</tr>
<tr>
<td>Honduras</td>
<td>1996m7</td>
</tr>
<tr>
<td>Hungary</td>
<td>1993m9</td>
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<tr>
<td>Hungary</td>
<td>1994m6</td>
</tr>
<tr>
<td>Hungary</td>
<td>1995m2</td>
</tr>
<tr>
<td>India</td>
<td>1991m5</td>
</tr>
<tr>
<td>India</td>
<td>1993m3</td>
</tr>
<tr>
<td>India</td>
<td>1995m10</td>
</tr>
<tr>
<td>India</td>
<td>1998m1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1983m3</td>
</tr>
<tr>
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<td>1984m7</td>
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<td>1986m9</td>
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<td>1997m8</td>
</tr>
<tr>
<td>Israel</td>
<td>1991m10</td>
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<tr>
<td>Israel</td>
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<td>Kazakhstan</td>
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<td>Kuwait</td>
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<tr>
<td>Kuwait</td>
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<td>Laos</td>
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</tr>
<tr>
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<td>1998m9</td>
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<td>1998m9</td>
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<td>Malaysia</td>
<td>1984m10</td>
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<tr>
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<td>1993m8</td>
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<tr>
<td>Nicaragua</td>
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<tr>
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<td>1995m11</td>
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<tr>
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<tr>
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<td>Philippines</td>
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<tr>
<td>Philippines</td>
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</tr>
<tr>
<td>Russia</td>
<td>2001m12</td>
</tr>
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<td>Singapore</td>
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<td>Venezuela</td>
<td>1998m7</td>
</tr>
<tr>
<td>Venezuela</td>
<td>2002m1</td>
</tr>
</tbody>
</table>

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2004, pp. 16-19). In combination with the appropriate econometric model, this allows us to apply a plausible definition of crisis length without imposing strong restrictions about the duration of a specific crisis.

To determine whether and when countries devalued, we use a behavioral criterion that evaluates exchange rate behavior based on the pre-attack type of de facto exchange rate regime (Reinhart and Rogoff 2004). This criterion grants intermediate regimes more policy flexibility than fixed exchange rate regimes. A small depreciation of the exchange rate may be in accordance with the rules of a relatively flexible regime, such as a pre-announced crawling band, but might violate the requirements of a stricter regime, such as a hard exchange rate peg. In operationalizing our devaluation-criterion, we therefore grant regimes with little exchange rate flexibility less freedom to depreciate than countries that follow more flexible exchange rate regimes.

**Table 5.2: Devaluation criteria, based on the de facto exchange rate regime type (Reinhart and Rogoff (RR) fine classification)**

<table>
<thead>
<tr>
<th>Exchange Rate Regime Type</th>
<th>Speculative Depreciation in One of the 6 Months Following the Speculative Attack</th>
<th>Overall Depreciation After the Speculative Attack</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preannounced Peg (RR 2)</td>
<td>1%</td>
<td>1%</td>
</tr>
<tr>
<td>Preannounced Horizontal Band (RR 3)</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>De Facto Peg (RR 4)</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Preannounced Crawling Peg (RR 5)</td>
<td>2.5%</td>
<td>5%</td>
</tr>
<tr>
<td>Preannounced Crawling Band (RR 6)</td>
<td>2.5%</td>
<td>5%</td>
</tr>
<tr>
<td>De Facto Crawling Peg (RR 7)</td>
<td>4%</td>
<td>8%</td>
</tr>
<tr>
<td>De Facto Crawling Band (RR 8)</td>
<td>4%</td>
<td>8%</td>
</tr>
<tr>
<td>Preannounced Crawling Band (5%) (RR 9)</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>De facto crawling band (5%) (RR 10)</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Noncrawling band (2%) (RR 11)</td>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>

The devaluation criteria employed in our study are presented in Table 5.2. We take into account two different criteria: First, we look at the amount of depreciation in each individual month compared with the previous month. Second, we consider the overall amount of depreciation in each month compared with the pre-attack level of the exchange rate. For comparatively flexible exchange rate regimes (Reinhart-Rogoff categories 5-11), we allow a higher overall depreciation rate than the individual monthly criterion. The first month in which either of these criteria indicates a devaluation is counted as the month of devaluation.
According to this operationalization, governments successfully defended their exchange rate in 47.2% of all cases. 34.9% of speculative attacks resulted in a devaluation within the month of the attack, while governments initially defended, but subsequently devalued in response to 17.9% of all speculative attacks in the sample.

To estimate the effect of the explanatory variables on the probability of a devaluation, we use different duration models (Box-Steffensmeier and Jones 2004). These models estimate the probability that a government defends in a specific month after the attack, conditional on not having devalued until then. We primarily use parametric models with lognormal and Weibull distributions because they are more efficient in small samples than the less restrictive, semi-parametric models (Box-Steffensmeier and Jones 2004, p.148-151). The outcome equation is specified as a log-linear model of duration times,

$$\log(y_{it}) = a' x_i + \varepsilon_{it},$$

where $y_{it}$ measures the number of months between an attack and the collapse of the fixed exchange rate; $x_i$ is a vector of several economic and political variables; and $\varepsilon_{it}$ is a random error. The errors are assumed to be type-1 extreme-valued distributed for the Weibull model and normally distributed for the log-normal model.

To check whether the underlying assumptions about the shape of the hazard rate are justified, we compare the results from the parametric models with those from a semi-parametric Cox model. For all models, statistical inference is based on robust standard errors that cluster on countries. Besides explicitly modeling the survival of the exchange rate, duration models have the advantage that they account for right-censoring. This is particularly useful for the analysis of crisis outcomes when it is unclear how long a specific crisis lasts and where, as in our case, the dependent variable might consequently be right-censored.

The explanatory variables in $x_i$ include the political regime type, operationalized as the POLITY IV score (Marshall et al. 2002), a continuous variable that ranges from -10 (very autocratic) to +10 (very democratic), and additional variables identified as important by the theoretical and empirical literature on currency crises. On the economic side, these include the level of foreign reserves relative to the money base, real GDP growth, and the inflation rate.

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13 In this accelerated failure time specification, coefficients indicate the effect of an explanatory variable on expected failure times.
all lagged by one month. Unless noted otherwise, data are from the IMF's *International Financial Statistics (IFS)*. We further include a dummy variable for oil-exporting countries and an interaction term between this dummy and the political regime type. To account for the potential impact of various political variables discussed in the literature, we also analyze the effects of the de jure exchange rate regime, partisanship, and electoral timing.

Speculative attacks do not occur at random. Speculative pressure increases when financial markets believe that the probability of devaluation is high. Statistical analyses of policy responses to attacks may be biased if we do not take into account that the sample of crises is not random. We therefore use an empirical model that estimates a) the probability that a speculative attack occurs (selection), and b) the probability that the government successfully defends given that an attack has been launched (outcome). The selection process is modeled using a latent variable specification:

$$\log(y_{2i}^*) = b'z_i + \varepsilon_{2i}$$

$$y_{2i} = \begin{cases} 1 & \text{if } y_{2i}^* > 0 \\ 0 & \text{if } y_{2i}^* \leq 0 \end{cases}$$

where $y_{2i}$ denotes whether a crisis occurs ($y_{2i} = 1$) or not ($y_{2i} = 0$); $z_i$ is a vector of empirically observable measures of economic conditions and government characteristics; and $\varepsilon_{2i}$ is a random error. We rely on existing research on the emergence of speculative attacks (Kaminsky et al. 1998; Kaminsky and Reinhart 1999; Leblang 2002; 2003b; Leblang and

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14 Foreign Reserves are total reserves held by the central bank in U.S. dollars minus gold (IFS line 11.d), divided by the monetary aggregate M1 (IFS line 34). For real GDP growth we use the average annual growth rate in real GDP for the previous three months (calculated using data from the IFS and the World Bank's *World Development Indicators*). Inflation rates are computed as the annual percentage change in the consumer price index (IFS line 64). We use the average inflation rates for the three pre-attack months.

15 Data on the de jure exchange rate regime are from Ghosh et al. (2002). The indicator varies from 1 to 15 with higher numbers denoting more flexible regimes. For partisanship we include a dummy variable for left governments, which takes the value of 1 if the government head belongs to the political left and 0 otherwise. Pre-election periods are coded as 1 during the three months prior to an election and 0 otherwise. Post-election periods are coded as 1 during the three months after an election and 0 otherwise. Data for both partisanship and the election variables were taken from the Database of Political Institutions (Beck et al. 2001).

16 For details on the specification of duration models with selection, see Boehmke et al. (2006).
Bernhard 2000) to identify the variables in $z_t$. These variables include the country’s political regime type, reserves/M1, real GDP growth, inflation, real exchange rate overvaluation, and contagion.\footnote{As proposed by Goldfajn and Valdés (1998) and Leblang (2003b), real exchange rate overvaluation is measured as the difference between the real exchange rate and the long-run real exchange rate path, which was calculated using a Hodrick-Prescott filter ($\lambda = 14400$) that isolates the long-term trend component of a series. The real exchange rate is the nominal exchange rate (IFS line rf) adjusted for differences between foreign and domestic (consumer) price levels (IFS line 64). Contagion is a dummy variable, which takes the value of 1 if there is more than one crisis in the international financial system within the same month. The other variables are operationalized as described above.} Table 5.3 presents the descriptive statistics for our sample of crises.

**Table 5.3: Descriptive Statistics for sample of speculative attacks**

<table>
<thead>
<tr>
<th></th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>106</td>
<td>4.302</td>
<td>2.792</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Polity</td>
<td>106</td>
<td>3.830</td>
<td>6.337</td>
<td>-10</td>
<td>10</td>
</tr>
<tr>
<td>Reserves/M1_{t-1}</td>
<td>106</td>
<td>1.141</td>
<td>1.906</td>
<td>0.02</td>
<td>18.19</td>
</tr>
<tr>
<td>Real GDP Growth_{t-1}*</td>
<td>106</td>
<td>0.165</td>
<td>0.489</td>
<td>-2.33</td>
<td>2.73</td>
</tr>
<tr>
<td>Inflation_{t-1}*</td>
<td>106</td>
<td>14.851</td>
<td>36.087</td>
<td>-10.13</td>
<td>343.57</td>
</tr>
<tr>
<td>OPEC*Polity</td>
<td>106</td>
<td>-0.585</td>
<td>2.625</td>
<td>-10</td>
<td>8</td>
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<tr>
<td>OPEC-Dummy</td>
<td>106</td>
<td>0.104</td>
<td>0.306</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>De Jure XR Regime_{t-12}</td>
<td>99</td>
<td>10.192</td>
<td>3.859</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Left</td>
<td>106</td>
<td>0.255</td>
<td>0.438</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Pre-election period (3m)</td>
<td>106</td>
<td>0.094</td>
<td>0.294</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Post-election period (3m)</td>
<td>106</td>
<td>0.075</td>
<td>0.265</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

* three-month averages

To estimate the complete model, we use an estimator developed by Boehmke et al. (2005; 2006) that simultaneously estimates the duration and selection processes. The estimator takes into account that the dependent variable of the outcome equation $y_{1i}$ can be observed only if a crisis occurs, i.e. if $y_{2i}$ takes the value 1. It estimates the hazard that the authorities devalue the exchange rate conditional on the probability that an attack occurred.\footnote{As an alternative, we could use strategic probit models (Signorino 1999). These models, however, impose very restrictive assumptions about the structure of a speculative attack, e.g. the length of a crisis, and are not able to account for right-censoring.}

### 5.4.2 Results

Table 5.4 presents the results for the parametric duration models. The distribution underlying the specific model is listed on top of each column. Positive coefficients imply that
higher values of the respective explanatory variable increase the duration of the exchange rate peg, or, equivalently, decrease the probability that the peg collapses. In total, the exchange rate pegs of the countries in the sample were at risk during 456 months.19

The first column of table 5.4 shows the results of an economic baseline model. The economic variables are lagged by one period because we assume that the decisions of governments and speculators are based on information from the previous month. The results imply that the probability of devaluation increases when the ratio of reserves to the money base decreases. The reserve level reflects the government's technical ability to defend the exchange rate. If it is so low that the attack depletes the remaining stock of reserves, the government cannot accommodate further capital outflow and has to devalue. This suggests that crises in our sample generally tend to follow the dynamics described by first-generation models (Flood and Garber 1984; Krugman 1979). In these models the government runs a budget deficit over a longer period of time and inflation increases, which leads to a constant outflow of capital and a decrease in the stock of reserves. Once the reserve level falls below a specific threshold, a speculative attack depletes the remaining stock of reserves and the government is forced off the peg.

The coefficients for growth and inflation imply that a higher inflation rate prior to the attack increases the probability that the peg collapses, but real GDP growth does not have any statistically significant impact on the outcome of crises. Again, this finding suggests that the developing and emerging market countries typically face fundamentals-based, first generation crises. Inflation is particularly relevant for crises that are caused by policies inconsistent with a pegged exchange rate. Economic growth, however, is more important for second generation crises that occur when market participants have doubts about the government’s commitment to the peg, and less important when weak economic fundamentals, such as reserves, trigger the attack (Obstfeld 1996). In an empirical study of crises in OECD countries, Sattler shows that, unlike in emerging market economies, reserves and inflation do have a statistically significant influence in the industrialized world (see chapter 4).20

The second column in table 5.4 presents the estimation results for a model that includes the political regime type as explanatory variable. This analysis includes both

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19 The number of observations is lower for model 5 because data on de jure exchange rate regimes are only available until 1999 (Ghosh et al. 2002).
20 In this context it is not surprising that fundamentals-based first-generation models were developed in response to currency crises in developing countries during the 1970s and the early 1980s, while expectations-based second-generation models were developed in response to crises in industrialized countries, such as the 1992-93 European Monetary System crisis.
Table 5.4: Duration of exchange rate peg after attack, accelerated failure-time metric

<table>
<thead>
<tr>
<th>Variable / Distribution</th>
<th>(1) Log-normal</th>
<th>(2) Log-normal</th>
<th>(3) Log-normal</th>
<th>(4) Log-normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regime Type, t</td>
<td>0.046* (0.024)</td>
<td>0.027 (0.030)</td>
<td>0.067*** (0.022)</td>
<td></td>
</tr>
<tr>
<td>Reserves_{t-1} / M1_{t-1}</td>
<td>0.220** (0.101)</td>
<td>-0.017 (0.075)</td>
<td>0.220** (0.095)</td>
<td>0.254** (0.100)</td>
</tr>
<tr>
<td>Growth, t-1</td>
<td>0.096 (0.246)</td>
<td>0.215 (0.197)</td>
<td>0.138 (0.216)</td>
<td>0.047 (0.262)</td>
</tr>
<tr>
<td>Inflation, t-1</td>
<td>-0.005*** (0.002)</td>
<td>-0.005*** (0.001)</td>
<td>-0.005*** (0.002)</td>
<td>-0.005*** (0.002)</td>
</tr>
<tr>
<td>OECD</td>
<td>0.238 (0.343)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>OPEC_t</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regime,*OPEC_t</td>
<td>-0.216*** (0.065)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>De jure regime_t</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left government_t</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-election, (3m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-election, (3m)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
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<td>1.416*** (0.225)</td>
<td>1.366*** (0.253)</td>
<td>1.084*** (0.191)</td>
</tr>
<tr>
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<td>σ = 1.47</td>
<td>σ = 1.46</td>
<td>σ = 1.39</td>
</tr>
<tr>
<td>N (Times at risk)</td>
<td>106 (456)</td>
<td>184 (780)</td>
<td>106 (456)</td>
<td>106 (456)</td>
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<td>Wald χ²</td>
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<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Log Likelihood</td>
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<td>-240.02</td>
<td>-138.17</td>
<td>-133.98</td>
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<tr>
<td>AIC / SBC</td>
<td>287 / 301</td>
<td>494 / 517</td>
<td>288 / 304</td>
<td>283 / 305</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors cluster on country and are listed in brackets below coefficients. * indicates p ≤ 0.1; ** indicates p ≤ 0.05; *** indicates p ≤ 0.01.
Table 5.4 (continued)

<table>
<thead>
<tr>
<th></th>
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<td>0.075***</td>
<td>0.069***</td>
<td>0.071***</td>
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<tr>
<td></td>
<td>(0.024)</td>
<td>(0.023)</td>
<td>(0.021)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>Reserves&lt;sub&gt;1/1&lt;/sub&gt; / M&lt;sub&gt;1/1&lt;/sub&gt;</td>
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<td>0.224**</td>
<td>0.303***</td>
<td>0.256**</td>
</tr>
<tr>
<td></td>
<td>(0.100)</td>
<td>(0.105)</td>
<td>(0.107)</td>
<td>(0.107)</td>
</tr>
<tr>
<td>Growth&lt;sub&gt;1&lt;/sub&gt;</td>
<td>0.139</td>
<td>0.049</td>
<td>0.095</td>
<td>0.089</td>
</tr>
<tr>
<td></td>
<td>(0.245)</td>
<td>(0.276)</td>
<td>(0.253)</td>
<td>(0.262)</td>
</tr>
<tr>
<td>Inflation&lt;sub&gt;1&lt;/sub&gt;</td>
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<td>-0.005**</td>
<td>-0.005**</td>
<td>-0.005***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>OECD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OPEC&lt;sub&gt;t&lt;/sub&gt;</td>
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<td>-0.346</td>
<td>-0.046</td>
<td>-0.155</td>
</tr>
<tr>
<td></td>
<td>(0.512)</td>
<td>(0.589)</td>
<td>(0.500)</td>
<td>(0.451)</td>
</tr>
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<td>-0.249***</td>
<td>-0.217***</td>
<td>-0.224***</td>
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<td>(0.065)</td>
<td>(0.070)</td>
<td>(0.063)</td>
<td>(0.061)</td>
</tr>
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<td></td>
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</tr>
<tr>
<td></td>
<td>(0.035)</td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>0.385</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>(0.389)</td>
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<td></td>
</tr>
<tr>
<td>Pre-election, (3m)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.487)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Post-election, (3m)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(0.466)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
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<td>1.147***</td>
<td>0.898***</td>
<td>1.134***</td>
</tr>
<tr>
<td></td>
<td>(0.191)</td>
<td>(0.418)</td>
<td>(0.227)</td>
<td>(0.067)</td>
</tr>
<tr>
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<td>σ = 1.38</td>
<td>σ = 1.37</td>
</tr>
<tr>
<td>N (Times at risk)</td>
<td>106 (456)</td>
<td>99 (421)</td>
<td>106 (456)</td>
<td>106 (456)</td>
</tr>
<tr>
<td>Wald χ²</td>
<td>93.91</td>
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<td>36.69</td>
<td>38.29</td>
</tr>
<tr>
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<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Log Likelihood</td>
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<td>-125.67</td>
<td>-133.41</td>
<td>-132.70</td>
</tr>
<tr>
<td>AIC / SBC</td>
<td>297 / 319</td>
<td>269 / 292</td>
<td>284 / 308</td>
<td>285 / 312</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors cluster on country and are listed in brackets below coefficients.
* indicates p ≤ 0.1; ** indicates p ≤ 0.05; *** indicates p ≤ 0.01.
developed and developing countries and shows that more democratic countries are significantly more likely to defend their exchange rate against speculative pressure. More developed countries have a stronger tendency to defend, as the positive (but not significant) coefficient of the OECD variable shows. As mentioned above, the crisis dynamics in less developed countries is likely to differ from that of industrialized countries. In what follows, we therefore focus our analysis on developing countries and emerging market economies. This first test for the sample of less developed countries (model 3) implies that more democratic governments are more likely to defend than more autocratic governments, although the coefficient is not statistically significant. An outlier analysis of model 3 shows that this result is mainly driven by oil-exporting autocracies, such as Kuwait and Saudi-Arabia. Contrary to the general trend across autocracies, these highly undemocratic governments always defend when speculators attack their currency. As Hall argues, this is because price stability in these countries depends significantly on earnings from dollar-denominated oil exports. These countries therefore have a strong interest in exchange rate stability (Hall 2005). To control for the influence of these countries, we re-estimate model 3 by including a dummy variable for OPEC countries and an interaction term for these countries with the political regime type.

Model 4 shows that controlling for the disproportionate influence of the oil-exporting autocracies increases the estimated impact of the political regime type on crisis outcomes considerably. The estimated coefficient also becomes statistically significant. The results thus strongly support hypothesis 1, which states that democratic governments defend more often than autocratic governments. This finding, however, is only valid for those countries that are not large oil exporters. The interaction term between the political regime type and OPEC membership indicates that oil-exporting autocracies defend more often than democratic oil-exporting countries.21

We test the robustness of these findings in several ways. First, we examine to what extent the results depend on the models' underlying assumptions about the shape of the hazard rate. Re-estimating the specification in the third column with a Weibull parameterization (model 5) hardly changes the results. Moreover, the results of the Weibull model in the proportional hazard (PH) metric correspond to those from a less restrictive Cox

21 Thus, for oil-exporting countries hypothesis 2 holds. It should be noted, however, that the number of OPEC countries in our sample of crises is very low. The inclusion of the OPEC dummy and the OPEC*regime type interaction is primarily designed to capture the outlier effect of these countries and not to systematically test a theoretical proposition about oil-exporting countries.
proportional hazard model that leaves the particular form of the duration dependency unspecified (not reported in the table). An analysis of the Schoenfeld residuals indicates that the PH assumption are not violated for these models and thus implies that the proportional hazard models are appropriate (Box-Steffensmeier and Jones 2004, p.131-137).

The model fit statistics at the bottom of the table indicate that we should favor the log-normal over the Weibull model. Both the Akaike and the Schwartz Bayesian Information Criteria show lower values for the log-normal model. For the Weibull model, the shape parameter $p$ is smaller than 1 implying that the hazard rate is monotonically decreasing (Box-Steffensmeier and Jones 2004, p.25-31). Since $\sigma > 1$, the hazard rate of the log-normal model rises to its peak quickly and then also falls (Box-Steffensmeier and Jones 2004, p.31-37).\footnote{Note that $p = 1/\sigma$ for the log-normal model. When $p$ is large, the hazard rate of a log-normal model first increases and then decreases. When $p$ is small as for the models in table 5.3, the hazard rate reaches its peak quickly and then falls monotonically.}

Analyzing the hazard rate of a Cox model with the same specification confirms that this is the case. The estimated coefficients of the log-normal and the Weibull models thus are similar because of similar estimated hazard rates. Since the log-normal model accounts for the short increase of the hazard at the beginning of the examination period, it performs better and is the more appropriate model. We therefore chose this model for our further analyses.

The shape of the hazard rate indicates that the risk of an exchange rate collapse at a particular point in time, given that the rate has survived until then, first increases and then decreases over time. This confirms the view that most governments initially try to defend their exchange rate, even though many of them eventually give up and devalue. The risk of a collapse thus increases during the first month of an attack. Once an exchange rate has survived this critical first month, the hazard that it will collapse decreases continuously. This suggests that once a government has managed to stabilize the exchange rate during the first month after the attack, it has good chances that its efforts at maintaining exchange rate stability will succeed in the medium run.

In addition, we examine whether the political regime type's estimated impact on crisis outcomes depends on other political considerations. For instance, the evidence that policymakers tend to postpone devaluations until after elections in tranquil periods (Blomberg et al. 2005; Klein and Marion 1997; Stein and Streb 2004) leads us to expect that electoral timing should influence the choice of exchange rate policies in times of crisis as well. We thus would expect democratic governments to defend more often against attacks that occur during election campaigns and to devalue more readily when the attack takes place right after
an election. Similarly, political economy research suggests that left- and right-wing governments represent different constituencies and thus might react differently to speculative attacks (Leblang 2003b). Finally, governments might defend more often if they have publicly committed themselves to a (de jure) exchange rate peg. Models 6 – 8 test the impact of these alternative explanatory factors. Apart from the post-election period, which as expected has a negative and statistically significant influence on the probability of a defense, none of these variables has a statistically significant impact on the probability of devaluation and defense. The estimated influence of the political regime type is not sensitive to the inclusion of these factors.\(^{23}\)

The results are also robust to the inclusion of various additional variables (not reported in the table). Adding economic control variables such as the current account deficit, domestic credit growth, and the budget deficit does not change the positive and significant effect of the political regime type. Similarly, the finding that democracy increases the likelihood of a defense is robust to controlling for the importance of exports, capital account openness and the de facto exchange rate regime type. Operationalizing political regime type with the political freedom variable provided by Freedom House does not change the results either, nor does re-estimating the equation as a probit model where the dependent variable is a dummy variable that only distinguishes between successful defenses and devaluations.

So far, the empirical evidence supports hypothesis 1, which posits a positive relationship between the political regime type and crisis outcomes: Democratic policymakers are more likely to defend than autocratic policymakers. The theoretical model has pointed to a third possible explanation, however, indicating that this result might be caused by a lack of transparency in autocratic regimes rather than policymakers' commitment to the peg. The model suggests that strongly committed, but intransparent governments could be attacked more frequently than those in more transparent regimes. If this hypothesis holds empirically, autocratic regimes should be selected more frequently into the sample of speculative attacks. Since autocratic policymakers in the sample would therefore on average be more strongly committed than their democratic counterparts (which, being more transparent, would be only attacked when they actually had a low commitment), this mechanism implies that we would observe a higher number of successful defenses by autocratic governments than by democratic governments. Studies that only analyze the outcome of crises, without taking this

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23 The model fit statistics select the model in the sixth column over all others. These values do not have any substantive meaning, but result from missings in the data because de jure exchange rate classifications by Ghosh et al. are only available until 1999.
potential selection process into account, might consequently lead to incorrect conclusions. If the selection process is modeled explicitly, however, it allows for a direct test of hypothesis 3. Restated in empirical terms, this hypothesis predicts that there is no difference between democratic and autocratic governments if we correct for selection bias.

To test hypothesis 3, we use selection models to jointly analyze the emergence and the outcome of speculative attacks. The results are presented in table 5.5. Models 8 and 9 present the results for separate estimations of the selection equation, which predicts the probability with which a exchange rate peg is attacked. For both estimations, we use probit models, where the dependent variable is whether a crisis occurred or not. Among the theoretically plausible determinants of currency crises, only real exchange rate overvaluation and the contagion variable show a statistically significant impact. An attack thus is more likely, the more overvalued the exchange rate is.\(^24\) Contagion measures whether other crises occur in the international financial system at the same point in time. The results indicate that speculative attacks are highly contagious, i.e. the risk of being attacked increases dramatically when there is a crisis somewhere else in the system.

We cannot confirm the finding of previous studies that autocracies are attacked more often than democracies. Instead, our estimation results do not show any statistically significant influence of the political regime type on the probability of a crisis. A possible explanation for this discrepancy is that we use a significantly larger sample of countries than previous studies. Most other variables are not statistically significant either. We have to keep in mind, however, that the rare occurrence of crises poses a major difficulty for predicting when such events occur. In our dataset, there are 106 crises out of 5856 country-months, representing around 1.8% of all observations. Crises thus are extremely difficult to predict, and the explanatory power of empirical models is fairly low.\(^25\)

The duration-selection models 10 and 11 yield identical results to the models in table 5.4 that ignore the selection process. The estimated correlation among the errors of the selection and the outcome equations is not statistically significant in the selection equation. These results suggest that the effect of censoring on the results of the outcome equation is

\(^{24}\) The variable is defined such that lower values indicate more overvaluation. A negative coefficient thus implies that more overvaluation increases the probability of a crisis.

\(^{25}\) Re-estimating the models using a rare events logit estimator (King and Zeng 2001) increases the significance level of overvaluation considerably, but does not significantly affect the other variables. Other studies suffer from similar problems. Leblang (2003b, p.550) reports that his strategic probit model seriously overpredicts the probability of speculative attacks. It predicts that an attack should occur in 2335 out of 7240 cases, while the number of actual attacks is only 41 (p.550).
Table 5.5: Duration of exchange rate peg with selection, accelerated failure-time metric

<table>
<thead>
<tr>
<th></th>
<th>(8) Probit</th>
<th>(9) Probit</th>
<th>Log-normal with Selection</th>
<th>Log-normal with Selection</th>
</tr>
</thead>
<tbody>
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<td><strong>Duration</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regime Type&lt;sub&gt;t&lt;/sub&gt;,</td>
<td>0.066***</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reserves&lt;sub&gt;t-1&lt;/sub&gt; / M1&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.222**</td>
<td></td>
<td>0.253**</td>
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<tr>
<td></td>
<td>(0.099)</td>
<td></td>
<td>(0.100)</td>
<td></td>
</tr>
<tr>
<td>Growth&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>0.105</td>
<td></td>
<td>0.049</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.237)</td>
<td></td>
<td>(0.259)</td>
<td></td>
</tr>
<tr>
<td>Inflation&lt;sub&gt;t-1&lt;/sub&gt;</td>
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<td></td>
<td>-0.005**</td>
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</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td></td>
<td>(0.002)</td>
<td></td>
</tr>
<tr>
<td>OPEC&lt;sub&gt;t&lt;/sub&gt;</td>
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<td>-0.185</td>
<td></td>
<td>(0.497)</td>
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<td>0.004</td>
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<td>(0.005)</td>
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</tr>
<tr>
<td>Reserves&lt;sub&gt;t-1&lt;/sub&gt; / M1&lt;sub&gt;t-1&lt;/sub&gt;</td>
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<td>-0.040</td>
<td>-0.038</td>
<td>-0.040</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.033)</td>
<td>(0.032)</td>
<td>(0.033)</td>
</tr>
<tr>
<td>Growth&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>-0.435</td>
<td>-0.389</td>
<td>-0.442</td>
<td>-0.391</td>
</tr>
<tr>
<td></td>
<td>(2.075)</td>
<td>(2.169)</td>
<td>(2.073)</td>
<td>(2.163)</td>
</tr>
<tr>
<td>Inflation&lt;sub&gt;t-1&lt;/sub&gt;</td>
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<td>-0.000</td>
<td>-0.000</td>
<td>-0.000</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.000)</td>
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<tr>
<td>Overvaluation&lt;sub&gt;t-1&lt;/sub&gt;</td>
<td>-0.001*</td>
<td>-0.001*</td>
<td>-0.001*</td>
<td>-0.001*</td>
</tr>
<tr>
<td></td>
<td>(0.0006)</td>
<td>(0.0006)</td>
<td>(0.0006)</td>
<td>(0.0006)</td>
</tr>
<tr>
<td>Contagion&lt;sub&gt;i&lt;/sub&gt;</td>
<td>0.754***</td>
<td>0.753***</td>
<td>0.755***</td>
<td>0.753***</td>
</tr>
<tr>
<td></td>
<td>(0.100)</td>
<td>(0.099)</td>
<td>(0.100)</td>
<td>(0.100)</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.160***</td>
<td>-2.172***</td>
<td>-2.161***</td>
<td>-2.172***</td>
</tr>
<tr>
<td></td>
<td>(0.053)</td>
<td>(0.056)</td>
<td>(0.053)</td>
<td>(0.056)</td>
</tr>
<tr>
<td><strong>Shape parameter</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rho</td>
<td>-0.119</td>
<td>-0.053</td>
<td>(0.373)</td>
<td>(0.402)</td>
</tr>
<tr>
<td>N (Uncensored)</td>
<td>5856</td>
<td>5856</td>
<td>5856 (106)</td>
<td>5856 (106)</td>
</tr>
<tr>
<td>Wald $\chi^2$</td>
<td>66.40</td>
<td>66.08</td>
<td>66.52</td>
<td>66.20</td>
</tr>
<tr>
<td>Pr $&lt;\chi^2$</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-502.47</td>
<td>-502.30</td>
<td>-641.14</td>
<td>-636.28</td>
</tr>
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</table>

Notes: Robust standard errors cluster on country and are listed in brackets below coefficients.
* indicates $p \leq 0.1$; ** indicates $p \leq 0.05$; *** indicates $p \leq 0.01$.  

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minor. The coefficient for political regime type is not statistically significant. This implies that we cannot confirm the hypothesis that exchange rates of autocratic countries are attacked more often than those of democratic countries. The extent of transparency of the political regime type thus does not seem to influence the selection into the sample of crises, and the results in table 5.4 are not biased. A problem of the duration-selection model is the low predictive power of the selection equation. The rare events character of speculative attacks makes it difficult to adequately correct for non-random selection into the sample of crises. Future research should reexamine the role of selection for the results reported here using other methods that address selection problems in large samples with rare events in different ways.

Our results suggest that we should favor hypothesis one, which posits that democratic governments are more likely to successfully defend their exchange rate against speculative pressure than autocratic governments. This result is robust to a variety of specifications, including when we control for possible selection effect. Varying levels of regime transparency (hypothesis 3) do not affect the positive relationship between the political regime type and the likelihood of a successful defense.26

5.5 Conclusion

This paper has shown that the insights from studies of the interwar period are only partially applicable to crises in the contemporary international financial system. While these studies find that the democratization of most European states was the main cause for the demise of the Gold Standard in the 1920s and the ensuing economic and political turmoil, our results show that the opposite holds for modern crises. Analyzing 106 speculative attacks in developing and emerging market economies, we find that democratic governments today are significantly more likely to defend their exchange rates against speculative attacks than autocratic policymakers. Moreover, and contrary to previous studies that examined fewer cases, we do not find a significant difference in the vulnerability of autocratic and democratic countries’ currencies to speculative attacks. To the extent that devaluations can threaten international financial stability, our results suggest that the growing number of democratic countries increases, rather than decreases, the stability of the modern international financial system.

26 Our result is consistent with findings presented by Pisa (2006), who argues that open autocracies are more likely to pursue competitive devaluation strategies than open democracies.
One explanation for our finding can be found in democratic countries’ exchange rate regime choice. On average, democracies tend to choose more flexible exchange rate regimes, both de jure (Broz 2002) and de facto (Bearce and Hallerberg 2006). By following a more flexible exchange rate regime, democratic policymakers are able to cushion some part of the speculative pressure by letting the exchange rate depreciate within the allowed limits. Since voters punish policymakers less for such de facto depreciations than for devaluing from a de jure peg (Leblang 2005), this implies that democratic governments are able to defend their currencies without having to rely fully on domestic adjustment. More flexible exchange rate regimes thus allow policymakers to reduce the costs of currency defenses.

These findings suggest that democratic governments devalue more often when they are bound by a highly inflexible exchange rate regime, such as the Gold Standard during the interwar period, but are more likely to defend when they follow an intermediate exchange rate regime. It seems to be the combination of democratic rule and more flexible exchange rate arrangements that has a stabilizing effect on the international financial system.
Chapter 6

Conclusion
The findings of this dissertation thesis contribute to the existing literature in several respects. The general analysis of economic policymaking in Britain is the first study that explicitly models the complete relationship between voters, governments and international and domestic economic actors. Most previous studies focused on the effect of economic liberalization on government policies, e.g. taxes or government consumption and spending. These studies thus miss important aspects of the room to maneuver debate. To demonstrate that room to maneuver continues to exist in an open economy, it is not sufficient to show that economic liberalization does not have a serious impact on government policy. It is equally important to show that governments are able to produce distinct macroeconomic outcomes when citizens are unsatisfied with economic developments. This political accountability mechanism is an essential part of room to maneuver that previous research has not addressed.

A limitation of existing research is the dominance of time-series cross-section analyses based on annual data in this field of research. It is difficult, if not impossible to adequately model the simultaneous evolution of macropolitical, domestic and international macroeconomic processes with this approach. These extant studies generally fail to model the constraints from the international economy explicitly. Moreover, studies that are based on annual data miss an important part of the dynamics that take place between voters, the government and the economy. The monthly analysis of policymaking presented at the outset of this thesis captures the dynamics in a much more sophisticated manner. Such single-country or comparative time-series analyses are a promising approach to complement mainstream research in international political economy.

The results of our empirical analysis show that an accountability mechanism existed in Britain during our period of analysis, but it worked outside the real economy. The British government was responsive to changes in political evaluations. The public hence can induce changes in government policy and exerts some influence over policy instruments. Voters then reward the government for its reaction, and political support for the government increases. We thus find a visible link from popular evaluations of economic developments to government policy and back to evaluations. But there is no evidence that the government can effectively influence the real economy. The changes in policy induced by shifts in popular evaluations had no impact on inflation and economic growth. Government capacity to shape macroeconomic outcomes was limited, and popular control over economic policy was ineffectual. The results thus do not support the Room to Maneuver thesis.

Future research should extend this first, general analysis in several respects. First, many scholars suggest that governments use fiscal policy to mediate the effects of
domestic structural changes resulting from economic globalization. If this is true, an enlarged model should show that there is a causal chain that connects popular evaluations, policy and outcomes, and this chain works through fiscal policy. Second, the study is restricted to the period before the Bank of England was granted independence in 1997. An extension to 2005 would address the question whether delegation of monetary policy to the Bank of England has enhanced the government’s capabilities to cope with international economic integration. Finally, recent theoretical research implies that the beneficial effect of central bank independence is lower than models of monetary policy suggest if the preferences of the bank and the elected government diverge significantly. Using the framework of the first study, it is feasible to empirically assess the impact these fiscal-monetary interactions with an independent central bank on inflation and economic growth, e.g. in Britain after 1997 or in Germany from 1950 to 1998.

The results from the subsequent analyses of currency crises yield less pessimistic conclusions about policy autonomy than the general study of policymaking in non-crisis situations at the outset of the thesis. The empirical analyses show that governments defend in more than half of the cases. This is consistent with the findings from the few previous empirical studies of currency crisis outcomes. These stylized facts imply that governments are able to resist pressure from financial markets under certain circumstances. Governments do have effective instruments to defend their exchange rates and thus have some room to influence economic outcomes in crisis situations. The studies of crisis outcomes examine in greater detail which instruments the government has available, when they are effective and when they fail.

My analysis of crisis outcomes complements the existing literature of currency crises that largely has neglected exchange rate defenses. Most theoretical models of currency crises at least implicitly suggest that the government always has to devalue when speculators attack the currency. In the early, so-called first-generation models, the government pursues economic policies that are inconsistent with a fixed exchange rate ultimately leading to the collapse of the peg. The newer, second-generation models assign a more active role to the government. But when a speculative attack occurs, economic circumstances deteriorate, and therefore the government always devalues. Some studies explicitly model exchange rate defenses, but the costly defense usually fails, e.g. because speculators anticipate that the government will devalue later on.
The second study presents a theoretical model of a speculative attack that allows the government to defend the exchange rate. The model establishes under which circumstances uncertainty may be beneficial increasing the policy autonomy of the government and when it is costly. The model suggests that, contrary to the prevalent view in economic and political research, intransparency can be beneficial for social welfare under very specific circumstances. However, policymakers have to be aware that the room to maneuver that they gain from uncertainty is small. Intransparency does not allow governments to pursue policies that are inconsistent with a fixed exchange rate over a longer period of time. In this case, uncertainty is counterproductive because it reduces pressure to adjust policy and thus increases the probability of a large crisis.

The third and fourth studies contribute to the small empirical literature of exchange rate defenses. Similar to theoretical research, there is a huge amount of empirical literature that almost exclusively focuses on the emergence of crises. The few existing studies of exchange rate defenses primarily concentrate on the government’s immediate reaction to an attack. I use a less restrictive operationalization of crisis outcomes to distinguish between the short- and long-term effectiveness of exchange rate defenses.

The third study of interest rate defenses does not confirm the findings by previous research that interest rates are an ineffective tool to defend an exchange rate peg. It shows that interest rates are effective to stop low and intermediate levels of speculative pressure. The results also suggest that raising interest rates may be counterproductive if speculation is extremely strong. Governments thus have to use interest rates cautiously when they face an attack. While raising interest rates signals strength and commitment to traders in the foreign exchange market, the government has to be aware that the domestic contractionary effects of such a defense can be severe. Governments that do not have the political strength and willingness to defend over a longer period of time should rather devalue immediately. The chances that the defense fails when the government tries to bluff should not be underestimated, and the welfare consequences of such failed defenses can be grave.

The findings about the potentially adverse effect of extremely high interest rates are preliminary, however. Future research should further investigate the impact of such spectacular interest rate hikes on the outcome of crises. Since such events are very rare, the standard large-n cross-sectional methods are unlikely to be helpful for further analyses of this question. Other types of research design could be more fruitful. A possibility is to examine two cases that match on the important explanatory variables, including the level of interest rate, but differ with respect to the success of the defense. A comparison of the failed defense
in Sweden 1992 with another high interest rate defense in a similar country that was successful could yield interesting insights into the mechanisms that ultimately led to the two different outcomes.

The last study of political regime type and exchange rate defenses suggests that the insights from studies of the interwar period are only partially applicable to the contemporary international financial system. While these studies find that democratic governments devalued their exchange rate more often than autocratic governments when speculative pressure increased, our results show that the opposite is the case for emerging market economies and developing countries since the 1980s. After the First World War, democratic rule had a destabilizing effect on the international financial system and, by implication, promoted the economic and political turmoil at that time. Nowadays, democratic governments defend their exchange rate more often against speculative attacks than autocratic governments. We conclude from our study that democratic political regimes do not destabilize the modern international financial system. Our results suggest that its stability should increase rather than decrease, the more countries in this system become democratic.

Apart from the direct relevance of this study for research on speculative attacks, our analysis also complements research on exchange rate regime choice in general. This literature has shown that on average democracies tend to choose more flexible exchange rate regimes, both de jure and de facto. This implies that democratic policymakers may be able to defend their currency without having to rely fully on domestic adjustment. If they follow a more flexible regime — such as a crawling peg — policymakers are able to accommodate parts of speculative pressure by letting the exchange rate depreciate within the allowed limits. More flexible exchange rate regimes thus allow policymakers to reduce the costs of defending.

From these findings, we can conclude that it is the combination of democratic rule and more flexible exchange rate arrangements that has a stabilizing effect on the international financial system. It is possible that democratic governments devalue more often when the exchange rate regime is very inflexible, such as during the interwar period. However, democracies do not necessarily need such a hard peg to gain monetary credibility if the central bank is fairly autonomous. This allows democratic governments to choose less restrictive exchange rate arrangements that provide more flexibility to manage crises. In contrast, autocratic governments usually choose less flexible arrangements because they cannot credibly delegate monetary policy to an independent central bank. It is thus more difficult for autocratic policymakers to accommodate speculative pressure leading to more devaluations in
autocratic countries. Future research should examine this link between political regime type, exchange rate arrangements and international financial stability further.
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