Lending Credibility

The International Monetary Fund and the Post-Communist Transition

Randall W. Stone

PRINCETON UNIVERSITY PRESS
PRINCETON AND OXFORD

Contents

Acronyms

ASI	American Statistics Index
AWS	Solidarity Electoral Action
BBWR	Non-Party Bloc for Reform
BNB	Bulgarian National Bank
BSP	Bulgarian Socialist Party
CBR	Central Bank of Russia
CIS	Commonwealth of Independent States
CMEA	Council for Mutual Economic Assistance
CPSU	Communist Party of the Soviet Union
CSFB	Credit-Suisse First Boston
CUP	Central Planning Agency
EBRD	European Bank for Reconstruction and Development
EFF	Extended Fund Facility
EMS	European Monetary System
EU	European Union
FIMACO	Foreign Investment Management Company
FSB	Federal Security Service
GDP	Gross Domestic Product
GEE	Generalized Evaluation Estimator
GKO	Short-term State Obligations (Russian treasury bonds)
G-7	Group of Seven Industrialized Countries
HIID	Harvard Institute for International Development
IBRD	International Bank for Reconstruction and Development (World Bank)
ICPSR	Intercollegiate Consortium for Political and Social Research
IFS	International Financial Statistics
IMET	International Military Education and Training
IMF	International Monetary Fund
ITAR-TASS	Russian Information Agency
KGB	Committee for State Security
KLD	Liberal Democratic Congress
KPN	Confederation for an Independent Poland
KPRF	Communist Party of the Russian Federation
LDPR	Liberal Democratic Party of Russia
LHS	Left-hand side
MAE	Monetary and Exchange Department of the IMF

M0	Base money, a narrow measure of the money supply
M2	A broad measure of the money supply
MRF	Movement for Reforms and Freedom
MVF	International Monetary Fund (in Russian)
NAFTA	North American Free Trade Agreement
NATO	North Atlantic Treaty Organization
NBP	National Bank of Poland
NBU	National Bank of Ukraine
NDA	Net domestic assets (of a central bank)
NIR	Net international reserves (of a central bank)
NIS	Newly Independent States
NSZZ "S"	Independent, Self-Governing Trade Union "Solidarity"
OA	Official Assistance
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
OMRI	Open Media Research Institute
PBE	Perfect Bayesian Equilibrium
PC	Center Alliance
PL	Peasant Alliance
PPPP	Polish Beer Lovers' Party
PSL	Polish Peasant Party
PUWP	Polish United Workers' Party (Communist Party)
RAO	Joint Stock Company (in Russian)
RFE/RL	Radio Free Europe/Radio Liberty
RHS	Right-hand side
SBA	Stand-by Arrangement
SBU	Security Service of Ukraine
SDR	Special drawing rights
SdRP	Social Democracy of the Republic of Poland
SDS	Union of Democratic Forces (in Bulgarian)
SLD	Alliance of the Democratic Left
SOE	State-owned enterprise
STF	Systemic Transformation Facility
TASS	Telegraph Agency of the Soviet Union
UD	Democratic Union
UDF	Union of Democratic Forces (SDS in Bulgarian)
UES	Unified Energy System
UP	Union of Labor
UPR	Union of Real Politics
USAID	United States Agency for International Development
USMil	United States military aid
USSR	Union of Soviet Socialist Republics

UW	Union of Freedom
VAT	Value Added Tax
WAK	Catholic Electoral Alliance
ZChN	Christian National Union

Preface

I embarked on this project five years ago not with the intention of providing policy guidance but simply to study the influence of an important international institution that seemed to me poorly understood by the scholarly community. At the time, the International Monetary Fund (IMF, or simply the Fund) was a likely focus for academic conferences but not for congressional hearings or street protests in Washington. Most of the undergraduates I taught had no idea what the IMF was until they took my course, nor could they have distinguished it easily from the rest of the alphabetical flotsam that clutters syllabi in international political economy, such as WTO, IBRD, ECB, OECD–all of which are important institutions in their own right, of course. East Europeans, on the other hand, along with citizens of developing countries, recognized the significance of my topic immediately. Indeed, in the course of my travels across the region I have often been asked which agency I worked for: the IMF or the CIA?[1] The IMF quickly lost its obscurity in the United States, largely as a result of the events related in this book. Subsequently, I have been asked to address Sunday school classes, groups of concerned students, and gatherings of officials in Washington and Moscow. I have discovered some important things, and they are relevant to the practical concerns of churchgoers, students, and policymakers, but this is not primarily a book of policy advice. This is a work of political science, and its objective is to train the best tools available to social science on an important substantive question in order to see what we can learn in the process.

It is not easy to write about the IMF without taking sides. When I mention at Washington cocktail parties that I am writing a book about the IMF and the post-Communist transition, I am invariably asked the question, "Are you for or against?" My standard reply is that I am in favor: I think the post-Communist transition was a pretty good idea. Flip rejoinders aside, my position on the IMF is more supportive than critical on balance, and I hope that, as devastating as my criticisms may seem, they will be seen in time as constructive. I believe that both the extreme Right and the extreme Left are fundamentally mistaken about the IMF. It is neither simply an example of the abuses of big government, nor simply the executive committee of international finance that represses efforts to ameliorate the situation of the poor. In principle, the IMF has an important role to play in improving government policy, which can greatly improve the

[1] My truthful answer, that I was an independent researcher working on a book, was often met with skepticism.

lot of the poorest of the global poor. In practice, I can show that it has played a constructive role in a number of post-Communist countries, which has, in fact, benefited the poor.

This is the starting point for a barrage of criticism that I address to the IMF, as well as the motivation for the hope that inspires my most important policy recommendation. The IMF is effective only in countries from which it can credibly threaten to withdraw support. In the work that follows, I show that the credibility of the IMF's bargaining position depended on the international influence of the target countries. Countries that were very influential—in particular, those that received the most foreign aid from the United States—were treated very leniently and, consequently, were much less likely to follow IMF advice. The IMF can lend credibility to governments sorely in need of it, but only when the conditions attached to its own lending are credibly enforced. Thus, countries that were influential enough to convince the United States government to pressure the IMF to be lenient derived much less benefit from their interactions with the Fund than ordinarily countries that lacked such leverage.

For countries like Russia, as a result, international influence became a strategic liability rather than an asset. In a crowning irony, the same can be said about the ultimate exponent of such influence, the United States. For the United States, the most important policy goal in the post-Communist region in the 1990s was the consolidation of democracy and a market economy in Russia. The U.S. government's continual efforts to shield Russia from the rigor of IMF conditions, however, compromised Russia's efforts at market reform, and the prolonged economic transition that resulted ultimately undermined the basis of democratic legitimacy in the most important country in the region. The United States gained a number of short-term concessions from Russia in return, but the long-term cost of this policy was disastrous. Influence is not always an advantage; indeed, the United States would have achieved a much better outcome had it been unable to influence the IMF. Consequently, my most important piece of policy advice is this: As is true of central banks, international financial institutions can only be effective to the extent that they are independent of political authorities. The IMF is a tremendous force for farsighted economic management in small countries, but it will remain a deficient tool for managing the affairs of the large countries that are most important to the international system as long as it remains dependent on the policies of a small number of powerful countries.

I have accumulated many debts in the process of completing this project. The greatest is to my colleagues and students, past and present, at the University of Rochester. In particular, I learned a great deal from my colleagues Jeff Banks, Randy Calvert, John Duggan, Curt Signorino, and Dave Weimer, without which the technical parts of this book would have been much less effective. Bing Powell and John Mueller were also very generous with a junior colleague, and this book is better for my many conversations with them. Colleagues at

other institutions have also been very helpful at key junctures. In particular, I wish to thank Chris Achen, Jim Alt, Leslie Armijo, Tom Biersteker, Doug Blum, John Carey, Jerry Cohen, Matt Evangelista, Jim Fearon, Geoff Garrett, Joe Grieco, Steve Hanson, Joel Hellman, Yoi Herrera, John Jackson, Juliet Johnson, Miles Kahler, Barb Koremenos, Gary King, Herbert Kitschelt, Bob Keohane, Mark Kramer, Charles Lipson, Lisa Martin, Vladimir Popov, Ronald Rogowski, Duncan Snidal, Josh Tucker, Celeste Wallander, Tom Willett, David Woodruff, Kim Marten Zisk, and five anonymous reviewers for their helpful comments and constructive criticism. While some of them disagree with much that I have written, their arguments have surely improved the final product. For any errors and omissions that remain—other than those recorded in the current accounts of the countries in this study—I have only myself to blame.

The many people who generously helped with technical details, coding data, making connections with interview subjects, and in other ways are too numerous to list but have my gratitude. Chuck Myers and Roger Haydon offered valuable suggestions for revisions, and Rita Bernard did a very thorough and professional job of copyediting the manuscript. Judith and Robert Martin have my thanks for hosting me in Washington on numerous occasions, and Judith (aka Miss Manners) has my gratitude and admiration for thinking of the title. When she heard my working title (which I sensibly decline to reveal now), she told me that it "simply would not do." Within five minutes she had suggested *Lending Credibility*. Naturally, I accepted her advice with good grace.

The research on which this book is based was supported by grants from the National Science Foundation (SES-9974663), the Social Science Research Council, the National Council for Eurasian and East European Research, the Skalny Center for Polish and Central European Studies at the University of Rochester, the Watson Institute for International Studies at Brown University, and by a year of leave generously granted by the University of Rochester.

I am deeply indebted to the research assistance of a number of talented Ph.D. students at the University of Rochester: Timothy Carter, Chris Kamm, Iulia Kazdobina, Kalina Popova, Branislav L. Slantchev, and Robert Walker. This project reflects their hard work and dedication. For their significant contributions, Timothy Carter, Chris Kamm, and Kalina Popova are listed as coauthors of Appendix B: Statistical Methods.

Early versions of some of the research for this book were presented at various annual meetings of the American Political Science Association, the International Studies Association, and the American Association for the Advancement of Slavic Studies, at conferences sponsored by the Program on New Approaches to Russian Security (PONARS), by the Watson Institute for International Studies at Brown University, and by Jagiellonian University in Krakow, Poland, and in talks at the University of Chicago, Harvard University, the University of Rochester, Brown University, and Duke University. I am thankful for all the comments and suggestions that were made by members of the au-

dience in each of these forums. Many of these filtered into the final product, even though I cannot always recall where they originated.

I gratefully acknowledge the permission of MacMillan Press to republish portions of a chapter I wrote for a volume edited by Leslie Elliott Armijo, *Financial Globalization and Democracy in Developing Countries* (1999). Portions of this chapter reappear in altered form in chapters 1, 2, and 6.

My deepest gratitude goes to my wife, Martha Koenig Stone, whose support and confidence never cease to amaze me, and to my children, Henry, Sophia, and William. They have tolerated my long absences, have always welcomed me home with joy, and have made the effort worthwhile.

Lending Credibility

1

Introduction

WITH THE END of the Cold War, the International Monetary Fund (IMF) emerged as the most powerful international institution in history. The Western countries designated the IMF as their primary vehicle for funneling aid to the countries that had emerged from the ruins of the Soviet empire and made it responsible for creating a strategy for interacting with them. That strategy, as it gradually unfolded, was ambitious: nothing less than the economic transformation of every society in the region. The early years after the collapse of the Soviet bloc were heady ones for the IMF: a vast new territory was becoming integrated with the world economy, international capital movements were rising to the top of the political agenda in Central Europe and Eurasia, and multilateral lending agencies were beginning to figure prominently in cabinet meetings and parliamentary debates. The Fund eventually signed loan and conditionality agreements with every country of the former Soviet Union and Eastern Europe except Serbia and Turkmenistan. Even as this ambitious institutional strategy took shape, however, questions were raised about whether the instrument was equal to the task. Can an international institution really hope to exercise influence in a nation's domestic affairs? If it does so, will that influence be beneficial?

Formal international institutions are the peculiar innovation of the advanced industrial democracies, which have relied on these institutions since World War II as a central pillar of their effort to impose order on the anarchy of international politics. In the aftermath of the worst war the world has ever known, the United States and its allies had sought to promote international cooperation by creating an impressive architecture of international institutions: the United Nations, the International Monetary Fund, the World Bank, the General Agreement on Tariffs and Trade, the European Economic Community, and numerous specialized agencies. The Cold War between the United States and the Soviet Union quickly became the focus of attention in the international system, and it redefined many of the purposes of these institutions. Still, whenever the United States and its allies tried to foster cooperation after World War II, they created international institutions. International institutions became an essential part of

the relations among these countries, and a broad consensus on the rules that they embodied helped to foster an unprecedented blossoming of coordinated action across a variety of issue areas.

The International Monetary Fund is an unusual international institution because it has some enforcement powers. International institutions generally rely on convention, normative suasion, modest efforts at monitoring, and decentralized collective action to promote cooperation. To be sure, the Fund extends carrots, not sticks, when it attempts to influence government policies. However, it signs intrusive agreements with governments that regulate sensitive aspects of their domestic and international economic policies; it typically does so when countries are particularly vulnerable and dependent on international financing; and it threatens to withdraw support if its detailed policy prescriptions are not observed. This enforcement mechanism would seem to give the IMF a significant edge over gentler international institutions.

Two strong traditions in international relations shed doubt on the ability of international institutions to influence public policy. The first, commonly known as realism, emphasizes the priority of security concerns, the overriding interest of states to assert their autonomy from foreign control, and the tendency for international norms or rules to be manipulated by powerful countries for their own purposes. According to this perspective, the IMF is likely to find that borrowing countries are unwilling to submit to its tutelage and that powerful donor countries will subvert its objectives in order to advance their own. The second perspective emphasizes the importance of domestic constraints and argues that economic policy involves distributive and redistributive issues that go to the heart of politics. If political coalitions and alignments are fundamentally about economic policy, there are severe limitations to what foreign intervention in these matters can achieve.

This book argues that both perspectives are right, up to a point: International power and interests constrain what the IMF can achieve; so do domestic power and interests. Nevertheless, I will argue that the IMF plays an important role in the nexus between power, interests, and policymaking, and exerts a significant influence over national policies. The effects of domestic and international constraints can obscure IMF influence in quantitative and qualitative studies if we fail to take them into account. However, carefully studying both sets of constraints reveals the very important role the IMF has played in the post-Communist countries.

If it is true—and it is—that IMF conditions are often violated and inconsistently enforced, that the IMF has made a number of mistakes in managing the economics of transition, and that countries have misused IMF funds in sometimes spectacular and intricately fraudulent schemes, this still does not answer the question: Has the IMF exerted a meaningful influence over economic policies in these countries? To answer this question, we have to do more than simply measure the economic policies of countries in transition against the

ideal of IMF performance criteria or merely catalogue the Fund's tactical errors and the instances of corruption. In this book I do both in great detail; but to answer the question, we have to examine the counterfactual: What policies would have been followed without the involvement of the IMF?

In some sense, of course, we can never know. The IMF was a feature of the international system into which the post-Communist countries were born, and its existence shaped the incentives they faced as they sought to define economic policies right from the beginning. We cannot remove the IMF from the equation and restart history from 1990. However, there are three ways in which one can do meaningful counterfactual analysis that can shed light on the effect that the IMF has had on the post-Communist transition. First, one can be rigorous about what effects one ascribes to the causal variable, and explore the influence it has in an abstract formal model. Second, statistical analysis with a large sample enables one to make certain kinds of counterfactual inferences. Third, detailed studies of relations between the IMF and several borrowing countries can fill in the context, the actors' expectations, and the intermediate causal links that, on balance, lead us to believe certain causal inferences and reject others. In this book, these three approaches form the legs of a tripod that supports a causal argument. Without any one of these supports–analytical rigor, generalizable inferences, or contextual knowledge–the structure becomes unstable and the argument untenable. In combination, each approach complements the others by supplying pieces of the puzzle that the others cannot.

The first step in my research design is to define the effects that IMF intervention is expected to have, and the precise conditions under which it is supposed to have them. To do this I develop a formal model that specifies the hypothesized relationships among the IMF, international capital markets, and borrower countries. The key innovation of the model is that the IMF is treated as a strategic actor that seeks to defend its reputation for enforcing conditionality, but suffers from credibility problems. In the model I assume that every actor is sophisticated about the strategies and beliefs of the other actors, so they all anticipate that IMF programs will not always be properly implemented, that countries will sometimes find it advantageous to cheat, and that the IMF will sometimes find it difficult to hold them accountable. Nevertheless, IMF programs affect the economic policies of the borrowing countries, and because of this they influence capital flows to those countries. The results of the formal model can be thought of as a possibility theorem. They show that even in a messy world where things often do not go as planned, it is still possible for an imperfect institution like the IMF to exert influence. The IMF can still lend credibility, even if the credibility of its lending is in question. The model spells out the kind of influence that the Fund is expected to have–both over countries' policies and over market expectations–and it defines the conditions that limit that influence because of the Fund's own credibility problems.

The second step is to subject the hypotheses that the model advances to quantitative tests. Testing these hypotheses requires a data set with novel features: one that allows the analyst to control for the political factors that influence countries' abilities to stabilize their economies, and that measures country policies and IMF responses with sufficient precision to untangle the causes from the effects. With the help of several research assistants, I have compiled a data set designed for this purpose. The result is a unique statistical database that comprises monthly economic and political time series for twenty-six countries over the decade of the 1990s. Using a variety of statistical methods that are explained in the text for the layperson, and with more technical detail in an appendix, I estimate models to explain IMF strategies, government longevity, government policies, and market expectations. To foreshadow, I find that the IMF does have a significant effect on government policies but that this effect is mitigated whenever the IMF cannot credibly threaten to impose lengthy punishments, namely, in large countries and countries that receive substantial amounts of foreign aid from the United States. As the model predicts, countries that are harder to punish are punished for shorter periods, and the reduced severity of the IMF's response significantly increases their propensity to pursue inflationary policies. Conversely, however, these pessimistic conclusions imply an optimistic one. In order to be vastly less effective in some countries, the IMF must be vastly more effective in others; indeed, in small countries and those without recourse to U.S. intervention, the IMF plays a very critical role in moderating the incentives that fuel inflation and in establishing credibility for stabilization policies.

The third step is to check the plausibility of general conclusions by plunging back into the details. A detailed study of the bilateral relations between the Fund and particular countries, based on interviews with policymakers, negotiators, and Fund officials, can go beyond the thin description accessible in statistical form. Participants can be asked counterfactual questions and asked to share their own hypotheses about which variables caused which effects, based on the accumulation of years of experience. This book is based on extensive field research in Russia, Ukraine, Poland, Bulgaria, and the IMF headquarters in Washington, D.C. Readers of the detailed country studies may find that the picture that emerges confirms the broad-strokes critiques of the Fund as an ineffective organization; indeed, there are numerous anecdotes that could be used as cautionary tales. In part, this is a matter of whether the reader chooses to view the glass as half full or half empty. I believe that what emerges is a picture of an organization that has remarkable influence in spite of the fact that it is working against tremendous odds. Certainly, the case studies in this volume suggest that the Fund should be humble about offering advice and that our expectations of success in difficult cases should be modest. However, they also demonstrate that the deck was terribly stacked against reform in most of these countries and that the IMF was almost always a relevant player–sometimes the

only relevant player–lobbying for economic reform. In some cases, when circumstances were right, the IMF did exactly what the model predicts: It tipped the balance of incentives in favor of a long-run strategy of fiscal and monetary restraint, and reinforced the credibility of governments that presided over fragile capital markets. Even in cases where IMF programs failed and ultimately had to be abandoned, the Fund typically exercised a significant influence over policies.

The primary focus of this book is on the effectiveness of the IMF at influencing government policies. However, a prior question that must have occurred to the reader is whether it is normatively desirable for the IMF to exercise influence, and I turn to this question before proceeding with my argument. Critics of unbridled capital markets and the "Washington Consensus" that supports them worry that international institutions and global capital flows may so constrain economic policies during the transition that weak democratic institutions are swept away by popular discontent. Furthermore, they argue, the IMF's neoliberal economic prescriptions of tight monetary and fiscal policy, deregulating the economy, and lowering the barriers to the "creative destruction" wreaked by markets–stabilization, liberalization, and privatization–represent a naïve application of standardized recipes to a much more complex reality. In the felicitous Russian aphorism, it is easy to turn an aquarium into fish soup, but only God can reconstitute the aquarium.

To the contrary, I argue that the basic thrust of the policies urged by the international financial institutions was, in fact, correct. At this point, I want to distinguish carefully between the basic strategy of transition and the specific tactical choices that were made in particular countries. By tactical choices I mean operational decisions on which economic theory does not yet provide straightforward guidance, such as the best ways of targeting exchange rates, the best ways of carrying out privatization, and the optimal sequence of structural reforms. The Fund supported programs in countries that chose a wide range of approaches to these issues, but in some cases IMF staff promoted specific policies that turned out very poorly. We have learned things about economic transitions over the last ten years that would have made it possible to make better choices, had we known them earlier. On the other hand, the key IMF strategy for reform was clear: Accelerate the full spectrum of market reforms as much as possible, and lead with rapid macroeconomic stabilization and liberalization. This appeared to be a rather risky strategy from the vantage point of 1990. From the vantage point of 2000, however, it is clear that this was the strategy best suited to promoting economic growth and consolidating democracy in post-Communist countries, because inflation has such disastrous consequences during the transition.

1.1 The Strategy of Transition: Inflation and Democracy

Critics of austere, anti-inflationary policies in post-Communist countries point to the apparent success of gradual reform in China, and to the enormous human costs and political instability associated with neoliberal policies in Latin America.[1] The image that captures the imagination is Adam Przeworski's "J-curve," which describes a trade-off between the short-term and long-term pain of the transition.[2] As countries enter the reform process, they adopt austerity measures that reduce output, cut social transfers, and create unemployment, moving down into the "valley of the transition." The more rapidly this is done, the more quickly comes the recovery—but at what cost? What if the misery of the transition is so intense that popular patience is exhausted and democratic institutions are swept away? Perhaps a flatter "J-curve" would be preferable, one that spreads the transition over a longer period but reduces the depth of the recession.

The evidence of the last ten years is that there is, in fact, no such trade-off.[3] Instead, the post-Communist countries that succeeded in quickly bringing inflation under control suffered a smaller drop in output than those that continued to endure the ravages of inflation.[4] They attracted foreign investment and began to grow, laying the groundwork for long-term prosperity and political stability. Economies that failed to tame inflation declined more precipitously and continued to decline long after the transition had been completed in more successful countries. In addition, the low-inflation countries maintained a much less skewed distribution of wealth and income, maintained more social services, and sustained a higher quality of life. Table 1.1 summarizes the data by presenting the results of bivariate regressions of growth, foreign direct investment, income inequality, the United Nation's Human Development Index, and life expectancy on inflation, using a variety of methods. Each row represents a variable that is affected by inflation, and the columns represent a series of econometric models for assessing the effects. The analysis uses all available annual data for post-Communist countries from 1990 through 1999.

The significance of these results is that countries with higher inflation grew more slowly, or declined more rapidly, and attracted less foreign direct invest-

[1] Note that there are some good reasons for questioning whether Chinese-style gradualism would have been successful in the more highly developed countries of Eastern Europe and the former Soviet Union (Woo 1994).

[2] Przeworski 1991, p. 163.

[3] Hellman 1998.

[4] This is consistent with a large quantity of scholarship that shows that inflation leads to lower rates of growth in gross domestic product (GDP) (Kormendi and Meguire 1985, Grier and Tullock 1989, Barro 1991, De Gregorio 1992, Roubini and i Martin 1992). Levine and Renelt (1992) criticize the robustness of some of these findings; Gylfasson and Herbertsson (1996), Andres, Domenech and Molinas (1996), and Andres and Hernando (1997) find that the negative correlation between inflation and growth is robust to changes in the specification of the model.

Table 1.1: Effects of Inflation on Growth and Quality of Life.

		Inflation (in 1,000%)			
	n	*OLS*	*Robust SE*	*Fixed Effects*[a]	*Random Effects*
GDP Growth	135	-5.34^{**}	-5.34^{*}	-4.43^{**}	-4.93^{**}
		(1.02)	(2.45)	(1.06)	(1.00)
Foreign Direct Invest. (% GDP)	132	$-.797^{**}$	$-.797^{*}$	$-.694^{*}$	$-.717^{*}$
		(.293)	(.167)	(.282)	(.270)
Income Inequality (Gini Coeff.)	52	5.97^{**}	5.97^{**}	1.14	5.97^{**}
		(2.06)	(.46)	(.81)	(2.02)
Human Develop. Index	82	$-.026^{*}$	$-.026^{**}$	$-.0086$	$-.01$
		(.011)	(.0076)	(.0055)	(.0055)
Life Expectancy	131	$-.47$	$-.47$	$-.012$	$-.011$
		(.032)	(.031)	(.011)	(.011)

$^{*}p < .05$; $^{**}p < .01$, two-tailed tests

[a] F-tests reject the hypothesis that all fixed effects are equal to zero at the .01 level for each of the equations.

ment. Furthermore, it was the poor rather than the relatively wealthy who suffered most from inflation: High inflation caused income inequality to increase. There is also some evidence that high inflation caused countries' scores to decline on the United Nations' broadest scale of the quality of life, the Human Development Index. This captures a wide range of factors, such as health care, education and nutrition as well as per capita income. Inflation may cause life expectancy to decline as well, but these data cannot prove this to be the case. Figure 1.1 presents the relationship between growth and inflation in graphical form using the same data.

Taming inflation was the most urgent task facing post-Communist countries, because high levels of inflation threatened to derail all other aspects of their reform programs. All these countries faced a substantial jump in prices when they abolished price controls, and most accelerated inflation by continuing to subsidize state-owned enterprises. High inflation is a self-fulfilling prophecy: The longer it persists, the more stubborn inflationary expectations become, and the more difficult it becomes to restore confidence in the currency. Meanwhile, financial instability distorts economic decisions and, in particular, increases the risks for investors. In addition, a high level of inflation has proven to be a profoundly destabilizing force in politics. While the costs of inflation have been vividly demonstrated in developing countries such as

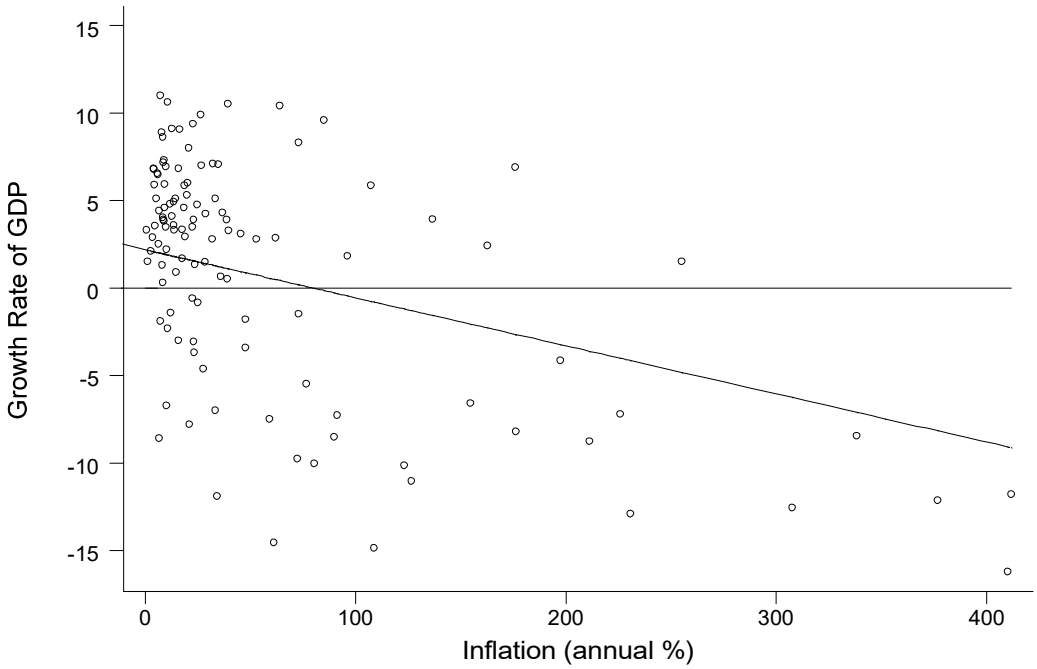

Figure 1.1: Inflation and GDP Growth.

Argentina and Brazil, inflation has the potential to be even more devastating in post-Communist countries, for three reasons.

First, inflation and the policies that lead to high levels of inflation-loose credit, budget deficits, and government subsidies—warp the incentives of firms, preventing industrial restructuring. Firms make choices about whether to make costly investments in future competitiveness or to engage in lobbying activity, and when the latter is relatively inexpensive and lucrative, they fail to restructure. This is particularly costly in post-Communist countries, because the structure of production inherited from central planning is highly inefficient. The evidence indicates that controlling inflation contributes substantially to industrial restructuring.[5] Countries that succeed in controlling inflation and restructuring industry, in turn, experience higher rates of growth.

Second, inflation undermines the confidence of international investors. Recent research shows that inflation significantly depresses capital flows to developing countries and leads to higher real interest rates.[6] International investment provides foreign exchange, technology transfers and management expertise. Foreign investment takes on critical significance for post-Communist countries, because it determines the success of privatization programs and represents the best hope for rapid industrial restructuring. In the most successful Central European countries, foreign direct investment has made a substantial

[5]Berg 1994.
[6]Pindyck and Solimano 1993; Sobel 1997.

contribution to export-led growth and has turned centrally planned dinosaurs into modern, competitive firms. In countries like Russia, on the other hand, potentially lucrative investments remained mired in political risk and economic uncertainty.[7]

Third, high inflation leads to a skewed distribution of wealth. The evidence for the post-Communist countries is striking, as Table 1.1 demonstrates. Econometric studies of developing countries have led to the same conclusion: High inflation leads to increased inequality.[8] This observation clashes with widespread assumptions about the distributional effects of inflation, but there is a good reason: These assumptions are largely based on the American experience in the nineteenth century, which was unique in important respects. The Left in America has long assumed that inflation was good for the poor and bad for the rich, because it deflates the real value of debt. Since the poor in America tended to be in debt and the rich tended to hold the debt, it was clear whose interests were served by a policy of tight money and a strong currency. In William Jennings Bryan's phrase, the common folk of America were being crucified on a "cross of gold." The Left understood its interests properly in nineteenth-century America; but the inflationary strategy of the Populists was only attractive because there were no low-cost alternatives to holding dollar-denominated assets, labor was virtually unable to engage in collective bargaining, and the government provided no transfer payments. Once the wealthy become able to shelter their assets from the inflation tax at low cost, it is no longer possible to use it to redistribute their wealth. Meanwhile, if labor has any bargaining power, inflation is disadvantageous because it shifts the status quo in favor of management. Nominal wage bargains become less valuable, and indexation becomes a concession that management makes grudgingly in return for something else of value. Finally, if government makes transfer payments, inflation erodes their value. Again, if policymaking is a bargaining process, inflation shifts the status quo away from the beneficiaries of transfer payments, who face dwindling real payments.

The transition countries are unusually prone to the inegalitarian effects of inflation, because the combination of inflation with far-reaching structural reform and political instability creates opportunities for nonproductive activities that generate a great deal of profit, usually at the expense of the state. For example, Russian banks made most of their profits in the early years of the transition by taking subsidized credits from the Central Bank of Russia, investing in foreign currency, and repaying the credits after the ruble fell.[9] Similarly, high rates of inflation and access to subsidized credits for the privileged few led to the pervasive pattern of manager ownership, frequently referred to as "*nomenklatura* privatization," that has tarnished the legitimacy of Russian

[7]Halligan and Teplukhin 1996; Watson 1996.
[8]Crisp and Kelly 1999.
[9]Åslund 1995; Treisman 1998.

reform. Although most of the shares in enterprises were distributed to their workers, managers ended up with controlling interests because they were able to buy up shares with cheap credits and repay the loans with deflated currency. Workers, on the other hand, had higher discount rates because they did not have access to subsidized credits, so they sold. While elites with political access make fortunes in inflationary times, ordinary citizens without access to arbitrage opportunities suffer from inflation because their savings are eroded and their wages and pensions fail to keep pace with rising prices.

In the post-Communist context, therefore, the first step toward establishing political legitimacy for reform is to slow inflation. The failure to restructure industry and attract foreign investment traps post-Communist countries in a spiral of economic decline, which poses severe challenges to the legitimacy of a democratic order. The corrosive influence of inequality is even more insidious. Economic reform always entails winners and losers, but at least rapid reform keeps the winnings and losses within bounds. An extended, inflationary transition transfers most of the dwindling wealth of society to a narrow and largely criminal elite that is closely linked to the government—a prospect profoundly disheartening to democrats.

1.2 What Would We Like the IMF to Do?

Inflation does not arise primarily because someone benefits from inflation per se; it arises primarily because politicians find it difficult to resist the short-term temptations that lead to inflation. The politicians who set monetary and fiscal policies face a commitment problem: *ex ante*, a policymaker prefers to be able to commit to an anti-inflationary policy for all future periods; yet, *ex post*, the policymaker prefers to renege.[10] Inflation rates depend on the expectations of private agents such as wage setters, investors, and currency traders, so the policymaker would like to be able to commit to an anti-inflationary strategy to reassure markets. The dilemma is that there are many temptations to renege on such commitments. Economic models often invoke the idea that "surprise" inflation has macroeconomic benefits, while political models point to imminent elections and the disproportionate power of narrow interests.[11] The temptation to pursue inflationary policies compels private agents to hedge their bets, driving the inflation rate higher than it would be were policymakers able to pursue a strategy of full commitment.

The consequence is that inconsistent authorities cast about for ways to tie their hands. The classic solution is to delegate monetary policy to an independent central bank, but this may not be feasible for countries still in the process of building democratic institutions. The same short-term considerations that

[10] Kydland and Prescott 1977; Barro and Gordon 1983.
[11] Alesina and Perotti 1995; Alesina and Rosenthal 1995.

drive politicians to promote inflationary policies will also compel them to undermine the independence of the central bank. In principle, however, the IMF can substitute for entrenched domestic institutions by monitoring compliance with stabilization programs and offering rewards and punishments that tip the balance of incentives in favor of the full-commitment equilibrium.[12]

International capital markets play a key role in enforcing the bargain. As the volume of international transactions increases, national governments become increasingly subject to the power of markets.[13] As barriers to capital flows fall, exit becomes less costly for private agents, and governments concerned about promoting welfare and productivity are compelled to provide more hospitable conditions for capital. The greater part of the IMF's leverage over borrowing countries arises, consequently, because it is able to coordinate the actions and expectations of the dispersed actors who comprise capital markets.[14] Investors can punish bad economic policies without coordination, simply by diving for cover. It is more difficult, however, for decentralized actors to reward good policies, because a sound investment climate is a state of mind that has to be painstakingly constructed. When the Fund negotiates a stabilization program with a government that imposes policy conditions, it creates a focal point for investors to coordinate their expectations. Investors benefit from following IMF signals, because the threat of IMF sanctions for noncompliance helps to protect the value of their investments. In return, the impact of the Fund's resources is vastly magnified by world capital markets, which are opened up by the IMF seal of approval. Under favorable circumstances, a virtuous circle can arise, in which IMF intervention, government policies, and international investment reinforce one another.

The picture becomes somewhat more complex, however, when we consider that the IMF's own credibility is in question. IMF lending decisions are not informative signals about the borrower's ability to repay, because they are not costly: The Fund does not have to worry about default.[15] Therefore, the IMF seal of approval is only valuable if conditionality is backed by rigorous enforcement. The IMF, however, is not an autonomous actor, analogous to an independent central bank. Rather, IMF policy is closely controlled by the Fund's board of directors, which is appointed by the donor countries. A coalition of a few large donors can set policy under the IMF system of weighted voting, and all decisions about new agreements, loans and disbursements must be cleared by the board. Consequently, the autonomy of the IMF staff varies in inverse

[12]Dhonte 1997; Swoboda 1982; Jones 1987. Similarly, the European Monetary System (EMS) has been modeled as a means for low-credibility countries to borrow credibility for their macroeconomic policies from high-credibility countries. See Giavazzi and Pagano (1988).

[13]Cohen 1996; Keohane and Milner 1996.

[14]Lipson 1986.

[15]For a discussion of the complexity of official creditor seniority, see Bulow, Rogoff and Bevilaqua (1992).

proportion to the international significance of the case at hand. The Fund has a relatively free hand in negotiating with small developing countries, but in important cases the interests of the donor governments dictate the negotiations.[16] International strategic concerns and trade policies frequently override the stabilization agenda.

A major objective of the research design described above is to address exactly this objection. Is it possible for an institution whose basic mission is compromised in this way to nevertheless exert a positive influence? How significant is the influence of noneconomic considerations on IMF lending decisions, and how strong are the effects of IMF intervention on government policies? Answers to each of these questions emerge from the formal model, the quantitative empirical analysis, and the detailed country studies and interviews with participants in the negotiations. The conclusions show that the IMF's credibility problem is indeed severe, and consequently the organization's effectiveness is compromised in some of the most important countries. At the same time, this study finds ample evidence that the IMF has exerted significant influence over the economic policies of post-Communist countries. This mixture of findings suggests a synthesis of perspectives on international relations that emphasize power and interests with those that emphasize the role of international institutions. The interests of powerful countries define the parameters within which the International Monetary Fund operates, and the limits of what it can achieve. The IMF is, after all, an international institution, not a supranational one. However, international institutions are not only instruments that powerful nations wield in order to obtain whatever objectives appear to be expedient; they are also strategic actors in their own right. Furthermore, even when the playing field is uneven and the rules are subject to manipulation, international institutions create incentives for countries to shape their national policies in accordance with international norms.

[16]I introduced a formal model based on this argument, and econometric tests using data from Russia, Poland, the Czech Republic, and Romania, in Stone (1997).

Part I

Models and Data

2

A Formal Model of Lending Credibility

THIS CHAPTER presents the main argument of the book in the form of a game-theoretic model. Game-theoretic modeling is a powerful tool, but it comes with a significant drawback: The predictions of a model are only as good as the assumptions that go into it. For example, the model can say nothing about whether the utility functions attributed to the players accurately reflect the values and priorities of real actors, or whether the parameters of the model accurately reflect the strategic situation they face. There are numerous, important questions about which game theory can tell us nothing at all. If its limitations are kept firmly in mind, however, game theory can help us to build more rigorous arguments than would otherwise be possible about a particular class of phenomena that play an important role in politics: strategic interactions. I develop a formal game-theoretic model because the strategic interaction between the IMF and borrowing countries is complex, and game theory is the most appropriate tool for analyzing the factors that are most important: credibility, market expectations, reputation, and information.

Formal theory must be empirically informed in order to be empirically relevant. While it is not technically feasible to model all the nuances of complex international interactions, I strive for a particular kind of realism: I seek to focus attention on the strategic variables that are empirically most important.[1] Consequently, my model is tested against extensive interviews with Russian, Ukrainian, Polish, and Bulgarian officials and their negotiating partners in the IMF. In a break with much work in formal theory, I consider it a valid criticism of my model if the strategies that it calls for do not seem realistic to the agents who would be required to implement them. Furthermore, I have worked

[1] Robert Powell describes this approach as a "modeling dialogue," in which the analyst uses contextual knowledge to improve models to better reflect empirical situations. The problem, of course, is circularity: If the data go into the model, they cannot be used to test it. The only solution is out-of-sample testing. In the case of this project, the key features of the model were derived from a case study of Russian relations with the IMF from 1992 to 1996 (Stone 1999). The portion of my Russian case study based on interviews conducted through 1997, therefore, can only be regarded as an illustration of the theory, not a test. The next four years in Russia, the other case studies and the quantitative tests, on the other hand, are out-of-sample tests of the model's predictions.

to build a realistic model in order to make possible more powerful empirical tests. For example, it is essential that the model capture the fact that cheating occurs under IMF programs, that IMF officials anticipate cheating when they design these programs, and that international capital markets anticipate cheating when they react to them. This makes it possible for the model to make empirically testable predictions about levels of inflation, international capital flows, and the conditions under which the IMF will suspend lending.

The following features of the strategic situation are built into the model:

1. *Dynamic inconsistency.* Economic policymakers in a variety of contexts suffer from commitment problems, or from dynamic inconsistency, as the phenomenon is called in the macroeconomic literature.[2] *Ex ante,* a policymaker would like to be able to commit to a goal of low inflation in order to attract foreign investment and forestall a spiral of self-fulfilling inflationary expectations; *ex post,* however, having reaped the benefits of noninflationary expectations, the policymaker prefers to exercise discretion. The basic problem in this model is that the government faces a temptation to throw sound economic policy to the winds for short-term political gain, and the IMF must somehow persuade it not to do so. If this temptation were a constant parameter, however, we would not observe both compliance and defection. Furthermore, the empirical stories we tell about particular countries generally dwell on the transient elements that intensified or relaxed political constraints at key junctures. Consequently, the model treats the temptation to defect as a random variable. This makes it possible for a government to negotiate a program in good faith that it subsequently proves to be unwilling to carry out. I found a few cases in my country studies in which governments negotiated with the IMF in bad faith, but it was much more common for countries to defect because political constraints had changed in ways they had not foreseen. Furthermore, I treat the realization of the countries' temptation parameters each period as private information. This reflects the fact that governments know their own assessments of how likely they are to fall, to win reelection, or to pass key pieces of legislation, whereas the IMF and the market can only guess.

2. *Partisanship.* The strategic literature in macroeconomics focuses attention on an exogenously given trade-off between inflation and output.[3]

[2] Kydland and Prescott 1977; Barro and Gordon 1983.

[3] Perfectly anticipated inflation cannot increase output, since wages and prices will be set to counteract its real effects. To get around this problem, these models incorporate an element of "surprise." If wages are inflexible in the short run, a surprise burst of inflation will depress real wages, increasing output. In the long run, wages adjust to the new equilibrium price level, and output gains evaporate. However, as Lord Meynard Keynes famously remarked, "In the long run, we're all dead." As long as the benefits are high enough in the short run, there is a temptation to pursue inflationary policies.

Thus, we have Rogoff's (1985) famous result that delegating macroeconomic policy to a known conservative may have welfare-enhancing consequences, and Alesina's (1987) result that partisan competition can lead to political budget cycles, because left- and right-wing governments make these trade-offs differently. Partisanship is a natural way of interpreting this trade-off, since the immediate distributional costs of inflation and recession are borne disproportionately by different social groups, and these groups typically organize politically to defend their interests. Recent research has provided strong evidence that the partisan effect remains potent in advanced economies in spite of the forces of globalization and interdependence that were once expected to overwhelm it.[4] There is every reason to expect that partisan effects will be stronger in the post-Communist countries, since economic stabilization and reform are more salient issues there than in the stable polities and economies of the advanced industrial countries.

3. *The shadow of the market.* The countries that borrow from the IMF are already constrained by the reactions of market actors to their policies.[5] Indeed, to the extent that the Fund is able to exercise influence at all, it is by leveraging its own resources with the much greater economic impact of decentralized economic agents. Consequently, the game in which the Fund interacts with sovereign borrowers has to be nested in a game in which those borrowers interact with a market. However, I chose not to model the situation as a signaling game, where investors would follow IMF signals because the IMF had an information advantage over markets. First, I do not think it is empirically true that the IMF has an important information advantage. Market participants have stronger incentives and greater capacity than the IMF to gather the relevant information, and although governments provide the IMF with a great deal of privileged information, they have obvious incentives to distort it. Furthermore, the IMF reacts slowly to economic data, and market participants react much more rapidly. Second, there is a more important dynamic at work in the relationship between the Fund and the market that would be obscured by modeling it as a signaling game. Consequently, I build a model that shows that markets follow the IMF even under the pessimistic assumption that the Fund has no information advantage.

4. *The IMF's credibility problem.* The model assumes that the IMF bears a cost when it withdraws financial support from a country that has failed to fulfill the conditions of its program. This is intended to represent the influence over IMF decision making of the donor countries, which

[4] Alesina, Roubini and Cohen 1997; Garrett 1998; Robert J. Franzese 2002.
[5] Cohen 1996.

frequently intervene to urge the Fund to be lenient toward their favored clients. As a result of this assumption, the Fund faces a political incentive to be lenient in the model, which makes it difficult to enforce conditionality agreements. A study of seventeen developing countries concludes that,

> In its worst forms, such political interference forces the Fund to provide essentially unconditional finance to governments with proven records of economic mismanagement. This undermines the legitimacy and credibility of the Fund, and was among the most important reasons for programme ineffectiveness.[6]

It may at first seem odd to model the IMF as a bank that prefers to lend to countries that are bad credit risks, but the reader must recall that the IMF does not face any of the incentives of a commercial bank. It need not show a profit, and the value of its loan portfolio is immaterial. The Fund has the functions and interests of a central bank: Its objectives are to manage global liquidity and prevent local financial instability, which in the global economy takes the form of inflation and exchange rate crises. Its resources are determined by its board of directors, and, in principle, they are as unlimited as those of any central bank: it can create international currency (special drawing rights, or SDRs), and it can borrow from the world's central banks whatever its members determine to be appropriate. Like any central bank, the IMF comes under continual pressure to bail out insolvent clients, and withholding financing during a crisis is analogous to a central bank allowing a commercial bank to fail. The difference is that the IMF's clients are national governments and central banks rather than commercial banks, so the pressure takes the form of high foreign policy.

5. *Reputation.* In spite of the incentive to relent, the IMF is able to build a reputation for punishing, because it values the future cooperation that it expects this strategy to elicit from borrowers. In order to capture this effect, I model the interaction as an infinitely repeated game.

6. *Precedent.* As a commitment device, the IMF attempts to assure that countries are treated according to standard procedures, which minimizes its discretion in particular cases. Fund negotiators frequently refer to the precedents that particular concessions would establish for their relations with third countries.[7] Consequently, I model the Fund's simultaneous in-

[6]Killick and Malik 1992, p. 629.

[7]Interviews with Ernesto Hernandez-Cata, February 17, 1999; Yosuke Horiguchi, November 8, 1999; Mark Allen, February 19, 1999; Mohammed Shadman-Valavi, May 4, 2000; Anne McGuirk, May 3, 2000; Marcus Rodlauer, June 23, 1997; and Peter Stella, May 12, 1999.

teraction with n borrowers, and I study an equilibrium in which a failure to maintain the Fund's reputation in a particular case causes a general breakdown of cooperation. The Fund's reputational strategy with any particular country is only sustainable because of the linkage to simultaneous games with all the others.

7. *All countries are not created equal.* Although standard procedures are desirable, it is not credible to apply them equally across the board. Countries that play a prominent role in U.S. foreign policy tend to escape the rigors of IMF enforcement. Examples include Russia under Yeltsin, Mexico after the North American Free Trade Agreement (NAFTA), and Zaire and the Philippines during the Cold War. I capture this in the model by attaching different weights to different countries, so that the IMF's comparison of present incentives for leniency and future benefits of stringent enforcement varies across countries. If a country has a large weight it is more costly to punish (i.e., withhold committed financing), so the strategy of defending the Fund's reputation may not be sustainable. I find an equilibrium in which countries of different sizes are subject to different enforcement schemes. "Russia gets a discount," a Ukrainian National Bank official assured me.[8] Bulgarian officials protested on several occasions, "Well, Bulgaria is not Russia!"[9]

   Decision makers and analysts alike have often assumed that reputations depend on consistent treatment of dissimilar cases: For example, several U.S. administrations felt compelled to confront Communist guerrillas in Vietnam in order to signal U.S. resolve in Europe. Similarly, game-theoretic models typically assume that all players are treated equally, because this is an assumption that significantly simplifies the analysis. There is nothing inherent in game theory that requires equal treatment, however, so long as it is reasonable to assume that all the players know the rules for making distinctions. Reputations can be built around dissimilar treatment of dissimilar cases, and the strategies that result suffer from fewer credibility problems. As long as Bulgarians and Poles know that they cannot get away with behaving like Russians, they can be deterred regardless of what concessions the IMF makes to Russia.

8. *Macroeconomic policy is path-dependent.* IMF negotiators plan in terms of projected paths for macroeconomic aggregates, because the current level and velocity of those aggregates severely constrain the set of feasible policy scenarios. From an econometric perspective, there is autocorrelation in inflation and exchange rate data. From a strategic perspective, path dependence poses painful dilemmas. As a government deviates

[8] Interview with Oleg Rybachuk, July 3, 1998.
[9] Interview with Dimitar Popov, May 11, 1999; interview with Martin Zaimov, May 15, 1999.

from its targets, those targets become increasingly unrealistic because the future policy corrections required to reach them become more and more draconian. Should the Fund stay the course and insist on the fulfillment of increasingly irrelevant targets, thereby guaranteeing that the government will find its program too risky to adhere to? Or should it water down its program targets when they are not met, creating a perverse moral hazard? From a government's perspective, it becomes more difficult to meet future targets after the first deviation, so the balance of incentives shifts away from compliance. At the same time, since market participants are rational and anticipate the inertia that drives macroeconomic aggregates, increasingly higher levels of inflation are required to produce the same temporary rise in living standards. Thus, the first deviation is likely to lead to further deviations that fuel the inflationary spiral. Eventually, at the top of the spiral, the costs of hyperinflation become obvious to partisans of every stripe, and a period of restraint gradually brings inflation down. Lower levels of inflation, however, restore the incentives to surprise the market and bring renewed vulnerability to an inflationary spiral. In the model this roller coaster of surging and receding inflation is produced by a moving-average process that affects inflation, the assumption that the cost of inflation rises faster as inflation rises, and rational expectations. The roller coaster itself is an empirical observation: Many post-Communist countries have approached stabilization after several disastrous flirtations with hyperinflation, and it is rarely the first IMF program that succeeds in stabilizing an economy.

I capture these features in a game-theoretic model, which is presented formally in an appendix at the end of this chapter. The assumptions, logic, and results of the model are described here in more accessible terms. Readers who prefer a formal presentation, which is more precise, may prefer to read the appendix first. Other readers may question why a formal model is necessary at all, if it is possible to present the argument in plain English. There are two reasons. First, the plain English version does not give the reader any way to assess the truth of the claim that the conclusions follow from the assumptions. Convincing arguments are often false. If a formal argument is false, however, it can be disproved. Powell (1999) expresses this with an apt phrase: Formal modeling imposes "accounting standards" for arguments, making them more transparent and vulnerable to criticism.[10] Second, the process of solving a formal model often leads to insights and hypotheses that were not anticipated beforehand. This is certainly the case here, as I point out below.

[10]Mathematical symbols can obfuscate as well as clarify, however, which is why I chose to present the argument here in more straightforward terms.

2.1 The Model

The players are the IMF, a number of borrowing countries that vary in size, and a large number of small foreign investors. The game is infinitely repeated. In each period the investors decide whether to invest, each government chooses an inflationary or anti-inflationary policy, and the IMF disburses or withholds an installment of a loan to each country, called a *tranche*. The funds become available in the next period.

Foreign Investors. Investors who choose to invest make profits when the government chooses an anti-inflationary policy and take losses when the government chooses an inflationary policy. I assume that the international market for capital is in equilibrium, so the rate of return to investment exactly compensates the investors for the risks they take in each market. Consequently, each foreign investor is indifferent as to where to invest, so long as the risks do not change. In equilibrium, the rate of return depends on the long-run probability that the government chooses inflationary policies. Events that increase the probability that the government defects in the short run cause investors to withdraw from the market.

The Governments. Each country's government has negotiated a macroeconomic stabilization program with the IMF, which commits it to abstain from a particular inflationary policy. The government is tempted to violate the agreement: It receives a lump-sum benefit each time it chooses to defect, and the size of this benefit varies from period to period. This reflects the fact that a government can never know, when it signs an agreement, exactly what political constraints it will face in the future. On the other hand, the inflation that results from these policies is costly, and the government benefits from foreign investment and IMF financing. The size of each government's benefit from inflationary policies in any given period—its temptation—is private information. Thus, the other actors can only make their strategies depend on the governments' policies, which they observe, and not on the governments' levels of temptation, which they do not.

The IMF. Two factors affect the IMF's utility in this model: The Fund dislikes inflation, and it finds it costly to punish countries by withholding financing. The IMF puts a weight on each country, which corresponds to its political influence and strategic importance. The intuition behind this is that it is more costly to deny financing to countries that figure prominently in the foreign policy priorities of the IMF's most important members. By the same token, however, financial instability is more costly when it occurs in very important countries. As a result, the IMF faces conflicting incentives in dealing with large countries, and I capture this by applying a country's weight to the IMF's disutility from inflation as well as to its utility of lending.

Figure 2.1 summarizes the sequence of events that occur in each period.

This is a game of incomplete information, since governments know exactly

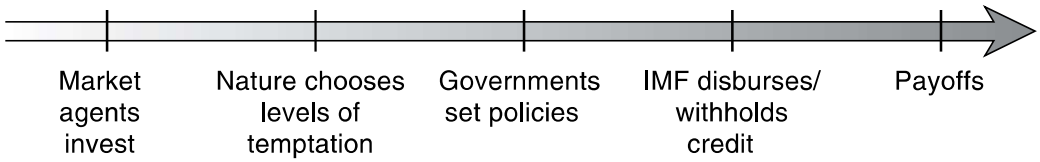

Figure 2.1: The Stage Game.

what political constraints they believe they face, whereas markets and the IMF can only guess (i.e., the realizations of the governments' variable temptation parameters in each period are private information). Foreign investors move first, deciding whether to invest in each country, so they cannot rely on any current-period signals from the IMF to build their strategies. The governments move next, after learning their levels of temptation, and thus are able to catch investors by surprise. This ability to surprise market agents who have already committed themselves is central to most stories about how governments can benefit from inflationary policies by seigniorage (revenue from creating money, which acts as an inflation tax on money balances and other nominal assets) or by using short-term labor market rigidity to exploit a Phillips curve (lowering real wages in order to expand employment and output). These strategies would not work if they were not surprises, because wages and assets would already be indexed and hedged. The IMF moves last, but its decisions do not take effect (money is not disbursed) until the following period. This reflects the fact that the IMF follows rather complex bureaucratic procedures and consequently does not react quickly to punish defection.[11]

2.2 The Equilibrium

As is the case in infinitely repeated games generally, this model has multiple equilibria.[12] Thus, deciding which equilibrium to study is a modeling choice as important as setting the model's parameters and the sequence of actions. Since my objective is to design a theory that can be tested empirically, these choices are critical. The equilibrium that I study subsumes a large class of similar equilibria that would generate very similar predictions; nevertheless, important choices had to be made. My approach to this problem is to regard institutions as equilibria, and institutional details—standard operating procedures, norms, and rules—as the equilibrium expectations that support them. Since I am studying a concrete institution, the International Monetary Fund, the appropriate way to select an equilibrium for the game is to choose equilibrium expectations that conform closely to the Fund's own procedures. Viewed

[11] Interview with Shadman-Valavi, May 4, 2000. Mr. Shadman-Valavi was head of the IMF Mission to Ukraine 1997-2000.

[12] Fudenberg and Levine 1989; Fudenberg and Tirole 1991.

in this way, the "multiple-equilibria problem" is not an obstacle that prevents the theory from generating testable hypotheses but, rather, an opportunity to incorporate some of our empirical knowledge into the theory to generate better hypotheses. For example, the IMF practice is not to impose punishment periods of any particular length on countries that violate their conditions; instead, its rule is to suspend financing until the country brings its policies back on track, ordinarily requiring them to meet the original conditions set forth in the memorandum of understanding that the government signed when it agreed to the program. When the IMF makes exceptions, it does so by allowing the country to resume borrowing after improving its policies and renegotiating its targets, without necessarily achieving the original ones. I incorporate this practice into the model not as a constraint but as an equilibrium expectation.

I find a perfect Bayesian Nash equilibrium (PBE), which means that in this equilibrium the actors are permitted to use only credible strategies and to hold only rational beliefs.[13] Credibility means that if the actors are ever called on to implement their strategies, they must find it in their interest to do so. Furthermore, they must not prefer to deviate from them under any possible circumstances, including circumstances that should never arise in equilibrium. In such an equilibrium, any incredible threats or promises that one of the actors might choose to make would simply be ignored; everyone assumes that everyone else will simply act in accordance with his or her own interests as they appear at the time. For example, in this model the IMF cannot credibly threaten to punish for eternity any country that fails to fulfill its commitments, because it would never be willing to implement such a threat if an important country defected. Consequently, no country would believe such a threat, so no one would be deterred by it. Similarly, in this model no country can credibly promise never to deviate from its program targets, since it might at any time draw such a high level of temptation that defection would be optimal regardless of the long-term consequences. In this equilibrium, therefore, governments defect whenever the temptation exceeds a critical value that depends on the IMF's strategy.

The critical value for defection depends on whether the government in question defected in the previous period. A government that defected last period knows that it will not receive capital inflows next period, irrespective of its policy choice this period, so the benefits of exercising restraint are deferred and therefore less valuable. Since its incentive to abide by its program commitments is lower, the threshold value is lower and the probability that the randomly drawn temptation parameter is high enough to lead it to defect is higher. On the other hand, defecting last period increases inflation next period. Since I assume that the cost of inflation rises more rapidly as the inflation

[13] Perfect Bayesian equilibrium requires that the players' strategies form a Nash equilibrium whenever they must make a decision, on or off the equilibrium path, and that their expectations and beliefs be consistent, using Bayes' Rule whenever it applies, on the equilibrium path. There are no restrictions on beliefs off the equilibrium path.

rate increases, this means that last period's inflationary policies make it more costly to choose inflationary policies in the future.[14] This effect mitigates the previous one to some degree. In a more general model the inflation rate could be generated by an autoregressive process rather than a one-period moving average. In other words, the effect of an inflationary policy in any given period would gradually die away, but the effects of inflationary policies chosen successively would accumulate indefinitely. In that case the mounting costs of inflation would eventually become so great that the balance of incentives would swing back toward macroeconomic restraint, and the government would be compelled to change course.[15]

Since governments cannot keep a promise not to defect, investors will never believe such a promise and will only invest if they are compensated for the risk of doing business in a country whose government may choose inflationary policies. I assume that, in the long run, real returns on investment adjust so that investors are indifferent as to where they invest. In practice, this means that the return is set precisely to offset the risk that a country that has not defected in the previous period defects in the current one. Investors observe each country's behavior in the prior two periods and invest in those that have not defected. If the country defected in the previous period, it is more likely to defect in the current period, and therefore the return to investment is no longer high enough to compensate for the risk. Therefore investors strictly prefer not to invest.[16] If the country defected in the period before last, but not in the last period, investors are indifferent. In this equilibrium, investors choose not to invest in this case. In effect, they require governments that have deviated from their programs to prove their dedication to sound macroeconomic policy

[14] To be precise, I assume that the cost of inflation is proportional to inflation squared. I chose a quadratic function because it is easy to work with, but any function that makes the cost of inflation rise more rapidly as inflation increases would generate the same results.

[15] I do not attempt to solve such a model. It is considerably more complex than the model I solve in the appendix, because there are many more possible states of the world. However, the model that I solve is a limiting case of such a model in the same sense that a one-period moving average is a limiting case of an autoregressive process: The effects of all lags of inflation except the first are assumed to be 0. A simple thought experiment suggests that in a more general model that allowed some of these lags to exert an influence on inflation, the incentive to defect would gradually decrease after successive defections. After the first defection, the inflationary cost of the next defection would be exactly as it is in the current model. After the second, the inflation rate would be somewhat higher, raising the cost. After three successive defections, it would be higher still. Provided that the effect of lagged inflation were great enough, the mounting cost of inflation would eventually overwhelm the incentives to defect.

[16] Note that this has the character of a self-fulfilling prophecy: Investors withdraw because governments are more likely to defect, and governments are more likely to defect because investors are expected to withdraw. In a sense, game theoretic arguments are circular because, in a Nash equilibrium, everyone's actions depend on everyone else's. One might wonder why the government and the investors cannot collude to break out of the vicious cycle. Since other equilibria exist, the best answer is that this is an empirical question. Investment climates and pyramid schemes are built on mutually reinforcing expectations, and those expectations can be very persistent.

by cooperating twice before they will take the risk of returning to the market. This is a realistic equilibrium expectation to adopt, since it reflects the fact that investors move into new markets cautiously, so a favorable investment climate takes time to produce investment. Furthermore, this additional delay is a substantively desirable feature of the model, since it simulates factors that were left out of the model in order to make it tractable. For example, if government policies were observed gradually, or were observed with uncertainty, delays of this sort would arise because investors would strictly prefer not to invest. Some delay is necessary in the model in order to support the equilibrium; I chose a one-period delay because it is the easiest to work with.

The IMF does not treat all borrowers consistently in this equilibrium: It uses two different punishment schedules. For less important countries it uses a regime that I call *hold the line*: It withholds financing if the government has defected from its program, and it does not resume financing until the country has achieved its original program target—that is, until the country has gotten itself back "on track" by its own efforts. In this model it is impossible for the government to achieve its original target this period if it defected last period, and the fact that it defected last period increases the incentive for the government to defect again. Consequently, when the Fund insists that a country achieve its original target before resuming financing, it consigns the country to a punishment interval that may be quite lengthy. Under the assumptions of the model, it lasts at least two periods and ends after the government has cooperated twice in succession.

It would not be credible to threaten to apply the *hold-the-line* regime to the most important countries. The reason is that the cost of punishment is all concentrated on the IMF's utility vis-à-viz the defecting country, but the cost of failing to punish affects the IMF's utility vis-à-viz all countries, because the IMF loses its reputation with all of them if it fails to carry out a punishment that its strategy requires. Thus, the cost of punishment is greater when the country in question is more important, while the cost of failing to punish remains constant. Beyond some threshold size, the cost of punishment multiplied by the importance of the country exceeds the total discounted benefits of maintaining a reputation. Consequently, the IMF applies a regime to important countries that is less exacting and is therefore possible to credibly enforce. I call this regime *tit for tat*. Instead of demanding that they return to their original targets by cooperating twice in succession, the Fund requires that they cooperate only once in order to become eligible to receive financing. In effect, it revises their short-term policy targets in return for a policy improvement. This regime also calls for indefinite periods in which countries may not be eligible for financing, since governments may defect repeatedly, but it imposes much lower expected costs on both the IMF and the government involved.

Since the punishment interval is shorter under *tit for tat* than under *hold the line,* governments are more tempted to defect, and as a result they defect more

often. Thus, the model predicts that average inflation rates should be higher in countries that are more important, and foreign investment should be lower. In addition, the model predicts that since these countries defect from their agreements more often, all else being equal, they should be punished more often. However, they should be punished for shorter periods on average. Since the probability of defection is higher under the *tit-for-tat* regime, equilibrium interest rates will be higher in more important countries to compensate for the increased risk.

2.3 Hypotheses Derived from the Formal Model

The model generates hypotheses about the behavior of three kinds of actors. The first set of hypotheses concerns the IMF's strategies. The Fund is expected to punish smaller, less important countries for longer periods than larger ones. On the other hand, larger countries should be subjected to punishment episodes more frequently, because they violate their agreements more often. For example, Russia has had its IMF loans suspended repeatedly but never for long, and the IMF has often had to scale back the conditions attached to its programs in order to reach an agreement to reestablish Russia's credit line.

The second set of hypotheses concerns the countries' strategies. First, IMF intervention should make a difference in countries' economic policies. Whenever the enforcement of an IMF conditionality program is at issue or the negotiation of such an agreement is possible and desirable–regardless of whether a program is currently in force–policies should be less inflationary on average. Second, the effect of IMF intervention should depend on the credibility of IMF threats to withhold financing in particular countries at particular times: The more credible, the greater the effect. Third, countries that have defected recently should be more prone to defect again, because capital markets and the IMF will only resume lending after some delay even if they exercise restraint. Countries in good standing with the Fund and the market are less likely to defect because they have more to lose. Fourth, the difference in policy between punishment periods and periods of good standing is greater for smaller, less influential countries. Smaller countries' policies deteriorate more when their programs are suspended because they have to wait longer for lending to resume, and consequently their incentives to comply are reduced more. Larger countries' policies improve less when their programs are in good standing, because they gain less credibility from good standing and therefore have less to lose when they defect.

The third set of hypotheses concerns the expectations of actors in capital markets. Capital markets are expected to respond to IMF signals. Thus, when a country becomes eligible to receive IMF financing, and therefore subject to the incentives the IMF provides to its members, the market should expect better policy, and this should be reflected in more stable exchange rates, capital

inflows, and less capital flight. In addition, participants in capital markets are expected to form rational expectations about the probability that the IMF will suspend disbursements of loans, so these expectations should affect capital flows and the price of foreign currency. The more credible the IMF commitment to enforce conditionality, the stronger capital inflows and the national currency should be. Furthermore, capital markets are sophisticated about the incentives for repeat defection and the effects of the IMF's credibility on those incentives, so capital movements should anticipate them. Therefore, the capital account should deteriorate when a country's program is suspended; but this effect should be markedly less pronounced in the most influential countries.

2.4 Conclusions

In this model, governments are sometimes deterred from defecting, but still defect when the variable component of their temptation parameter is high enough. The IMF invests in its reputation by punishing countries that defect, but has different punishment schedules for different countries. The IMF does not have an information advantage over the market, and market agents are sophisticated about the Fund's credibility problems, but the market still responds to IMF strategies. Indeed, the fact that market participants condition their strategies on the IMF's behavior strengthens governments' incentives to cooperate with the Fund. The most striking findings of the model are that countries can indeed benefit from building a reputation for complying even though they often cheat, and that the IMF can indeed enforce cooperation without knowing anything that everyone else does not know, and despite the fact that it consistently favors some countries over others.

Several predictions of the model are quite counterintuitive. It is not surprising that countries that are more costly to punish are subject to shorter punishment periods. It is surprising, however, that the IMF is expected to punish more important countries more often than less important ones, *ceteris paribus*. Given the argument that the Fund finds it more costly to punish more important countries, one might naturally suppose the opposite, that it would punish more important countries less frequently. This is a case where formalizing the argument allows us to learn something important. I find that the constraint on punishment is not the average cost of withholding financing, but the credibility of threats to enforce long punishments on large countries. Thus, randomizing and punishing larger countries with a lower probability would not solve the problem, because whenever a costly punishment had to be meted out, the IMF would renege. Therefore, the IMF must resort to a shorter punishment regime for more important countries.[17] Given the shorter punishment regime,

[17]Models of deterrence (Powell 1987) avoid this problem by assuming that the decision maker can credibly delegate its final decision to a random process, for example, by escalating a crisis in

governments are more likely to defect, and be punished—for a short time—as a result.

Similarly, it is not obvious that the incentive to defect is greater for countries that have already defected in the recent past. Furthermore, although one might anticipate the model's expectation that countries that are difficult to punish are likely to have higher inflation, it is not obvious that small countries' policies will deteriorate more when their programs are suspended. Again, these expectations are plausible when they are explained, but they emerge from the complex strategic interaction in the model. Without the model, it is unlikely that it would have occurred to anyone to test them.

Several testable propositions emerge from the model, regarding the choices of the IMF, borrowing countries, and international investors. The chapters that follow test these hypotheses using quantitative analysis and detailed case studies.

a way that increases a risk that "things will get out of control." This would not be a reasonable assumption in the case of the IMF. If there were any way for the Fund to delegate its decision to an impartial process, it would not have a credibility problem.

Appendix: A Formal Model of Lending Credibility

The Model

The players are the IMF, the governments of countries, i, $(i = 1, 2, \ldots, n)$, and a large number of small foreign investors. The game is an infinitely repeated game of incomplete information, and the private information in the game concerns one parameter of the governments' utility function. The actions available to the players are as follows: the IMF disburses or does not disburse a loan tranche to each country, $S_i = \{s, 0\}$, where $s \in (0, 1)$; the investors decide whether to invest, $K_i = \{k, 0\}$, where $k \in (0, 1)$; and each government chooses a macroeconomic policy, $X = \{x, 0\}$, where $x \in (0, 1)$.

The stage game is as follows. First, the investors choose whether to invest. Second, the countries observe their private information and simultaneously choose their policies. Third, the IMF observes the policies of the n countries and, in a randomized sequence, decides whether to disburse funds. The funds become available in the next period.

The Investors

The international capital market is in equilibrium, so the return to investment exactly equals the risks in every market. Investors are risk neutral, so they are indifferent as to where to invest. If investors invest and there is no inflation, they receive r, the nominal interest rate. If investors choose to invest and there is inflation, they receive a payoff of -1, and if investors choose not to invest, they receive a payoff of 0. The condition that investors are indifferent implies that r is the market-clearing rate:

$$r = \frac{1 - b^*}{b^*}$$

where b^* is the equilibrium probability that the government chooses a non-inflationary policy. I assume that r does not adjust in the short run in response to government policies, but adjusts instantaneously in response to a change in the IMF's strategy (i.e., assessments of individual country risks adjust slowly, but adjustment to systemic changes in the global economy is rapid).

The Governments

Each government has a policy instrument, X, which can create a spurt of inflation. In each period, t, it chooses $x_{i,t} \in X$. Inflation, π, is a first-order moving

average process with $\rho \in [0, 1]$:

$$\pi_{i,t} = x_{i,t} + \rho x_{i,t-1}$$

Governments receive disutility from inflation but benefit by using their policy instrument. They also benefit from capital inflows and from receiving IMF funding. Each government's per-period payoff is

$$u_i = \begin{cases} -\alpha\pi_i^2 + k + s & \text{if } x_i = 0 \\ -\alpha\pi_i^2 + b_i + k + s & \text{if } x_i = x \end{cases}$$

The parameter b_i, which determines a government's temptation to inflate the economy, is an iid random variable drawn for each country each period from a uniform distribution on $[0, 1]$ and is private information to the government. The parameter $\alpha \in [0, 1]$ is the disutility from inflation multiplier. Each government maximizes its discounted stream of payoffs using a common discount factor $\delta \in (0, 1)$.

The IMF

The IMF can disburse or withhold a loan tranche. It receives disutility from inflation and utility from disbursing funds, ω. It assigns weight, $\lambda_i \in [0, 1]$, to each country, i, such that $\sum_{i=1}^{n} \lambda_i = 1$. The IMF's per-period payoff is

$$u_{\text{IMF}} = \sum_{i=1}^{n} \lambda_i(\omega - \pi^2) \tag{2.1}$$

and the IMF maximizes its intertemporal sum of payoffs using the common discount factor δ.

Equilibrium Analysis

Consider three types of IMF punishment strategies: (i) *unconditional lending* (UNC), where it provides financing irrespective of the government's policy; (ii) *tit for tat* (TFT), where it withholds financing for one period after every deviation from the anti-inflationary policy; and (iii) *hold the line* (HTL), where it disburses financing to every government that has achieved zero inflation in the current period and withholds financing from any government with positive inflation.

Furthermore, assume $k - 2\alpha\rho x^2 > 0$. Recall that k is capital investment, and the other term is the interaction between the disutility of the inflation caused by current policy and that caused by last period's policy. The substantive significance of this assumption is that all the countries in the model are significantly,

but not excessively, dependent on foreign capital flows.[18]

Also, assume that the IMF's payoff from punishing defectors under the HTL regime is strictly lower than the payoff in the TFT regime, which itself is strictly lower than the payoff in the UNC regime.[19] If the condition did not hold, the IMF would never be tempted to be lenient. This assumption limits the rest of this discussion to cases in which the IMF has a credibility problem.

Proposition 2.1. *The following strategies form a perfect Bayesian equilibrium. Each country i plays according to three regimes, depending on λ_i. For every country i and any period t, investors invest k if $\pi_{i,t-1} = 0$, and 0 otherwise. The IMF disburses s if $\pi_{i,t} = 0$, and otherwise responds according to the three regimes:*

1. *If $\lambda_i > \lambda^*$, the IMF plays UNC. If the government complied in the previous period, it defects if $b_i \geq b^*_{UNC}$, and if it defected in the previous period, it defects if $b_i \geq b^{**}_{UNC}$;*
2. *If $\lambda^{**} \leq \lambda_i \leq \lambda^*$, the IMF plays TFT. If the government complied in the previous period, it defects if $b_i \geq b^*_{TFT}$, and if it defected in the previous period, it defects if $b_i \geq b^{**}_{TFT}$;*
3. *If $\lambda_i < \lambda^{**}$, the IMF plays HTL. If the government complied in the previous period, it defects if $b_i \geq b^*_{HTL}$, and if it defected in the previous period, it defects if $b_i \geq b^{**}_{HTL}$,*

where

$$b^*_{UNC} = E/F \qquad b^{**}_{UNC} = b^*_{UNC} + G$$
$$b^*_{TFT} = E/F + (2\delta s)/F \qquad b^{**}_{TFT} = b^*_{TFT} + G$$
$$b^*_{HTL} = E/F + \frac{2\delta s - 2\delta^3 ks - \delta^3 s^2}{F - 2\delta^2 s} \qquad b^{**}_{HTL} = b^*_{HTL} + G - \delta s$$

with

$$E = 2\alpha x^2 + 2\delta k - \delta^3 k^2 + 2\delta\alpha\rho x^2(2 + \rho - G + \delta k)$$
$$F = 2(1 + \delta G)$$
$$G = 2\alpha\rho x^2 - \delta k$$

[18] In a richer model, where inflation was generated by an autoregressive process instead of a one-period moving average process, these interaction terms would accumulate as the government continued to defect in successive periods, until eventually the rising cost of inflation created incentives to exercise restraint that exceeded the incentives facing countries that had cooperated from the outset. In such a model, the probability of defection would initially increase after the first defection, and then gradually decrease as inflation rose. I use the moving-average assumption, however, because it simplifies the solution for an equilibrium.

[19] This assumption is formally stated in (2.9), and holds for sufficiently high values of s and sufficiently low values of δ. In other words, it is a restriction on the values of the exogenous variables. Substantively, it means that it is more costly to punish a country for a long period than for a short period, in spite of the fact that longer punishments imply lower inflation.

and where λ^*, λ^{**} are as defined in (2.12) *and* (2.13)*. If the IMF ever deviates from its equilibrium strategy, investors and governments expect it to stop defending its reputation and play UNC thereafter.*

Proof. Note that, given the assumptions, $G \in (-1, 0)$, $F \in (0, 2)$, and $E \geq 1$. I shall prove the claim by construction. Consider first the government strategy at some arbitrary time t. Each country i falls into one of the three regimes, depending on λ_i. I shall examine the strategy for each regime in turn. Let $\iota \in \{\text{UNC,TFT,HTL}\}$ be an indicator of the regime for country i and define six value functions. Let V_ι be the present discounted value of i's payoffs given that it cooperated in the current period and inflation was zero; and let W_ι be the present discounted value of i's payoffs given that it defected in the current period. In the following text the subscripts i and t are omitted for clarity.

Case 1

$\lambda > \lambda^*$, in which case the IMF plays UNC. If the government has not defected in $t-1$, then it defects in t if

$$-\alpha x^2 + b + k + s + \delta W_{\text{UNC}} > k + s + \delta V_{\text{UNC}}$$

or if

$$b > \alpha x^2 + \delta(V_{\text{UNC}} - W_{\text{UNC}}) \equiv b^*_{\text{UNC}} \tag{2.2}$$

On the other hand, if the government has defected in $t-1$, then it defects in t if

$$-\alpha(\rho x + x)^2 + b + s + \delta W_{\text{UNC}} > -\alpha\rho^2 x^2 + s - \delta k + \delta V_{\text{UNC}}$$

or if

$$b > 2\alpha\rho x^2 + \alpha x^2 + \delta(V_{\text{UNC}} - W_{\text{UNC}}) - \delta k \equiv b^{**}_{\text{UNC}} \tag{2.3}$$

Since $k > 2\alpha\rho x^2$ by assumption, it follows that for sufficiently high δ, $\delta k > 2\alpha\rho x^2$ also, which implies $b^*_{\text{UNC}} > b^{**}_{\text{UNC}}$. We now have

$$\begin{aligned} V_{\text{UNC}} &= k + s + b^*_{\text{UNC}}\delta V_{\text{UNC}} + (1 - b^*_{\text{UNC}})\Big(-\alpha x^2 + \frac{1 + b^*_{\text{UNC}}}{2} + \delta W_{\text{UNC}}\Big) \\ &= \frac{1}{1 - \delta b^*_{\text{UNC}}}\Big[k + s + (1 - b^*_{\text{UNC}})\Big(-\alpha x^2 + \frac{1 + b^*_{\text{UNC}}}{2} + \delta W_{\text{UNC}}\Big)\Big] \end{aligned} \tag{2.4}$$

Similarly, the value for the future conditional on current defection is

$$\begin{aligned} W_{\text{UNC}} &= s + b^{**}_{\text{UNC}}(-\alpha\rho^2 x^2 - \delta k + \delta V_{\text{UNC}}) \\ &\quad + (1 - b^{**}_{\text{UNC}})\Big[-\alpha(\rho x + x)^2 + \frac{1 + b^{**}_{\text{UNC}}}{2} + \delta W_{\text{UNC}}\Big] \\ &= \frac{1}{1 - \delta + \delta b^{**}_{\text{UNC}}}\Big[s - \alpha\rho^2 x^2 + b^{**}_{\text{UNC}}\delta(V_{\text{UNC}} - k) \\ &\quad + (1 - b^{**}_{\text{UNC}})\Big(-\alpha x^2 - 2\alpha\rho x^2 + \frac{1 + b^{**}_{\text{UNC}}}{2}\Big)\Big] \end{aligned} \tag{2.5}$$

Substituting (2.5) in (2.4) and simplifying yields

$$V_{\text{UNC}} = \Big[(1-\delta)(1-\delta b^{*}_{\text{UNC}} + \delta b^{**}_{\text{UNC}})\Big]^{-1} \Bigg\{ (1-\delta+\delta b^{**}_{\text{UNC}})(s+k) + \frac{1}{2}(1-b^{*}_{\text{UNC}})\Big[1+\delta b^{**}_{\text{UNC}} - \delta (b^{**}_{\text{UNC}})^2 + 2\delta s - 2\delta^2 k b^{**}_{\text{UNC}} + b^{*}_{\text{UNC}}(1-\delta+\delta b^{**}_{\text{UNC}}) - 2\alpha x^2 (1+2\delta\rho(1-b^{**}_{\text{UNC}}) + \delta\rho^2)\Big] \Bigg\} \quad (2.6)$$

Substituting (2.6) in (2.5) and simplifying yields

$$W_{\text{UNC}} = \Big[2(1-\delta)(1-\delta b^{*}_{\text{UNC}} + \delta b^{**}_{\text{UNC}})\Big]^{-1} \Bigg\{ (1-\delta b^{*}_{\text{UNC}})\Big[1+2s-(b^{**}_{\text{UNC}})^2 - 2\alpha x^2 (1+\rho)^2\Big] + b^{**}_{\text{UNC}}\Big[\delta(1-(b^{*}_{\text{UNC}})^2 + 2s + 2\delta k b^{*}_{\text{UNC}}) + 2\alpha x^2 (1-\delta-2\rho(1-\delta b^{*}_{\text{UNC}}))\Big] \Bigg\} \quad (2.7)$$

Substituting (2.6) and (2.7) in (2.2) and (2.3), and simplifying the result, yields the values for b^{*}_{UNC} and b^{**}_{UNC} stated in the proposition.

Case 2

$\lambda^{**} \leq \lambda \leq \lambda^{*}$, in which case the IMF plays TFT. Using an argument analogous to the one used to establish the threshold values in the previous case, I find $b^{*}_{\text{TFT}} > b^{**}_{\text{TFT}}$. These are identical to expressions (2.2) and (2.3), respectively, up to the continuation values, which are now V_{TFT} and W_{TFT}. As before, I solve for the continuation values, simplify, and substitute the results into the expressions for the thresholds, which yields the values stated in the proposition.

Case 3

$\lambda < \lambda^{**}$, in which case the IMF plays HTL. Using the construction for the previous cases, *mutatis mutandis*, yields the thresholds $b^{*}_{\text{HTL}} > b^{**}_{\text{HTL}}$ in terms of the continuation values V_{HTL} and W_{HTL}. The condition for the inequality to hold is $\delta k + \delta s > 2\alpha\rho x^2$, which is satisfied. Solving for these values, substituting, and simplifying yields the values of the thresholds stated in the proposition.

These strategies are perfect, given the off-the-path beliefs stated in the proposition. In particular, if the IMF ever deviates from its equilibrium strategy, governments expect it to stop defending its reputation and to provide unconditional financing. In this case, the condition for defecting by the governments is given in (2.2) and (2.3). Therefore, the IMF has nothing to gain from punishing defections, so it reverts to unconditional finance. This establishes the optimality of the government strategy.

Consider now the investor strategy. Let $b_\iota^* \in \{b_{\text{UNC}}^*, b_{\text{TFT}}^*, b_{\text{HTL}}^*\}$ be the probability that the government defects, which depends on the punishment regime that applies to that country, and define b_ι^{**} analogously. The interest rate is set to make the investor indifferent between investing in this market or elsewhere, so

$$r = \frac{1 - b_\iota^*}{b_\iota^*}$$

If the government has not defected in the prior period, $1 - b_\iota^*$ is the true probability that the government defects, so the investor will be indifferent. If inflation in the previous period was zero, some proportion of funds, k, is invested in the country. If the government has inflated in the previous period, however, the probability of defection is $1 - b_\iota^{**} > 1 - b_\iota^*$. Consequently, investors strictly prefer not to invest in the country.[20] If the government did not inflate in the previous period but did in the one before, the investors' equilibrium strategy requires them not to invest. This strategy is supportable in equilibrium because the probability of defection is $1 - b_\iota^*$, so the investors are indifferent.[21] Finally, suppose that the IMF deviates from its strategy. In this case, investors expect it to cease defending its reputation and play UNC thereafter. Consequently, governments are expected to choose inflationary policies with probabilities $1 - b_{\text{UNC}}^*$ if they have not defected in the previous period, and $1 - b_{\text{UNC}}^{**}$ if they have. Since interest rates adjust instantaneously to changes in the IMF's reputation, interest rates rise to offset the increased risk of defection. This establishes the optimality of the investor strategy.

Consider now the IMF's strategy. The cost of failing to punish any country at any time, t, is constant over time: Starting immediately with t, all countries revert to the strategy for unconditional funding. The IMF's payoff depends on the proportion of countries to which each punishment regime applies, which depends on the exogenous distribution of country sizes. Let D_{TFT} and D_{HTL} be the proportions of countries subject to the TFT and HTL regimes, respectively. Also, let $\iota \in \{\text{UNC,TFT,HTL}\}$ be an indicator of the regime type that applies to some country i in equilibrium, and define two types of value functions. Let

[20] Since by assumption interest rates do not respond to changes in government policy in the short run, any increase in the probability of an inflationary policy is fully reflected in a reduction of capital inflows.

[21] This modeling choice is arbitrary; since investors are indifferent in this model, there exist multiple equilibria in which the investors take different amounts of time to resume investment, governments defect with different probabilities, and long-run interest rates and risks assume different values. Some delay is necessary to support the equilibrium, but any length of delay will serve. In effect, the capital market forces governments to prove their dedication to sound macroeconomic policy before renewing confidence. Delay is a substantively desirable feature of the equilibrium, since it represents effects of realistic factors that were left out of the model for the sake of tractability. For example, investors would strictly prefer to withhold investment in this model if they were uncertain about the government's policies, or only learned them with certainty after some time had passed. A one-period delay, which corresponds to waiting until inflation has returned to its original level, is the simplest to work with.

V_ι^{IMF} be the present discounted value of the IMF's payoffs given that it carries out strategy ι when i has cooperated; and let W_ι^{IMF} be the corresponding value when i has defected. Then, for each i:

$$\begin{aligned} V_\iota^{\text{IMF}} &= \omega + b_\iota^* \delta V_\iota^{\text{IMF}} + (1 - b_\iota^*)(-x_i^2 + \delta W_\iota^{\text{IMF}}) \\ W_\iota^{\text{IMF}} &= b_\iota^{**}\Big[-\rho^2 x_i^2 + \delta(V_\iota^{\text{IMF}} - \omega)\Big] + (1 - b_\iota^{**})\Big[-(x_i + \rho x_i)^2 + \delta W_\iota^{\text{IMF}}\Big] \end{aligned} \tag{2.8}$$

Note that the following inequality is true by assumption:

$$W_{\text{HTL}}^{\text{IMF}} < W_{\text{TFT}}^{\text{IMF}} < W_{\text{UNC}}^{\text{IMF}} \tag{2.9}$$

Consider some arbitrary time, t, and suppose all countries have deviated in period $t-1$. This is the worst situation the IMF could face because it has to punish deviations as called for by its equilibrium strategy, and such deviations are more likely given that the countries have defected in the previous period. Suppose now that the first country i the IMF has to deal with is subject to the HTL regime. If the IMF deviates and does not punish i, every government switches to the UNC strategy in the next period, and the IMF's payoff is

$$\begin{aligned} &\lambda_i(\omega + \delta W_{\text{UNC}}^{\text{IMF}}) + D_{\text{TFT}}\Big[\omega + \delta\Big(b_{\text{TFT}}^{**} V_{\text{UNC}}^{\text{IMF}} + (1 - b_{\text{TFT}}^{**}) W_{\text{UNC}}^{\text{IMF}}\Big)\Big] \\ &\qquad + (D_{\text{HTL}} - \lambda_i)\Big[\omega + \delta\Big(b_{\text{HTL}}^{**} V_{\text{UNC}}^{\text{IMF}} + (1 - b_{\text{HTL}}^{**}) W_{\text{UNC}}^{\text{IMF}}\Big)\Big] \\ &\qquad + (1 - D_{\text{TFT}} - D_{\text{HTL}})\Big[\omega + \delta\Big(b_{\text{UNC}}^{**} V_{\text{UNC}}^{\text{IMF}} + (1 - b_{\text{UNC}}^{**}) W_{\text{UNC}}^{\text{IMF}}\Big)\Big] \end{aligned} \tag{2.10}$$

If the IMF follows its equilibrium strategy and punishes that government, the payoff then is

$$\begin{aligned} &\delta\lambda_i W_{\text{HTL}}^{\text{IMF}} + D_{\text{TFT}}\Big(b_{\text{TFT}}^{**}(\omega + \delta V_{\text{TFT}}^{\text{IMF}}) + (1 - b_{\text{TFT}}^{**})\delta W_{\text{TFT}}^{\text{IMF}}\Big) \\ &\qquad + (D_{\text{HTL}} - \lambda_i)\Big(b_{\text{HTL}}^{**}(\omega + \delta V_{\text{HTL}}^{\text{IMF}}) + (1 - b_{\text{HTL}}^{**})\delta W_{\text{HTL}}^{\text{IMF}}\Big) \\ &\qquad + (1 - D_{\text{TFT}} - D_{\text{HTL}})\Big(\omega + b_{\text{UNC}}^{**}\delta V_{\text{UNC}}^{\text{IMF}} + (1 - b_{\text{UNC}}^{**})\delta W_{\text{UNC}}^{\text{IMF}}\Big) \end{aligned} \tag{2.11}$$

The IMF will punish government i only when the payoff from doing so in (2.11) is at least as good as the payoff from deviating in (2.10). Note that the last term in each expression is identical. To simplify notation, let

$$\begin{aligned} A_\iota &= W_{\text{UNC}}^{\text{IMF}} - W_\iota^{\text{IMF}} \\ B_\iota &= A_\iota - (V_{\text{UNC}}^{\text{IMF}} - V_\iota^{\text{IMF}}) \\ C_\iota &= (\omega + \delta B_\iota) b_\iota^{**} \end{aligned}$$

After rearranging terms and using the simplified notation, the inequality becomes

$$\lambda_i C_{\text{HTL}} \leq D_{\text{TFT}}(C_{\text{TFT}} - \delta A_{\text{TFT}} - \omega) + D_{\text{HTL}}(C_{\text{HTL}} - \delta A_{\text{HTL}} - \omega)$$

which yields the country size threshold for the HTL regime:

$$\lambda^{**} = C_{\text{HTL}}^{-1}\Big[D_{\text{TFT}}(C_{\text{TFT}} - \delta A_{\text{TFT}} - \omega) + D_{\text{HTL}}(C_{\text{HTL}} - \delta A_{\text{HTL}} - \omega)\Big] \quad (2.12)$$

Thus, the IMF can credibly threaten to punish government i using the HTL regime if, and only if, $\lambda_i \leq \lambda^{**}$. By an analogous procedure we can find the corresponding value for TFT, which yields the necessary condition for punishment under that regime:

$$\lambda^{*} = C_{\text{TFT}}^{-1}\Big[D_{\text{TFT}}(C_{\text{TFT}} - \delta A_{\text{TFT}} - \omega) + D_{\text{HTL}}(C_{\text{HTL}} - \delta A_{\text{HTL}} - \omega)\Big] \quad (2.13)$$

Thus, the IMF can credibly threaten to punish government i using the TFT regime if, and only if, $\lambda_i \leq \lambda^{*}$. Although these threshold sizes are functions of exogenous variables, the expressions are very cumbersome and are omitted here. It remains to show that $\lambda^{**} < \lambda^{*}$, which is done in Lemma 2.2.

The IMF strategy is subgame perfect given the off-the-path beliefs of the governments and the players. This establishes the optimality of the IMF strategy. Therefore, the proposed strategies for the three players do indeed constitute a perfect Bayesian equilibrium of the game. □

Before I present the result about the threshold country sizes, I prove a useful lemma, which I then apply in the proof that follows.

Lemma 2.1. *$b^{*}_{HTL} > b^{*}_{TFT} > b^{*}_{UNC}$ and $b^{**}_{HTL} > b^{**}_{TFT} > b^{**}_{UNC}$.*

Proof. Consider the variable $F = 2+2\delta(2\alpha\rho x^2 - \delta k)$ as defined in the proposition and note that $1 > k - 2\alpha\rho x^2 \Rightarrow 2\alpha\rho x^2 - k > -1$, where the first inequality follows from $k < 1$. Since $\lim_{\delta\to 1} F = 2 + 2(2\alpha\rho x^2 - k) > 0$, it follows that for sufficiently high δ, $F > 0$. Since $b^{*}_{\text{TFT}} = b^{*}_{\text{UNC}} + 2\delta s/F$, this implies that $b^{*}_{\text{TFT}} > b^{*}_{\text{UNC}}$. Consider now the second term in the expression for b^{*}_{HTL}. For sufficiently high δ, the numerator lies in $(-1, 1)$. It can be verified that the smallest value of the numerator is obtained in the limit when $s, k \to 1$. In the limit, the largest value of the denominator in this case approaches 0 from the left (that it, it is negative because $F < 2$). This implies that the entire second term is positive and strictly greater than 1, which implies that it is larger than the second term in the expression for b^{*}_{TFT}. It can be verified that the same holds for the upper bound on the expression. Therefore $b^{*}_{\text{HTL}} > b^{*}_{\text{TFT}}$ for sufficiently high δ.

Since $b^{**}_{\text{UNC}} = b^{*}_{\text{UNC}} + G$ and $b^{**}_{\text{TFT}} = b^{*}_{\text{TFT}} + G$, we also have $b^{**}_{\text{UNC}} < b^{**}_{\text{TFT}}$. Since $b^{**}_{\text{HTL}} = b^{*}_{\text{HTL}} + G - \delta s$, and $b^{*}_{\text{HTL}} > b^{*}_{\text{TFT}}$, it follows that there exists some $\underline{s}$ such that for all $s \leq \underline{s}$, $b^{**}_{\text{HTL}} > b^{**}_{\text{TFT}}$. □

Lemma 2.2. *$\lambda_{HTL} < \lambda_{TFT}$.*

Proof. Consider some country i and let Y_i be the IMF's stream of payoffs from maintaining reputation with all other countries, and let Z_i be the stream of payoffs from providing unconditional financing. The IMF will enforce its TFT strategy if

$$\lambda_i \delta W^{\text{IMF}}_{\text{TFT}} + (1-\lambda_i)\delta Y_i \geq \lambda_i(\omega + \delta W^{\text{IMF}}_{\text{UNC}}) + (1-\lambda_i)\delta Z_i$$

or

$$\lambda_i \leq \frac{\delta(Y_i - Z_i)}{\delta(Y_i - Z_i + W^{\text{IMF}}_{\text{UNC}}) + s - \delta W^{\text{IMF}}_{\text{TFT}}} \equiv \lambda_{\text{TFT}} \tag{2.14}$$

Similarly, the IMF will enforce its HTL strategy if

$$\lambda_i \delta W^{\text{IMF}}_{\text{HTL}} + (1-\lambda_i)\delta Y_i \geq \lambda_i(\omega + \delta W^{\text{IMF}}_{\text{UNC}}) + (1-\lambda_i)\delta Z_i$$

or

$$\lambda_i \leq \frac{\delta(Y_i - Z_i)}{\delta(Y_i - Z_i + W^{\text{IMF}}_{\text{UNC}}) + s - \delta W^{\text{IMF}}_{\text{HTL}}} \equiv \lambda_{\text{HTL}} \tag{2.15}$$

The expressions (2.14) and (2.15) are positive and differ only in the last term of the denominator, and since $W^{\text{IMF}}_{\text{HTL}} < W^{\text{IMF}}_{\text{TFT}}$, it follows that $\lambda_{\text{HTL}} < \lambda_{\text{TFT}}$, as required. □

Comparative Statics

The following comparative statics are derived from the model:

- The longer the punishment period, the lower the probability of defection (Lemma 2.1):

$$b^*_{\text{HTL}} > b^*_{\text{TFT}} > b^*_{\text{UNC}} \text{ and } b^{**}_{\text{HTL}} > b^{**}_{\text{TFT}} > b^{**}_{\text{UNC}}$$

- Larger countries are subject to shorter punishment regimes (Lemma 2.2):

$$\lambda_{\text{HTL}} < \lambda_{\text{TFT}}$$

- The probability of defection in period t increases after a defection in period $t-1$ (Proposition 2.1):

$$b^{**}_{\iota} > b^*_{\iota} \text{ for all } \iota \in \{\text{UNC,TFT,HTL}\}$$

- The probability of defection in period t increases more after a defection in period $t-1$ for countries subject to HTL than for countries subject to TFT. Formally,

$$\begin{aligned} & (1 - b^{**}_{\text{HTL}}) - (1 - b^*_{\text{HTL}}) > (1 - b^{**}_{\text{TFT}}) - (1 - b^*_{\text{TFT}}) \\ \Rightarrow \quad & -G + \delta s > -G \\ \Rightarrow \quad & \delta s > 0 \end{aligned}$$