Is Transparency Good For You?

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Abstract

In this paper we show that those countries that have increased the quality and quantity of information released to markets since the emerging market crises of the 1990s have experienced an economically important decline in borrowing costs. We show this using data from a natural experiment generated when the IMF created three new ways for member countries to increase their transparency. We use two-stage least-squares to address endogeneity in the timing of reforms, exploiting internal IMF timetables that influenced the timing of adoption of the reforms but are unrelated to country events. We then examine some of the mechanisms by which transparency can affect spreads. We present a simple theoretical model illustrating how transparency can help solve a moral hazard problem or allow countries to signal their quality. Using high frequency data and a multi-country panel GARCH news effect methodology, we show these reforms led to better informed markets. We also find evidence that is consistent with the moral hazard version of our model, and other evidence that is inconsistent with the case where signaling leads to a loss in world output.

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IS TRANSPARENCY GOOD FOR YOU?

I. INTRODUCTION

The emerging market crises of the 1990s generated considerable debate about the role of institutions, and in particular, lack of transparency, in exacerbating crises. For example, failure to report the steady decline in reserves in Mexico in 1994 was blamed for the sharp turnaround in investor sentiment at the end of the year, while the revelation that the reserve position of the Thai central bank was not as strong as had been thought was a trigger for the Thai crisis in 1997. Similarly, the lack of transparency surrounding the nonperforming loans on bank balance sheets was a key element in the Korean crisis. It has been argued that with greater transparency, underlying problems would have been tackled earlier, capital inflows would have been smaller in the run up to the crisis, and the reversal in sentiment less dramatic.

While authors such as Furman and Stiglitz (1998) and Ortiz (2002) have questioned whether in fact lack of transparency played an important role in these crises, countries nevertheless responded to the experience by dramatically improving the quantity of information they release to the public. Mexico, for example, which before the 1994/95 crisis published figures on international reserves only three times a year, now posts the main items of the Central Bank's balance sheet on the web every week and reserve figures every month (Ortiz, 2002).

In this paper we examine whether markets have rewarded those countries that have become more transparent. While it is too early to assess whether greater transparency can reduce the probability of crisis, we can test whether increasing transparency reduces sovereign bond spreads (a measure of the market's perception of the probability of future crises) and if so why.

Using data from a natural experiment generated when the IMF introduced three transparency reforms which countries could adopt on a voluntary basis we find that greater transparency is associated with an economically important decline in sovereign bond spreads. These reforms

provide a unique opportunity to assess the general impact of transparency because the timing of their adoption by individual countries was largely determined by bureaucratic rules internal to the IMF and uncorrelated with country events and because they were designed to address precisely the types of opacity which had been important in the crises of the 1990s.

The reforms addressed in this paper were the publication of IMF Article IV staff reports—which provide an independent assessment of economic polices and prospects), the Special Data Dissemination Standard (which sets consistent definitions for macroeconomic data as well as frequency and timeliness standards), and the publication of Reports on the Observance of Standards and Codes (which assess countries' institutions against international benchmarks). We find that the countries that adopted the transparency reforms experienced an economically important decline in sovereign spreads—ranging from 4-13 percent depending on the particular reform and the exact specification. The size of the effect depends on the initial level of transparency, with a smaller effect for initially more transparent countries. It also depends on the size of the country's debt market. We hypothesize that countries with smaller debt markets experience a bigger effect from transparency, because the private sector has less incentive to do its own research on these countries. The results are consistent with survey findings that internationally active banks (particularly in New York) as well as credit rating agencies use IMF reports and observance of the SDDS in assessing country risk.

Next we present a simple theoretical model of why transparency might affect borrowing costs. In this model, there is asymmetric information between creditors and debtors. In the moral hazard version of the model, the asymmetric information is about the behavior of the debtor. In this case, monitoring or increased transparency can remove the moral hazard, reduce borrowing costs, and make everyone better off. In the signaling version of the model, the asymmetric information is about the nature of a random shock. In this case, voluntary transparency allows debtors to signal that they have received a good shock, and those choosing to signal experience a decline in borrowing costs. While transparency may improve the efficient allocation of capital and so improve world output, it may also be inefficient.

We use daily spread data to test a number of implications of the model. For either version of the model to explain the observed decline in spreads, the reforms we evaluate must provide the markets with new information. Using a generalized autoregressive conditional heteroskedasticity (GARCH) model, we find that there is a "news effect" associated with the publication of IMF documents, suggesting that the publication of IMF reports has led to more informed markets.

For these reforms to affect the behavior of governments and central banks (as hypothesized under the moral hazard model), some of the news must be about their policies and economic prospects, and not only about the behavior of the IMF. The signaling model will hold even if the news is about Fund behavior alone. We find a strong news effect for non-borrowing countries (where the Fund analyzes economic policies and prospects but takes no action). We therefore conclude that the news contained in IMF documents is not just about the actions of the IMF but more generally about countries' economic conditions.

Finally, we show that on the day that the IMF decided to allow countries to publish their Article IV reports, relative spreads narrow for those countries that had a high predicted probability of publishing. This allows us to rule out the possibility that in the introduction of transparency was inefficient in the sense that it led to a decline in world output.

II. RELATED LITERATURE

This paper is part of a growing literature on the relationship between institutions and economic performance (e.g., La Porta et al. (1997, 1998, 2000), Johnson et al. (2000), Wurgler (2000), Kaufmann et al. (2002), Acemoglu et al. (2001), Rodrik et al. (2002), and Frankel (2003)). However, unlike most of this literature, which looks at the implications of long-run historical developments, this paper examines the effect of recent specific changes in institutions. The results, therefore, translate more directly into specific policy recommendations (Frankel, 2003). In addition, this study uses a narrow objective definition of transparency (namely the release of data and analysis to the public) rather than the

commonly used wider definition of transparency (which includes lack of corruption and expropriation).[3]

There is also a large theoretical literature on the political economy of fiscal policy. This work suggests that a lack of transparency may be associated with higher fiscal deficits and less efficient expenditure. Buchanan and Wagner (1977) suggest that politicians deliberately reduce transparency in the budget process because this allows them to hide the true level of deficit and run larger deficits than the population would like. As Alesina and Perrotti (1995) point out, if the true deficit is usually larger than the official deficit, people will adjust their expectations accordingly. The authors do note that politicians can benefit from lack of transparency because it provides them with greater discretion about how the budget is spent. Alesina and Cukierman (1990) present a model along these lines in which politicians can use the flexibility provided by lack of transparency to skew expenditure towards their own objectives which may not be the same as those of society.

Rogoff (1990) suggests that lack of transparency may explain the existence of budget cycles which closely follow political cycles. In this model, politicians use budget cycles to signal the underlying quality of their fiscal policy. If lack of transparency is taken as given, this signaling is beneficial although full transparency would be the first best.

The conclusions of this literature easily extend to other areas of policy. As with fiscal policy, it is reasonable to think that lack of transparency in the reporting of international reserves gives politicians greater flexibility to run down the level of reserves. This in turn gives them more flexibility to pursue loose monetary and fiscal policy. While markets will know that on average reserves are likely to be lower than official statistics suggest, they cannot know the

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[3] Popular indices used in the literature include measures of corruption and expropriation from the International Country Risk Guide used in La Porta et al. (1998); Kaufmann et al.'s indices of rule of law used in Rodrik et al. (2002); and Transparency International's Corruption Perception Index. These indices are based on investors' perceptions, which may, in turn, be influenced by economic outcomes. In other words, investors may conclude that because a country is performing well, risk of expropriation must be low. Other indices such as those developed by La Porta et al. for shareholder and creditor rights are based on specific elements of the law and are less subject to this problem.

distribution of over-reporting across countries or across time within a country. Market participants will, as a result, add an additional risk premium for all countries.

Unlike the above literature we do not attempt to model the game between politicians and the population. Instead we take two of the underlying implications of lack of transparency (that it creates moral hazard and that politicians are looking for ways to signal their quality) to produce two versions of a simple but highly generalizable model which we go on to test.

Empirical studies that have examined the relationship between the release of data and analysis by countries and economic outcomes include Chortareas et al (2001), Alt et al (2002), Alesina et al. (1996), Gelos and Wei (2002), Institute of International Finance (2002), and Christofides, Mulder, and Tiffin (2003). These studies exploit cross-section variation in transparency, but, as the authors note, given the high correlation between transparency and other measures of institutions, it is hard to isolate the impact of transparency in this way.[4]

III. Do Spreads Fall When Countries Become More Transparent?

We examine whether countries that provide more information to markets are rewarded with lower borrowing costs. We do this using data from a natural experiment created when the IMF introduced three reforms designed to enable countries to become more transparent. These were the publication of Article IV staff reports (which summarize countries' policies and prospects), the publication of Reports on the Observance of Standards and Codes which provide an assessment of institutions (such as how nonperforming loans are treated on bank balance sheets), and the Special Data Dissemination Standard which sets consistent definitions for macroeconomic data and minimum timeliness and frequency requirements.

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[4] For example, Gelos and Wei (2002) find the effect of policy transparency on foreign investment flows disappears when corporate transparency is added to the regression.

These reforms represent a unique opportunity for studying the general effect of transparency. Because they were not available to countries before the late 1990s, the decision to adopt the reforms was primarily motivated by pre-existing attitudes to transparency rather than developments in the country at the time. In addition, the precise timing of adoption was primarily determined by internal IMF procedures that are uncorrelated with changing conditions in the country. Where the timing of adoption was influenced by country circumstances (as in the case of borrowing countries), we use internal IMF regulations to instrument for the timing of reform.

We find that countries that publish IMF reports or comply with the SDDS, experience a decline in sovereign spreads in that quarter.[5] The timing of publication depends both on when a report becomes available for publication and the country's decision on publication. In most cases, IMF reports are available for publication on a standard 12 to15 month cycle. The decision to publish is highly correlated with long-run characteristics of the country (which will be picked up by our fixed country effects) but the precise timing of the decision is rarely driven by short-run developments. In the same way, the decision to comply with the SDDS is related to long-run characteristics. Given the long lead times required to meet all the specifications of the SDDS, the precise timing of compliance depends more on the time since the country committed to meet the specifications of the SDDS than on concurrent events.

Nevertheless, as in some (usually program) countries, the timing of publication and SDDS compliance can be influenced by short-run developments in the country. Any endogeneity bias is corrected for in two ways: all program countries are excluded from the sample and two-stage least squares is used. The instruments used are the time since the last Article IV report, the time since SDDS subscription, and the interaction between these and characteristics that do not change over time. The results are robust to both methods of correcting for endogeneity bias.

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[5] The effect of publishing a ROSC is consistently significant only when endogeneity bias is corrected for.

The effect of increased transparency is economically large. Depending on the specification, the average country experiences a decline in spreads of 7 to 12 percent with the publication of an Article IV, and 4 to 13 percent with SDDS compliance. The impact of publishing a ROSC is significant only in some specifications. The size of the effect depends on the initial level of transparency, with a smaller effect for more transparent countries. The results are consistent with survey findings that internationally active banks and credit rating agencies use IMF documents and observance of the SDDS in assessing country risk.

Improving transparency has a larger effect in countries with smaller debt markets. This is probably because the private sector has less incentive to undertake its own research in smaller, less liquid markets. There is no consistent relationship between transparency and the average volatility of sovereign spreads over the medium-term.

A. Description of Reforms

Publication of Article IV Staff Reports

Article IV reports are produced on a regular (usually annual) basis for all IMF members and contain a description of recent economic developments, a short-term macroeconomic projection, and policy suggestions. The reports are written to inform other members of developments and advise the member country involved. Prior to the 1990s, they were considered highly confidential and only background material (including statistical tables and analytical work but excluding forecasts or policy advice) was published.

Following the emerging market crises of the 1990s there was growing support for greater transparency within the IMF. In 1996, publication of 2-4 page summaries of Article IV discussions called Public Information Notices or PINs was permitted and in March 1999, a pilot program of voluntary publication of Article IV staff reports was introduced. The pilot was made permanent in 2001. Given the lead times involved, the first Article IV reports were not published until the end of December 1999. For more details on the procedures involved in writing and publishing Article IV reports see Appendix I.

Article IV reports are closely followed by key market participants. Directors of country risk of the major investment banks in New York, who were interviewed by the authors indicated that IMF Article IV reports were one of the first places they turned to in assessing country risk. They all said they would take it as a negative signal if a country decided not to publish an IMF document (including an Article IV report).

The Special Data Dissemination Standard

The SDDS was established following the Mexican crisis of 1994/95 and was a response to the perception that the infrequent release of reserves data had exacerbated the crisis. The SDDS was strengthened following the Thai crisis when the failure to include the forward book in official reserve data precipitated that crisis. Manipulating the official level of reserves in this way was relatively common prior to the introduction of the reserves template of the SDDS. Countries were invited to subscribe to the SDDS (i.e. commit to meet its specifications in the future) between 1996 and 1998. The first countries to meet all the specifications of the SDDS were the United States and Canada in mid-February, 1999.

The SDDS was designed for those countries with, or seeking access to, international capital markets.[6] It sets consistent definitions for macroeconomic data and in particular establishes a very detailed definition for reserves data. The standard also sets minimum timeliness and frequency standards for macroeconomic data releases. For most countries, the most expensive and time consuming change necessitated by observance of the SDDS was the move to quarterly collection and release of national accounts data.

Observance of the SDDS is one factor in determining ratings by a major credit rating agency and a criterion in the models of country risk run by two of the largest U.S.-based investment banks (IMF, 2003b).

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[6] The General Data Dissemination System was established to improve the data of countries that had not yet reached the stage of seeking access to international capital markets.

Reports on the Observance of Standards and Codes

ROSCs assess members' institutions against internationally accepted standards of good practice in initially 11 and now 12 areas covering three broad issues: transparency, financial market regulation, and corporate governance. These international standards were developed in response to the crises of the 1990s and include the Basel Core Principles of Banking Supervision and the SDDS (for a list of all the areas see Appendix II.). The production and publication of ROSCs is voluntary for all members and the initiative is joint with the World Bank. All ROSCs contain a description of country practice in an area, an assessment of the extent to which the country meets the standard, and recommendations of where reform is most needed. [7] They explicitly avoid providing a rating. As they are a relatively new product and cover widely varying issues there is considerably more variance in their quality and relevance to markets than is the case for Article IV reports.

A survey of internationally active banks in G-7 countries found that 60 percent used ROSCs in their investment decisions (IMF, 2003b). Interviews with directors of country risk from the major investment banks in New York found that most had a sufficient knowledge of ROSCs to discuss the relative quality of reports for different countries.

B. Data and Estimation Methodology

Data

Spread data is taken from JP Morgan's Emerging Market Bond Index (EMBI) which records daily bond spread for 23 emerging market economies for the period of interest: January 1,

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[7] Formally, a report covering 1 of 12 areas it is called a ROSC module while a collection of all available reports on a country is called a ROSC. In practice, however, a report on a single area is usually referred to as a ROSC.

1999 through June 30, 2002 (Table 1).[8] The EMBI tracks the value of country-specific portfolios of dollar-denominated sovereign or quasi-sovereign debt instruments.[9]

Table 1: Indicators for Emerging Market Economies, June 30, 2002

| Country | Article IV Report | | Stand-alone PIN 1999-2002 2/ | ROSC | | SDDS Observance 3/ | Program | Size of debt market 4/ ($ millions) | Corruption Perceptions Index 5/ | Governance indicators 6/ | | |
	first published	months since last Art. IV 1/		first published	months since last Art. IV 1/					law	corruption	voice
Argentina 7/	12/19/00	22	…	04/15/99	14	11/01/99	1	134,450	3.0	0.32	-0.27	0.49
Brazil	…	…	12/22/00	12/06/01	12	03/14/01	1	184,665	4.0	-0.22	0.06	0.58
Bulgaria	04/19/00	13	…	03/17/00	13	...	1	7,013	2.9	-0.15	-0.56	0.47
China	…	…	09/01/00	…	…	...	0	109,407	3.5	-0.04	-0.29	-1.29
Colombia	12/29/99	13	…	…	…	05/09/00	1	24,442	2.2	-0.78	-0.49	0.15
Cote D'Ivoire	10/02/01	13	09/08/00	…	…	...	1	11,290	3.1	-0.33	-0.08	-0.57
Croatia 8/ 9/	01/30/00	18	…	09/../01	6	03/30/01	1	6,648	…	0.15	-0.46	-0.23
Ecuador	…	…	09/07/00	…	…	07/14/00	1	10,968	2.3	-0.72	-0.82	0.27
Korea	…	…	12/29/99	01/23/01	13	11/01/99	1	115,950	4.2	0.94	0.16	0.91
Lebanon	…	…	10/29/01	…	…	...	0	2,415	…	0.26	-0.40	-0.40
Malaysia 10/	…	…	08/10/00	12/11/00	4	09/01/00	0	34,272	5.3	0.83	0.63	-0.09
Mexico 7/	10/21/01	19	03/22/00	10/25/01	18	06/29/00	1	144,606	3.3	-0.47	-0.28	-0.11
Morocco 8/	11/13/01	16	09/01/00	…	…	...	0	11,607	3.7	0.68	0.13	-0.24
Nigeria 9/	08/06/01	20	…	…	…	...	1	19,983	1.9	-1.05	-0.95	-1.23
Panama	02/20/01	13	02/28/00	…	…	...	1	4,654	3.7	-0.39	-0.46	0.66
Peru 9/	03/19/01	20	…	…	…	07/15/99	1	18,853	4.5	-0.52	-0.20	-0.69
Philippines 10/	…	…	03/13/01	09/../01	6	01/17/01	1	29,874	3.3	-0.08	-0.23	0.63
Poland 10/	03/31/00	15	…	12/11/00	9	03/02/00	0	34,513	4.6	0.54	0.49	1.12
Russia	11/09/00	15	…	…	…	...	1	101,742	2.4	-0.72	-0.62	-0.19
South Africa	…	…	03/10/00	10/16/01	20	09/18/00	0	21,833	5.2	-0.35	0.30	0.99
Thailand	…	…	02/10/00	…	…	05/16/00	1	75,978	3.0	0.41	-0.16	0.22
Turkey 11/	…	…	01/03/00	06/27/00	6	07/20/01	1	54,298	3.4	-0.01	-0.35	-0.88
Venezuela	…	…	…	…	…	...	0	28,564	2.3	-0.66	-0.72	0.15

Source: IMF website, World Bank website, Transparency International website, Kaufmann et al (2002).

1/ Months between completion (i.e., Board discussion) of previous Article IV and publication date.
2/ Does not include stand-alone PINs published before mid-December 1999 (when the first Article IV report was published). Nor does it include PINs where the staff report was published on a different day than the PIN. In these cases, the report is usually published within a few days.
3/ Date when subscriber met SDDS specifications.
4/ Includes short and long term external sovereign debt to banks, bonds, and export credits but excludes debt to bilateral or multilateral creditors (OECD 1999).
5/ 1998 index from Transparency International's website (www.transparency.org). Data for Panama is from 2001, the only year Panama was covered. Data for Croatia is from 1999. A higher score indicates a lower perception of corruption.
6/ 1997/98 indicators from Kaufmann, Kraay, and Zoido-Lobaton (2002). These indicators go beyond the limited definition of transparency in this paper (i.e., access to information). A higher score indicates greater rule of law, less corruption, or more voice.
7/ Article IV and publication delayed.
8/ PIN published more than 2 months before staff report covering the same Article IV discussion.
9/ Article IV meeting took place more than 15 months after the previous meeting.
10/ First ROSC was done by the World Bank which does not produce ROSCs in accordance with the Article IV schedule.
11/ Data or fiscal ROSC was completed several months before the next Article IV. IMF rules allow data and fiscal ROSCs in these circumstances to be published outside the Article IV schedule.

Average spreads and daily volatility over 14 quarters were calculated as a measure of the medium term effect of transparency on spreads. This measure avoids picking up the short run volatility which may be associated with the precise content of publication or newly released

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[8] January 1, 1999 is taken as the start date for the analysis because the first ROSC was published on April 1999. Altering the start date would have an impact on country coverage—for example, if the analysis was run on data from July 1, 1999, additional 3 countries could be added to those listed Table 3.1, namely Algeria, Chile, and Hungary, as these countries were added to the EMBI data set in the first half of 1999. However, changing the sample period in this way would mean that we could not test the impact of the first series of ROSCs. The results are similar whether we start in January or July 1999 despite the change in sample size.

[9] The spread is defined as the country's EMBI portfolio's yield over the theoretical US zero coupon curve, where the sovereign yield is set to equate the total net present value of the sovereign risk cash flows to zero.

data.[10] It is also likely that the news that a country will publish a report or come into observance of the SDDS may become known to the markets before the exact date of publication/observance. Using quarterly average data picks up the change in spreads around the date of publication or observance.

Three quarterly measures of transparency were constructed based on whether a country had published an Article IV report or ROSC, and met the specifications of the SDDS. Information on the dates of publication and SDDS compliance are available on the IMF website (www.imf.org). The publication of Article IV reports and ROSCs rather than other documents were used because there was a change in policy towards these documents in the period studied, with the first Article IV reports published in December 1999 and the first ROSCs produced and published in April 1999.[11] Compliance with the SDDS was used, rather than subscription (the date on which a country declared its intention to come into compliance), because the first wave of subscriptions came in 1996 and EMBI spread data exists for only 9 countries for 1996. This means the impact of the SDDS is underestimated as only the effect of the last stage in the process of coming into compliance is measured.

An indicator of lack of transparency was constructed which measures a country's decision not to take the opportunity to publish an Article IV report. Markets are, for the most part, made aware that a country has passed up an opportunity to publish a report when a summary of the Article IV discussion (in the form of a PIN) is published without the corresponding report.[12]

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[10] Quarterly average data are used, rather than end-of-period data, because several countries in the sample published a report or came into full compliance with the SDDS on the last day of a quarter. In these cases end-of-period data would pick up the short run volatility associated with a policy change.

[11] Countries have been permitted to publish PINs since 1997 and over 90 percent of members have published a PIN. There is a presumption that policy intention documents (such as Letters of Intent) are published so there is virtually no control group of non-publishers for this type of document while countries were permitted to publish stand-alone use of Fund resources staff report only in January 2001.

[12] In a few cases, countries do not publish the PIN following the Article IV. However, over 90 percent of countries had published a PIN by mid-2002 and among the countries used in this estimation, only Venezuela had not published a PIN. In other cases, the staff report is published a month or more after the PIN, which may be considered a sign of lack of transparency. Including these cases in the PIN indicator does not affect the results significantly.

By the end of the period, 12 of the 23 countries in the sample had published an Article IV report, 14 had come into compliance with the SDDS, 11 countries had published a total of 15 ROSCs, and 14 had published stand-alone PINs.[13]

There is a pronounced regional pattern to the adoption of transparency reforms both in the sample used in this paper and for the IMF membership as a whole. For example, in the data used in this section no Asian country publishes an Article IV while all European countries do. This may reflect regional peer pressure or regional taste for transparency.

The reform events in the sample are distributed relatively evenly over time (Figure 1). There is some clustering in the center of our sample as, at the beginning, not all the reforms had come on stream while by the end many countries had already published their first Article IV or ROSC and complied with the SDDS and the rate of new reformers had slowed. From April 2000 until the end of 2001, however, the distribution of reform events is relatively uniform. In addition, there appears to be no coincidental relationship between the number of reform events and the overall EMBI index or U.S. interest rates. The possible exception is for the last quarter of 2001 when there was a peak in the number of ROSCs published and a sharp rise in the EMBI. This would tend to bias us against finding any result but the results are not sensitive to dropping data for this period.

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[13] The rate of publication of Article IVs in the sample is similar to that for the IMF membership as a whole. The percentage publishing a ROSC is somewhat higher and the percentage complying with the SDDS much higher than for the membership as a whole. The latter finding is not surprising as the SDDS is designed only for those members with access to, or seeking access to, the international capital markets. As the purpose of the paper is to examine the impact of transparency on bonds spreads, all the countries in the sample have at least some access to international capital markets.

Figure 1. Distribution of Reform Events Over Time
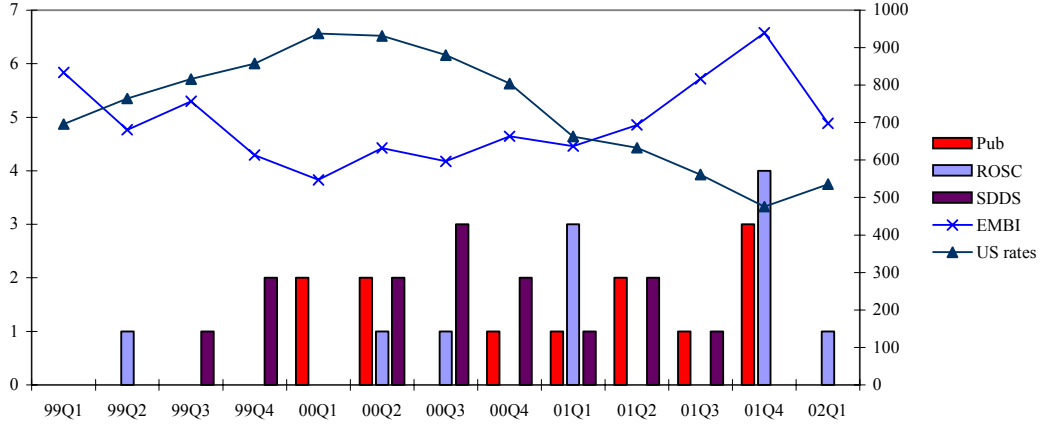
Estimation Methodology

We test whether there is a relationship between a change in the level of transparency in a country and the level of sovereign bond spreads using a panel estimation with fixed country effects. The country effects (α_i) pick up any characteristics that are constant through time and may be independently correlated both with spreads and with the decision about whether to publish or comply with the SDDS.[14] Quarterly dummies (q_t) pick up any trends in spreads across all emerging markets in our sample. The natural log of the spread is used as the dependent variable. This is the most common, although not the only, approach taken in the literature as, under a log specification, a 10 basis point change in the spread is more important for a country with a narrow spread than for one with a wide spread (see discussion on this subject in Christofides et al. 2003). The estimation is as follows:

$$\ln(spread)_{it} = \alpha_i + \beta_t q_t + \gamma_1 Pub_{it} + \gamma_2 ROSC_{it} + \gamma_3 SDDS_{it} + \gamma_4 Pub_{it} * ROSC_{it} + \gamma_5 Pub_{it} * SDDS_{it}$$
$$+ \gamma_6 SDDS_{it} * ROSC_{it} + \varepsilon_{it}$$

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[14] For example, countries that are less subject to shocks (and therefore have lower volatility and spreads) may find it easier to be transparent.

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where the independent variables Pub_{it}, $ROSC_{it}$, and $SDDS_{it}$ are zero/one dummies which take the value one for any quarter after a country has published an Article IV report, published a ROSC, or come into compliance with the SDDS respectively.[15] A zero/one dummy for Article IV publication is used rather than the number of reports published as no country published an Article IV in one year and declined to publish in subsequent years.[16]

Interaction terms between the different measures of transparency are also included. This is because we would expect that the impact of a given transparency measure is likely to depend on the existing level of transparency. In the base case we use ROSC and SDDS to measure existing transparency for Pub etc, as these three measures are the closest substitutes for each other. However, in other specifications we also add alternative measures of existing transparency such as Kauffman et al.'s rule of law and Transparency International's Corruption Perception Index. These measures, as discussed above, may pick up somewhat different aspects of transparency.

To the extent that there is a declining marginal benefit of transparency, the coefficient on the interaction terms would be positive (i.e. countries that are more transparent to start with have less of a decline in spreads when they introduce more transparency reforms). For example, if a country complies with the SDDS, markets will already have access to a lot of data that are consistent with international definitions. The additional information provided by an Article IV report would therefore be less than for a country that did not comply with the SDDS. Theoretically, there may be *increasing* marginal benefits of transparency. For example, some pieces of information may not be useful unless they are accompanied by other pieces of

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[15] For the quarter in which publication/SDDS compliance takes place, the dummy is given the value one if the event takes place in the first half of the quarter and zero if it is in the second half of the quarter.

[16] As ROSCs can be produced in several areas and publication in one area does not mean the country will necessarily publish reports in the other areas it would be possible to redefine ROSC as the number of reports produced for a country rather than a zero/one dummy. As there are only 4 countries that publish more than one ROSC report our results are relatively unaffected by whether ROSC is defined as a zero/one dummy or as the number of reports published. Given the difficulty of interpreting the pub*ROSC and SDDS*ROSC interaction variables when Pub and SDDS are dummies and ROSC is not, the zero/one dummy version of ROSC is used.

information. In this case, the coefficient on interactions between different measures of transparency would be negative.

In some specifications PIN_{it}, a zero/one dummy that takes the value one for any quarter after a country has published a stand-alone PIN after December 1999, is included.[17] This is a measure of untransparent behavior and so the expected sign on the coefficient is positive (an increase in spreads).[18] Again, the magnitude of the effect may depend on the existing level of transparency and so interactions with different measures of existing transparency are included. The expected sign on the interactions is again unclear. As discussed above, there may be a declining marginal benefit of transparency (which would imply a negative interaction term). There may also be a signaling effect that would suggest a positive interaction term. Thus if an un-transparent country does not publish an Article IV report (i.e., publishes a stand-alone PIN), the markets may conclude that this is because of a general distaste for transparency and does not signal anything negative about the contents of a report. If an otherwise transparent country publishes a stand-alone PIN (i.e. does not publish an Article IV), however, markets may conclude the full report contains some very negative news. In this case, the sign on the interaction terms would be positive.

There may also be a relationship between transparency and the size of the publicly traded debt market. Specifically, the publication of IMF documents and the availability of data according to international definitions may have a bigger impact in countries with smaller and less liquid debt markets where the private sector has less incentive to do its own research. This is because if a trader tries to exploit her private research by buying or selling debt she

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[17] Prior to December 1999, publishing a stand-alone PIN did not indicate an opportunity to publish an Article IV had been passed up because no country was permitted to publish an Article IV before this time. As with ROSC, it would be possible to redefine PIN as the number of stand-alone reports published since December 1999 rather than a zero/one dummy. This approach runs into the same problems discussed in footnote 16 and the results are relatively unaffected by which definition of PIN is used.

[18] PIN and Pub do not add up to one as there are many months when a country neither publishes an Article IV nor publishes a PIN.

will have a larger impact on the price in a smaller market and more quickly transmit the results of her research to others in the market through the price mechanism.

To the extent that the timing of transparency reforms is exogenous (see below) it is not necessary to control for other determinants of spreads. Nevertheless, as a robustness check, the sensitivity to including standard macro determinants of spreads in the regression was tested, to the extent that these are available on a quarterly basis. The macro variables used were consumer price inflation (defined as the percentage change in prices over the same quarter in the previous year), the current account balance as a percent of GDP, and the fiscal balance as a percent of GDP. To the extent that transparency leads to better macro policies, adding these variables would bias down the coefficients. However, to the extent that transparency only affects these variables over the medium-term, any bias during the short sample used here would be limited. Other determinants of spreads used in the literature are either unavailable on a quarterly basis (e.g., debt and debt service) or are likely to be influenced in the short run by changes in transparency (for example the level of reserves).

Given the presence of serial correlation in the data, Newey-West corrected standard errors were used. We could not reject the presence of an auto-regressive process of order one in the data. However, this is likely to reflect slow moving omitted variables rather than a true dynamic process. In addition, given the potential for bias when dynamics are included in a panel context with relatively few time periods, lags were not included in the main specification. Nevertheless, the robustness of the results to the inclusion of a lagged dependent variable was tested using the approach discussed in Arellano and Bond (1991).

Possible endogeneity in the timing of reforms to increase transparency
In a fixed-effect panel, the estimated γ coefficients will only be biased if the *timing* of the decision to publish or comply with the SDDS is prompted by a *change* in circumstances in the country. This assumption is discussed below and corrections are made for any possible bias including by using two-stage least squares.

The timing of publication depends on i) whether the country decides to publish and ii) when the report becomes available for publication. As discussed above, because the opportunity to

publish did not exist before 1999, a move to start publishing mainly reflects long-run characteristics of the country rather than changes in conditions at the time. If a country does decide to publish, the quarter in which it publishes is mainly determined by internal IMF procedures. Specifically, Executive Board discussion of Article IV reports takes place every 12 months with a grace period of 3 months.[19] Internal guidelines suggest that if a country decides to publish an Article IV, publication should take place within 10 days of the Board discussion (IMF 2001a). More detail on publication procedures is given in Appendix I.

There are three main reasons why publication does not always followed this schedule: the Article IV discussion is delayed to coincide with a program review which itself is delayed because targets have not been met; the Article IV mission is delayed because there is an upcoming election or the government is new; or publication is postponed following Board discussion because of a disagreement about whether a part of the report can be deleted under IMF guidelines (IMF 2001c and 2002b). All three of these reasons for delay could be correlated with changes in conditions in the country and therefore introduce endogeneity bias. In the sample used for estimation, there are 5 cases where the first Article IV report is published more than 16 months after the last Board discussion, all of which are for program countries. In most cases, the publication of ROSCs is also determined by the timing of the Article IV. However, in the sample there are 7 cases where the first ROSC was published outside a 12-16 months window following the previous Article IV discussion.[20]

It is not clear, a priori, which way any endogeneity bias will go. If countries facing a crisis are more reluctant to be transparent then the bias will be negative. However, countries facing a negative shock may be more inclined to take actions which could help reduce their spreads including by providing more information to markets. In addition, crisis countries may be

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[19] A few IMF members during this period were on an 18 or 24 month cycle but none of the countries in our sample fall into this category.

[20] This was mainly because the Article IV was delayed. In addition, ROSCs produced by the World Bank do not follow the Article IV schedule and if a fiscal or data ROSC (produced by the IMF) is completed several months before the conclusion of the Article IV report it can be published when completed (IMF 2001a).

more likely to adopt IMF supported reforms. In this case, any endogeneity bias would be positive (i.e., would mitigate against finding an effect).

Because the timing of documents for nonprogram countries is more likely to follow the standard schedule and not be influenced by changes in country conditions, the first correction for potential endogeneity bias is to compare the results for the full sample with those excluding program countries. A program country is defined as one that has an IMF program at any point during the sample. Only 7 countries fall into the non-program category.

Next, two-stage least squares is used to address any potential endogeneity bias. The average time between Article IV discussions was used to instrument for when a country has the opportunity to publish a document. Proxies for a country's taste for transparency (e.g. region) were used to instrument for whether it decides to publish. Variables on the first and second opportunity to publish an Article IV were constructed based on the time since the last Article IV discussion and the average time between Article IV consultations for different types of countries (IMF 2002a).[21] To calculate the average time between Article IVs, data for all the emerging markets and market access transition economies over the last five years were used. These opportunity to publish variables were interacted with indicators that are correlated with countries' decisions about whether to publish but are not directly correlated with quarterly changes in spreads or volatility during the sample. These are 1998 GDP per capita, the size of the debt market in 1998, Kaufmann et al.'s 1997/98 rule of law, voice, and corruption indicators, and regional dummies.

Also included as instruments were the interactions between the second opportunity to publish and measures of initial transparency, GDP per capita, and debt squared.[22] Countries with a medium level of transparency are most likely to see the variable on publication change at the time of the second opportunity to publish. This is because the most transparent countries will

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[21] Only one country (Korea) had a third opportunity to publish during the sample. In constructing our instruments, we therefore only use information on the first and second opportunities to publish.

[22] For measures that have only positive values we subtract the mean level of the indicator before squaring.

publish on the first opportunity (and therefore see no change at the time of the second opportunity to publish) while the least transparent countries do not publish throughout the whole period. Those interactions that turned out to be weak predictors were dropped.

SDDS observance was instrumented for using the time since a country announced its intention to subscribe (as long as this was announced before our sample period). Given the long lead times involved, the precise quarter in which a country meets the specifications of the SDDS will not, in most cases, be determined by concurrent events in the country. It is possible, however, that a crisis could delay the timetable for implementing SDDS requirements that would give a negative bias to the estimated coefficients. In fact, however, all three crisis countries during this period met SDDS specifications by the middle of 2002 and Brazil did so in an exceptionally short time, suggesting that if anything the bias goes in the opposite direction. Nevertheless, the timing of meeting SDDS specifications was also instrumented for. As complying with the SDDS is a time-consuming process, the number of months since the country announced its intention to come into compliance (the subscription date) was used in the first stage of the estimation. As more transparent countries are likely to find it easier to meet SDDS specifications and those with larger debt markets will have more incentive to meet them, the time since subscription was interacted with 1998 measures of transparency and the size of the debt market as well as regional dummies (reflecting the taste for transparency and peer effects).

If there is a diminishing marginal impact of transparency, using two-stage least squares may underestimate the true effect on spreads. This is because the first stage of the estimation exploits the fact that more transparent countries are more likely to publish IMF reports and comply with the SDDS. However, more transparent countries may also experience a smaller reduction in spreads from adopting any of the measures because they already provide much of the information contained in IMF reports to the markets directly. Thus, the standard panel includes a few initially less-transparent countries that decide to publish (e.g. Nigeria) that experience a larger than average reduction in spreads. However, with two-stage least squares, the first stage of the estimation is likely to predict that these less-transparent countries will not publish, thus underestimating the true effect.

C. Results

Sovereign bond spreads narrowed following the introduction of all three measures of transparency (Table 2), although the evidence for ROSCs is weaker than for the other reforms. Spreads rise after a country fails to publish an Article IV report (i.e., publishes a stand-alone PIN). The results are robust to the exclusion of program countries, the use of two-stage least squares, the inclusion of macro variables, and the inclusion of dynamics.

Panel Estimation Results

The effect is economically large, especially for those with low initial transparency (Table 2). Given the size of the sample, however, the coefficients are not very precisely estimated. Depending on the specification, the mean effect is a reduction in spreads of between 7 and 12 percent for publishing an Article IV and 4 and 13 percent for complying with the SDDS. The impact of publishing a ROSC is 11-13 percent but is only significant in some specifications. For a country like Morocco with a spread of 5.1 percentage points (which is close to the mean), a 7 percent fall in spreads represents a decline of 36 basis points.

The coefficients on the interaction terms suggest a declining marginal effect of transparency. All the interaction terms between the different measures of existing transparency are positive although not all are significantly different from zero. The high standard errors on the interaction terms mean that the impact of undertaking a second transparency reform is, in most cases, insignificantly different from zero. Declining marginal benefits of transparency can also be seen in the interaction with Transparency International's Corruption Perceptions Index (CPI)[23] and Kaufmann et al.'s rule of law index. Thus for a country with the mean level of CPI (3.4) complying with the SDDS would reduce spreads by 17 percent. For Nigeria (which has the lowest CPI score), compliance would reduce spreads by 36 percent.

The impact of SDDS observance on spreads is inversely correlated with the size of the sovereign debt market in the country (Table 2: regressions 2 and 6). This is in line with the

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[23] Panama is only included in the CPI for 2001 and Croatia only for 1999 and we therefore use these values for Panama and Croatia. The results are not sensitive to the exclusion of Panama or Croatia from the sample.

Table 2: Impact of Transparency on Level of Spreads: Fixed Effect Panel

	(1) ln(spread)	(2) ln(spread)	(3) ln(spread)	(4) ln(spread)	(5) ln(spread)	(6) ln(spread)	(7) ln(spread)
pub	-0.25	-0.30	-0.17	-0.15	-0.24	-0.30	-0.32
	(0.10) **	(0.09) ***	(0.09) *	(0.10)	(0.09) ***	(0.09) ***	(0.17) *
rosc	-0.21	-0.46	0.02	-0.18	-0.78	0.28	-0.23
	(0.17)	(0.81)	(0.39)	(0.16)	(0.33) **	(0.75)	(0.13) *
sdds	-0.22	-2.79	-0.61	-0.23	0.06	-4.50	-0.18
	(0.07) ***	(0.62) ***	(0.20) ***	(0.07) ***	(0.10)	(0.69) ***	(0.10) *
pub*sdds	0.30	0.44	0.31	0.30	0.05	0.34	0.67
	(0.11) ***	(0.11) ***	(0.11) ***	(0.11) ***	(0.12)	(0.12) ***	(0.25) ***
pub*rosc	0.12	0.09	0.09	0.00	0.63	0.36	-0.27
	(0.17)	(0.18)	(0.18)	(0.16)	(0.30) **	(0.26)	(0.13)
sdds*rosc	0.15		0.18	0.12	0.00	-0.24	0.00
	(0.14)		(0.16)	(0.14)	(0.13)	(0.12) *	(0.00)
sdds*ln(debt)		0.24				0.43	
		(0.06) ***				(0.07) ***	
rosc*ln(debt)		0.03				-0.07	
		(0.07)				(0.08)	
sdds*cpi			0.13				
			(0.05) ***				
rosc*cpi			-0.06				
			(0.09)				
pin					0.13	2.74	
					(0.08)	(0.49) ***	
sdds*pin					-0.36	-0.33	
					(0.12) ***	(0.14) **	
rosc*pin					0.80	0.72	
					(0.33) **	(0.28) **	
pub*law				0.31		0.26	
				(0.12) ***		(0.12) **	
sdds*law				0.02		-0.16	
				(0.08)		(0.12)	
pin*ln(debt)						-0.26	
						(0.05) ***	
pin*law						0.19	
						(0.12)	
Constant	6.77	6.78	6.66	6.78	6.73	6.75	6.92
	(0.13) ***	(0.13) ***	(0.12) ***	(0.13) ***	(0.12) ***	(0.11) ***	(0.22) ***
Observations	322	322	308	322	322	322	98
R-squared	0.85	0.86	0.87	0.85	0.86	0.89	0.87

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

hypothesis discussed above that the private sector has less incentive to do its own research in countries with smaller and less liquid debt markets. The results suggest that complying with the SDDS would lead to a decline in spreads of 33 percent for a country like Venezuela that had not published a ROSC or Article IV report and had a level of sovereign debt close to the

mean. Countries with the largest debt market in our sample (Argentina and Brazil) would see no decline from SDDS observance.

Spreads rise when a country fails to publish an Article IV staff report and publishes instead a stand-alone summary of the Article IV or PIN (Table 2: regressions 5 and 6). The effect ranges from a 10 to 16 percent increase. There is a positive interaction with ROSC and a negative interaction with SDDS suggesting the signaling effect dominates for the interaction between ROSC and PIN but not for the interaction between SDDS and PIN. This is plausible if the decision to publish an Article IV and publish a ROSC are seen as more similar (the data show they are more highly correlated) then failing to publish an Article IV when you have published a ROSC could be seen as giving a particularly bad signal. The increase in spreads is smaller in countries with larger debt markets, supporting the hypothesis that publication is particularly valued in countries where the private sector has less incentive to do its own research.

The results are not driven by outliers. Both Argentina and Lebanon experienced very sharp increases in spreads during the sample period but the exclusion of one or both of these has relatively little impact on the estimated coefficients.

Dropping program countries from the sample has little effect on the transparency coefficients except that ROSC becomes significantly different from zero (Table 2: regression 7).

Two-Stage Least Squares
The instruments are closely correlated with the measures of transparency (Appendix III). The instruments pass the standard test for weak instruments (Bound, Jaeger, and Baker, 1995).

The results are strengthened by the use of two-stage least squares. The coefficients on all three measures of transparency become more negative with this approach, suggesting that any endogeneity bias works against us finding a result (Table 3). However, the standard errors increase. The coefficient on ROSC is significant in most specifications while that for SDDS becomes insignificant in some specifications.

Table 3: impact of Transparency on Level of Spreads: Two-Stage Least Squares

	(1) ln(spread)	(2) ln(spread)	(3) ln(spread)	(4) ln(spread)	(5) ln(spread)	(6) ln(spread)
pub	-0.39	-0.47	-0.28	-0.25	-0.34	-0.8
	(0.16) **	(0.16) ***	(0.16) *	(0.16) ++	(0.14) **	(0.21) ***
rosc	-0.84	-2.70	-1.39	-0.72	-1.71	-1.26
	(0.44) *	(1.39) *	(0.64) **	(0.42) *	(0.71) **	(2.15)
sdds	-0.56	-1.57	-0.71	-0.60	0.15	-5.67
	(0.19) ***	(1.02)	(0.48)	(0.19) ***	(0.41)	(1.85) ***
pub*sdds	0.23	0.36	0.07	0.34	-0.21	0.43
	(0.25)	(0.24)	(0.23)	(0.26)	(0.38)	(0.37)
pub*rosc	0.22	0.29	0.51	-0.09	1.29	0.82
	(0.40)	(0.38)	(0.48)	(0.38)	(0.64) **	(0.51)
sdds*rosc	0.84	0.16	0.50	0.71	0.11	-0.89
	(0.31) ***	(0.33)	(0.31)	(0.33) **	(0.35)	(0.53) *
sdds*ln(debt)		0.10				0.60
		(0.09)				(0.18) ***
rosc*ln(debt)		0.22				-0.03
		(0.13)				(0.22)
sdds*cpi			0.13			
			(0.14)			
rosc*cpi			0.14			
			(0.16)			
pin					0.39	5.41
					(0.21) *	(0.99) ***
sdds*pin					-0.79	-0.92
					(0.39) **	(0.51) *
rosc*pin					1.59	2.15
					(0.56) ***	(0.70) ***
pub*law				0.60		0.50
				(0.21) ***++		(0.28) *
sdds*law				-0.10		1.08
				(0.17)		(0.34) ***
pin*ln(debt)						-0.54
						(0.09) ***
pin*law						-0.83
						(0.26) ***
Constant	6.87	6.92	6.79	6.92	6.77	7.09
	(0.15) ***	(0.15) ***	(0.15) ***	(0.16) ***	(0.14) ***	(0.19) ***
Observations	322	322	308	322	322	322
R-squared	0.83	0.85	0.85	0.83	0.84	0.76

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
++ jointly significant at 5%

Robustness Checks

The results are not driven by a coincidental correlation between the timing of transparency reforms and macroeconomic developments (not shown here). Data on inflation, the current account balance and fiscal balance are not available for our entire sample and reducing the sample size in some cases makes the coefficients insignificant. The inclusion of macro variables sometimes slightly weakens and sometimes strengthens the estimated effect of transparency but their inclusion never leads to a coefficient becoming insignificant. Similarly, while adding dynamics to the panel reduces the coefficients somewhat, it does not change the basic result.

IV. WHY DO SPREADS DECLINE WITH TRANSPARENCY--THEORY

In this section we set out two versions of a simple model which we use to illustrate two important reasons why transparency may be important for sovereign risk—moral hazard and signaling. If transparency is important because it helps solve a moral hazard problem, then introducing the option of transparency can only help countries. However, if transparency impacts spreads because it allows countries to signal that they have received good news, introducing the option of transparency can make some countries worse off and may even be inefficient. We start by outlining the full information case and then introduce asymmetric information in two different ways. This allows us to compare the effect of introducing voluntary, but costly, transparency when the sources of asymmetric information are different.

A. Full information case

Assume there are n countries that can each undertake an investment which returns X_0 the next period with probability P_0 and 0 with probability $1 - P_0$. The expected return is therefore equal to $X_0 P_0$ which is assumed to be greater than or equal to $1 + R$, where R is the risk-free rate of return available to lenders at home. There are a large number of competitive, risk–neutral lenders, and no cost to diversification and we assume the borrower only pays if the investment makes a positive return. Thus the borrower pays 0 with probability $1 - P_0$ and (as

we assume a competitive market and zero cost of diversifying), and $(1+R)/P_0$ with probability P_0. The expected return for the lender is $1+R$ i.e. there is no risk premium. We assume that $X_0 > (1+R)/P_0$, i.e. that the borrower can afford to pay the lender if the investment succeeds.

B. A moral hazard model of transparency

In this version of the model, we assume that the debtor can take some action that is unobserved by the creditor and will impact both the probability of success of the investment and the return from a successful investment. Thus if the debtor takes the action, the probability of success is P_1 and the return X_1.

The action is assumed to be inefficient, i.e. $P_1 X_1 < P_0 X_0$. However, we assume that, for a fixed interest rate, the debtor benefits from taking the action.[24] A necessary, although not sufficient condition for this to hold is that $X_1 > X_0$, i.e. the investment returns more, if it succeeds, when the action is taken than when it is not.

Examples of this kind of action are running down reserves to a level that is not sufficient to back a fixed exchange rate, or allowing banks to operate with low levels of capital adequacy. Failure to take adequate precautions reduces the probability of success by making devaluation, or bank collapse more likely. However, if the disaster does not take place, the return to the debtor is higher as they have avoided the cost of reserves, or unused capital. Crucially, if the investment does not succeed, the debtor does not pay anything. In contrast, it is the debtor that gains the additional return from a higher X if the investment succeeds.

While the debtor benefits by taking the (inefficient) action, if the interest rate remains unchanged with the introduction of asymmetric information, this is not an equilibrium. If the

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[24] This is the case when: $P_1 \left[X_1 - \dfrac{(1+R)}{P_0} \right] > P_0 \left[X_0 - \dfrac{(1+R)}{P_0} \right]$

interest rate were unchanged, countries would always take the inefficient action and the expected return to the investor would be below the risk-free rate.

Depending on parameter values, the equilibrium may or may not involve lending. In any possible equilibrium with lending, countries take the action if they borrow (as there is no way to credibly commit not to take it) and the interest rate is therefore $(1+R)/P_1$. There will be an equilibrium in which every country borrows if: $X_1 > (1+R)/P_1$. In this case, the payoff from borrowing is $[P_1 X_1 /(1+R)]-1$. Otherwise, the market collapses and no one borrows.

Commitment

Now suppose that countries can commit not to take the (inefficient) action. This commitment has a cost, which varies by country, and is C_i for country i (where i ranges from 1 to n). The commitment mechanism can be thought of as paying an independent observer to come and inspect, for example, that there are sufficient reserves or adequate bank capital.

This version of the model is compatible with the results in the previous section. I.e., if a commitment technology becomes available at T_0, those countries with high C_i will not commit (as the costs outweigh the benefits as shown in Appendix IV) while those with low C_i commit and interest rates fall for those countries that commit relative to those that do not.

If our results are driven by this type of moral hazard, countries can only benefit from the introduction of the option of transparency. If the cost of commitment is larger than the gain, countries will not make the commitment and those countries that do not commit experience no change in interest rates when others commit (i.e. there are no externalities). Lenders always receive the same expected return $(1+R)$ in any scenario.

C. A signaling model of transparency

Transparency can also be as much about signaling new information as preventing moral hazard. In this case, transparency or monitoring may or may not be efficient. Assume that countries acquire P_0 or P_1 not through any action of their own but as a result of random shocks. As above, $P_0 > P_1$. We will consider the set of equilibria where countries have a particular value of C_i. Assume that a country receives a negative shock with probability α and have probability P_1 of success, and receives a positive shock with probability $1 - \alpha$ and have probability P_0 of success. Define $\overline{P} = \alpha P_1 + (1 - \alpha)P_0$. In the absence of signaling, the only possible equilibrium contract requires borrowers to pay back $(1 + R)/\overline{P}$, if the investment is successful. The market will exist in the absence of signaling as long as $X > (1 + R)/\overline{P}$.

If monitoring/transparency is possible, then depending on parameter values, there may be a separating equilibrium, a pooling equilibrium, or both. In particular, there may be a separating equilibrium in which lenders believe countries have received bad news (i.e. have probability P_1) if they do not pay the cost of transparency C_i. They therefore require interest rate $(1 + R)/P_1$ from these countries. This equilibrium will exist if countries that receive good news (i.e. have P_0) prefer to pay the cost of transparency and get the lower interest rate, over the alternative of not borrowing. The conditions under which there is a separating or pooling equilibrium are set out in Appendix V.

Of more policy interest is the light that this model sheds on the possible welfare implications of introducing transparency. In the discussion below, we look at three examples which demonstrate the different possible welfare implications of signaling depending on parameter values. For a summary of the different cases see Figure 2.

Figure 2. Impact of Information Under Signaling Model

	Case 1	Case 2	Case 3
Without signaling all countries	No borrowing	Borrow	Borrow
With signaling countries receiving good news	Interest rate falls Borrow	Interest rate falls by more than C Borrow	Interest unchanged and must pay C Borrow
countries receiving bad news	Interest rate rises No borrowing	Interest rate rises No borrowing Borrowing would be inefficient	Interest rate rises No borrowing
Welfare effect those with good news those with bad news overall welfare	Better off Unchanged Better off	Better off Worse off Indeterminate, but output higher	Worse off Worse off Worse off, world output falls

Case 1: The market does not exist in the absence of signaling but does exist for those with P_0 in the presence of signaling. In this case, signaling is weakly Pareto improving. Nobody is hurt by signaling and those with good news benefit as it allows them to borrow when they would otherwise not have been able to. Those that receive a negative shock are not made any worse off because they would not have been able to borrow in the absence of signaling.

Case 2: In this case the introduction of signaling is not Pareto improving but it does lead to an increase in world output. If the market exists in the absence of signaling then it can be shown that the introduction of signaling is not Pareto improving as countries that receive a negative shock see their interest rate rises from $(1+R)/\overline{P}$ to $(1+R)/P_1$.

However, it is still possible that signaling leads to an increase in the net present value of world output if it is inefficient for those countries receiving a negative shock to borrow. After signaling is introduced, those receiving a positive shock borrow but those receiving a negative shock do not borrow. By eliminating borrowing in cases where it is inefficient, and assuming this money is used elsewhere on higher return projects, signaling leads to an increase in world output.

Case 3: In this case, signaling leads to a decline in the net present value of world output. Consider the following example. Assume that almost all (in the mathematical sense) countries have $P = P_0$ and that there is borrowing in the absence of signaling.

Assume also that there is a separating equilibrium in which almost all countries become transparent and face an interest rate $(1 + R) / P_0$. The interest rate paid is the same as these countries would face if transparency were impossible for all and yet in addition they are all paying C_i in transparency costs as well. Interest rates for those that receive bad news rise compared to those in the absence of the option of transparency. Both sets of countries are worse off than before signaling was possible.

The signaling version of the model is also compatible with the results in the previous section—i.e. that countries that opt to become transparent see a relative decline in spread compared to those that decide not to become transparent. The signaling version of the model is also compatible with the finding that it is possible to predict in advance whether countries decide to publish or not. In particular, it is possible that some countries will have such high C_i that they will not publish even if they receive good news. If C_i is correlated with long run observable variables it will be possible to predict that these countries will not publish. It will not be possible to predict which countries do not publish because they get bad news.

Those countries that have such high C_i that they do not publish even if they get good news are unaffected by the introduction of signaling. Markets can see the technology is not relevant to them and that they will not signal whatever type of shock they get. If Case 3 holds for those with low C_i, they will be made worse off by signaling while those with very high C_i will be unaffected. We can test this by observing the comparative change in spreads for countries with different C_i on the day the technology is adopted. If Case 3 holds we will observe an increase in spreads for those with low C_i relative to those with high C_i on the day of adoption before the shocks have taken place and anyone has had the chance to signal.

V.   WHY DO SPREADS DECLINE WITH TRANSPARENCY REFORMS--EMPIRICAL

In this section we examine what the empirical evidence can tell us about why spreads decline with transparency reforms. As discussed above, it is not possible to directly distinguish between the moral hazard and signaling versions of the model. However, there are various elements of each version of the model which can be tested.

For the reforms introduced by the IMF to explain the observed decline in spreads, they would have to provide information that is new to markets. To test this we use a standard news effect approach—i.e. whether there is higher volatility on the day following publication than usual.

For the moral hazard version of the model to hold, the publication of IMF documents must reveal information that is new to markets about the policies and prospects of the country and not simply the future actions of the Fund. If the information was only about the actions of the Fund, these documents would not fulfill the function of external monitoring of country behavior. In contrast, under the signaling version, transparency reveals the results of random shocks which is compatible with IMF documents revealing news only about Fund actions. We therefore test whether documents for non-borrowing countries that monitor country behavior but reveal nothing about the actions of the Fund have a news effect.

Under a moral hazard version of the model, countries with low costs of commitment benefit from transparency and so will experience a decline in spreads when a new commitment technology is invented. Under a signaling version, if signaling is efficient, countries with low costs of signaling will also experience a decline in spreads when a new signaling technology is invented. However, if signaling leads to a fall in world output, countries with low costs of signaling will experience a rise in spreads when the technology is adopted.

We therefore examine the change in spreads on the day (and day after) the IMF decided to allow publication of Article IV staff reports for the first time. We cannot undertake the same test for ROSCs or the SDDS. For ROSCs there was no gap between the decision to produce ROSCs and the production of the first ROSCs (i.e. the technology was invented and adopted

at the same time and it is not possible to disentangle the two effects).[25] The SDDS was introduced in 1996 when the number of countries covered by the EMBI index was small.

A. Data

We again use JP Morgan's EMBI spread data, although in this case we are interested in daily data for 32 emerging market countries for the period January 2000 through August 2002.[26] For these countries we collect the date of publication for all country related documents. There are 8 different types of country-related documents which fall into three categories: summary reports (like PINs), Article IV reports and background material (including ROSCs), and program documents, which describe how much will be lent and under what conditions as well as containing an evaluation of countries' progress against these conditions.

A publication event is defined as the publication of at least one document for a country, although typically a bundle of several related documents are published on the same day (Appendix VI).[27] In our sample, we have 130 such events across 29 countries (Table 5). In other words 90 percent of countries in the EMBI published at least one document during this period and 65 percent published a detailed IMF document such as a staff report. These publication rates are similar to those for the IMF membership as a whole.

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[25] The Executive Board of the IMF endorsed the introduction of transparency reports (which later became known as ROSCs) in early 1999. Three examples of these reports were presented to the Board as background to the discussion. These first ROSCs were published alongside the decision to introduce this new form of report.

[26] In this case we use an unbalanced panel as it allows us to include more countries. This is less of an issue in this case as our control for volatility on event days is volatility on other days for that country. This means we do not have the problem that the comparator group changes during the panel.

[27] At the conclusion of Article IV consultations or program reviews, a number of documents are available that a member can choose to publish including a staff report, staff statement, PIN, and statement by the Executive Director. In addition there may be other longer background documents including a statistical appendix or selected issues paper. Documents that are only produced for program countries, whose publication is recorded in the database include letters of intent (LOI), memoranda on economic and fiscal policy (MEFP), and technical memoranda of understanding (TMU).

Table 4: Emerging Market Economies Included in Emerging Market Bond Index 1/

Country	Publication events	Program 2/	End-of mission events	Summary publication events	Detailed publication events
Algeria	2	No	3	0	2
Argentina	11	Yes	4	8	3
Brazil	9	Yes	6	9	0
Bulgaria	6	Yes	2	4	2
Chile	3	No	3	0	3
China	1	No	2	1	0
Colombia	8	Yes	5	5	3
Cote D'Ivoire	3	Yes	1	2	1
Croatia	5	Yes	4	2	3
Ecuador	5	Yes	5	5	0
Egypt	1	No	2	1	0
Hungary	2	No	2	1	1
Korea	4	Yes	2	4	0
Lebanon	1	No	1	1	0
Malaysia	1	No	1	1	0
Mexico	3	Yes	2	2	1
Morocco	2	No	1	1	1
Nigeria	3	Yes	2	2	1
Pakistan	10	Yes	5	5	5
Panama	3	Yes	3	2	1
Peru	4	Yes	2	2	2
Philippines	4	Yes	3	4	0
Poland	6	No	3	3	3
Russia	4	Yes	3	1	3
South Africa	2	No	2	2	0
Thailand	2	Yes	2	2	0
Turkey	13	Yes	6	8	5
Ukraine	6	Yes	3	4	2
Uruguay	6	Yes	2	4	2

Source: www.imf.org.

1/ EMBI spread data are not available for the entire period for all countries.

2/ Indicates whether a country had a Fund-supported program at any point between January 2000 and August 2002. In some program cases, not all the documents published were program specific documents. In particular, Korea, Mexico, and Nigeria publsihed one document associated with a stand-alone Article IV and Ukraine published two during the sample period.

B. Do IMF Documents Contain News?

As discussed above, we are interested in testing whether IMF documents contain information that is new. Following the standard news effect literature (e.g. Anderson et al, 2003) and because our data exhibits skewness and fat tails common in high frequency financial market data, we use a GARCH model to determine whether volatility in the days of publication are

larger than predicted given the surrounding level of volatility. [28] Unlike other news effect studies we want to estimate a common coefficient on the news across countries and we therefore use a multi-country GARCH as follows:

$$
\begin{aligned}
(G1) \qquad s_{i,t} &= \alpha_i + \sum_{j=1}^{q_i} \rho_{i,j} s_{i,t-j} + \sqrt{h_{i,t}} \, \varepsilon_{i,t} \\
h_{i,t} &= \lambda_i + \gamma_G p_{i,t} + \beta_{1i} h_{i,t-1} + \beta_{2i} \varepsilon_{i,t-1}^2 + \phi_{1,i} h_{i,t}^R + \phi_{2,i} h_{i,t}^E
\end{aligned}
$$

where the top equation models the daily percent change in credit spread ($s_{i,t}$) as a function of its own lags, the number of which (q_i) are allowed to differ across countries, and a country specific constant (α_i) [29]. $h_{i,t}$ is the time varying conditional variance of $s_{i,t}$. The unconditional variance of $\varepsilon_{i,t}$ is factored out from the conditional variance process, so that the unconditional means of $h_{i,t}$ are normalized to one for each country.[30]

The second equation describes the law of motion for this conditional variance as a linear function of its own lagged value, a squared lagged error term, two conditional variance terms, and the event dummies $p_{i,t}$. This is a zero-one dummy variable that is equal to one for both the publication date and the day after. This accommodates the possibility of publications being released to the market after the end of the trading session of the day.[31] This inevitable choice means we are likely to underestimate the true impact of publication, because the model treats the impact as if it were spread over two days.

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[28] An OLS panel gives rather similar results but the standard statistical inferences are not valid in this case.

[29] Countries are indexed by i, while t is the time subscript.

[30] This normalization facilitates the interpretation of the magnitude of event dummy coefficients. If the coefficient estimate is w, it means that the conditional variance is higher by $100w$ percent than it would have been in the absence of the event.

[31] This is a particular issue for those bonds that are mainly traded in London (which is a large center for over-the-counter trades in sovereign bonds), due to the time difference.

A challenge for estimating a multivariate GARCH model is that the number of parameters to be estimated is proportional to N^2, where N is the number of variables. We therefore impose the restriction that the individual country volatility process is correlated only with the regional average volatility and the emerging market average volatility process. [32] Our conditional variance terms are then influenced by the weighted-average variance of other countries in its region ($h_{i,t}^R$) [33] and the weighted-average variance for the emerging markets as a whole ($h_{i,t}^E$). The event coefficient, γ_G is common for all countries, while the other parameters are country-specific (more details are given in Appendix VII).

In this estimation, endogeneity bias will only be a problem if events in the country (which are independently correlated with spreads) can influence the precise date of publication within a short window. As discussed above, IMF documents are produced on a standard timetable. While these timetables can be delayed because of events in the country (such as the failure to meet program conditions) these delays will usually be of several months duration. Whether a document is published on a Monday or Wednesday will be determined by internal factors (such as whether the Executive Board schedule on a particular day was crowded) that will be uncorrelated with events in the country.

There may be cases where another announcement occurs by chance during our two-day event period and causes a large price movement unrelated to the publication of the IMF report. We therefore check for outliers which may be driving our results and find one (a 32 percent fall in the Thai spread) but our results are robust to its exclusion.

Results

There is a significant news effect for the sample as a whole (Table 5). On average, both on the day of publication (day t) and the day after (day $t+1$), the conditional variance is 22

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[32] Others who have estimated multivariate GARCH models have followed Bollerslev (1990), in estimating a constant conditional correlation multivariate GARCH but this does not allow for estimation of a common coefficient across countries.

[33] We use the weights in the EMBI index.

**Table 5: Publication Impact of IMF Documents
and Changes in Credit Ratings**

	(1) program	(2) non-program	(3) credit rating
Publication effect	0.22 0.13	0.37	1.61
	(0.10)** (0.09)	(0.11)**	(0.18)**

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

percent higher than the GARCH model projects based on information up to day *t-1* and assuming no publication. Dropping Thailand from the sample lowers the effect to 20 percent.

As the GARCH approach compares the volatility on event days with the volatility in the short window surrounding the event, it is possible that if volatility is lower in the run up to a predicted event, this will bias upwards our coefficient. In practice, however, we find that volatility is somewhat higher than predicted before the event (possibly as traders speculate on the event or the news in the report leaks out) and lower than predicted after the event.

C. Is The News About the IMF or About the Country's Policies?

If the news contained in IMF documents was purely about the future actions of Fund rather than the actions of the government or central bank, they would not act as a monitoring device that could change government behavior in the way envisaged in moral hazard version of the model. We therefore test whether there is a news effect for non borrowing countries where IMF documents discuss economic policies and prospects and the IMF takes no action.

Country documents for program countries usually contain information both on country polices and on future IMF disbursement sizes and conditions. Either could impact spreads although only the first is the type of monitoring of country behavior envisaged in the moral hazard version of the model.

Documents produced by the Fund on non-borrowing countries are only about country policies and prospects. Committing to publish them could be seen as a form of external monitoring that could impact future policy decisions. These reports assess, for example, the realism of the government's fiscal projections (including a discussion of the extent of contingent liabilities) and the health of the banking system. Knowing that these assessments will be made public could induce countries to control contingent liabilities and work to improve the health of the banking system. These reports also include policy recommendations and it is reasonable to think that countries will be under greater pressure to implement these recommendations if they make them public. The fact that documents for non-program countries deviate from pre-set timetables less often is another reason to examine non-program countries separately.

We therefore test whether there is a news effect for non-borrowing (i.e. non-program) countries and how the news effect for these countries compares with the news effect for program countries using the following specification:

$$
\begin{aligned}
\text{(G3)} \qquad s_{i,t} &= \alpha_i + \sum_{j=1}^{q_i} \rho_{i,j} s_{i,t-j} + \sqrt{h_{i,t}}\, \varepsilon_{i,t} \\
h_{i,t} &= \lambda_i + \gamma_1 p_{1i,t} + \gamma_2 p_{2i,t} + \beta_{1i} h_{i,t-1} + \beta_{2i} \varepsilon_{i,t-1}^2 + \phi_{1,i} h_{i,t}^R + \phi_{2,i} h_{i,t}^E
\end{aligned}
$$

where $p_{1i,t}$ is equal to one if a document for a program country was published on that day or the previous day. $p_{2i,t}$ is set equal to one if a document for a nonprogram country was produced on that day or the previous day.

If markets were responding only to information about the future actions of the Fund, including the magnitude and timing of future disbursements, there would be a publication effect only for program or near-program countries. We find no statistical difference between

the coefficients for nonprogram and program countries while the coefficient on nonprogram countries is significantly different from zero.[34]

While the results suggest that markets are responding to information about economic policies and prospects, rather than just future financing from the Fund, the finding that, using the second definition of program countries, the magnitude of the publication effect is three times larger for nonprogram than program countries and that the effect for program countries is insignificant is somewhat counter intuitive. One reason for the finding may be that information about programs tends to be announced prior to the publication of the official Fund documents (indeed we find evidence—not reported here—of a news effect at the time of end of mission press conferences which tend to reveal the main elements of program). Another reason is that documents for program countries are produced, and therefore potentially published, much more frequently, diluting the news contained in each report.

D. Assessing the Magnitude of the News Effect

In this section we look at various indicators of the magnitude of the news effect. This can give some idea of whether the information contained in IMF reports is sufficiently important to markets that it is compatible with the impact on spreads reported above. Note that we would not expect the news effect to be identical to the change in spreads resulting from a move to transparency reported above for two reasons. First, it is much more likely that the decision to release a report will leak out than that the precise content of the report will leak— not least because while the content of the report is considered confidential until publication, there is no restriction on countries announcing their intention to release a report ahead of time. Second, we use a much wider sample of documents to test the news effect than is used in the previous section (which looks solely at the publication of the first Article IV for each

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[34] It is possible that markets could be reacting to Fund documents for nonprogram countries because of the information they provide about future Fund actions if the country had a crisis and came to the Fund for support. However, the magnitude of the publication effect for these countries, a cumulative 74 percent excess volatility using the second definition makes this very unlikely. Indeed, newspaper articles suggest that IMF reports may even be news-worthy for advanced countries where there is no prospect of IMF lending. The Financial Times, for example, reported on August 14, 2001 that "Investor sentiment was also hit by a warning from the IMF that Japan would enter a recession this year with the economy contracting by 0.2 percent."

country). Thus the change in spreads at the time of publication in the two sections are not directly comparable.

A comparison with the news effect of a change in credit rating

First we put the magnitude of the news effect for IMF documents in some context by comparing it to the news effect associated with a change in a S&P and Moody's credit rating using the same methodology, country coverage, and time period as above. We find that a change in credit rating has a large and significant impact on emerging market sovereign bond spreads. The magnitude of the effect is roughly seven times the average publication effect of an IMF document and just over four times the publication effect for a nonprogram country document (Table 5, regression 4) However, the coefficient on the credit rating is likely to be biased up significantly because the timing is not exogenous as announcements and actions by countries can trigger both a change in credit rating and a change in spreads. There also tend to be more changes in credit ratings in times of crises than in normal times.

Estimates of the downward bias in the estimated news effect

It is not straightforward to assess what the magnitude of the news effect would have been if it was concentrated on one day. This is because the increased variance on day t will affect the projected variance on day $t+1$. However, given the linear-in-variance structure, a rough estimate is a 44 percent increase in the conditional variance over the level projected by GARCH (40 percent if Thailand is excluded). This, however, is an underestimate of the news effect because we have effectively restricted the impact to be equally split over two days. To get an upper bound on the effect, we take our two publication days for each event and assume that the news effect occurs on the day with the larger movement. In this case, the effect rises to 99 percent. In other words, if our assumption is valid, the conditional variance on the day of the event is, on average, twice what it would have been in the absence of publication.

E. Is Transparency Efficient?

Under the moral hazard version of the model the introduction of transparency can only benefit countries. This is not necessarily the case under the signaling version of the model. To test whether the type of transparency introduced by the IMF was beneficial we examine the relationship between the change in spreads on the day the IMF decided to allow countries to publish their Article IV report and a country's estimated probability (based on observables) of publishing. While the probability of publishing depends on Ci and whether a country received good news or bad news under the signaling model, only Ci can be predicted in advance and it is therefore Ci that we are estimating. If transparency reforms are efficient we would see a relative decline in spreads for those countries with low costs of transparency ie those that are projected to publish. If the reform led to inefficient signaling then spreads would rise for those countries with low costs of signaling on that day.

The Executive Board of the IMF made the decision to allow countries to publish their Article IV report on March 5, 1999. We test whether there was a relationship between the change in spreads on that and the subsequent day and the estimated probability that a country would take this opportunity to publish their Article IV in the next three years.

To estimate the predicted probability that a country would publish their Article IV we ran a simple OLS regression of Pub (as defined in the previous section) against factors that might be correlated with the cost of commitment. As richer and more transparent countries are likely to have lower costs of transparency we included GDP per capita in 1998 and various indicators of transparency in 1998 (including the rule of law, voice, and corruption indicators discussed in the previous section) as predictors of publication. As transparency has strong regional patterns (either reflecting cultural attitudes to transparency or peer effects) we also included regional dummies. We were able to predict whether a country decided to publish an Article IV relatively accurately with an adjusted R squared of 0.37 (Table 6, column 1)

Table 6: Impact of announcement of transparency policy

	(1) pub	(2) news 5 March	(3) news 5 March	(4) news 6 March	(5) news 6 March	(6) news 5+6 March	(7) news 5+6 March	(8) news 5+6 March
probability		-4.27	-70.39	-0.47	-25.29	-2.37	-47.84	-22.65
		(2.42)*	(33.65)*	(1.07)	(13.22)*	(1.36)*	(18.78)**	(12.98)*
asia	-0.99	-5.40	-9.25	-1.82	-2.72	-3.61	-5.99	-2.13
	(0.43)**	(2.44)**	(3.54)**	(1.08)	(1.39)*	(1.37)**	(1.97)***	(1.43)
latin	0.32	0.11	-1.49	0.1	-1.37	0.11	-1.43	-1.14
	(0.35)	(1.70)	(2.33)	(0.75)	(0.92)	(0.96)	(1.30)	(0.86)
europe	0.39	2.46	2.23	-0.99	-1.67	0.74	0.28	-0.49
	(0.38)	(2.08)	(2.49)	(0.92)	(0.98)	(1.17)	(1.39)	(0.92)
mideast	-0.72	-1.42	-5.3	-0.85	-2.02	-1.13	-3.66	-2.22
	(0.46)	(2.21)	(3.30)	(0.97)	(1.30)	(1.24)	(1.84)*	(1.24)*
ln(debt)	0.00		-4.12		-1.2		-2.66	-1.08
	(0.09)		(1.95)*		(0.77)		(1.09)**	(0.76)
ln(debt)*probability			4.78		1.21		3.00	1.13
			(2.70)		(1.06)		(1.51)*	(1.03)
cpi			-3.15		-2.30		-2.72	-1.90
			(1.97)		(0.77)**		(1.10)**	(0.74)**
cpi*probability			4.01		3.23		3.62	2.7
			(2.98)		(1.17)**		(1.66)**	(1.11)**
law	0.70		7.52		0.90		4.21	0.44
	(0.40)		(3.15)**		(1.24)		(1.76)**	(1.30)
law*probability			-7.46		-1.35		-4.41	-0.51
			(4.32)		(1.70)		(2.41)*	(1.70)
voice	-0.19							
	(0.19)							
corruption	-0.01							
	(0.38)							
Constant	3.00	1.98	59.93	0.74	23.15	1.36	41.54	19.87
	(1.42)*	(2.17)	(25.60)**	(0.96)	(10.06)**	(1.22)	(14.29)***	(10.00)*
Observations	23	23	22	23	22	46	44	43
R-squared	0.63	0.34	0.62	0.34	0.71	0.23	0.41	0.36
Adjusted R-squared	0.37	0.15	0.20	0.14	0.38	0.13	0.21	0.14

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

For these days we run a simple OLS regression to test for a correlation between the percentage change in spread and the estimated probability that a country will publish. Next, we examined the relationship between the estimated probability of publication and the change in spread when the new policy on publication was decided. Unlike the news effect case discussed above, here we are interested in the direction of the change in spread. The dependent variable is therefore the change in the natural log of the spread i.e. the percentage

change in the spread from one day to the next. Also unlike the news effect case, we are comparing the change on one day in one country with the change on the same day in another country (rather than comparing changes across time for a single country). Nevertheless, we check for skewness and fat tails in the data.

There is some uncertainty about exactly when the news of the change in policy became known to the market. While the decision was taken by the Board on March 5, the official press release with the details of the policy was not issued until April 16 (i.e. 6 weeks later). Given the relatively high profile of this issue it is unlikely that the policy remained secret until then.[35] Whether the news of the March 5 Board meeting reached the markets before the close of trading, however, is not clear. We therefore use March 5 and 6 and April 16 and 17 as our event days. We find no significant effect for April 16 (not shown). [36]

To the extent that there are other country specific shocks to spreads on these days there is no reason to think that these will be systematically correlated with the probability of publishing. There may, however, be regional shocks which could create a spurious correlation as region is also correlated with probability to publish. We therefore also control for region in our estimation. As discussed in the previous section, we would expect to see less of a decline in spreads for countries that are already more transparent and those with large debt markets. In some specifications, therefore, we test for interactions between the estimated probability of publication and existing measures of transparency and the size of the debt market.

For March 5, the day of the decision, and March 5 and 6 combined, we find a negative and significant coefficient for the estimated probability of publishing. For March 6 we find a negative coefficient which is significant when we add the interaction terms but not otherwise.

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[35] The US Congress had strongly criticized the IMF for its lack of transparency and, partly as a result, the US administration had declared changing the policy on Article IV publication a key objective. Debate on the issue had been going on for some time with more minor moves towards transparency agreed earlier, including the publication of Article IV summaries in public information notices (PINs).

[36] That the decision had been taken was not considered confidential and there may even have been public statements on the issue. It was the precise wording of some of the detailed elements of the press release that were negotiated in subsequent weeks which delayed the publication of the press release.

There is an outlier (spreads fell by 12 percent for China on March 5). Excluding this outlier reduces the coefficient on predicted publication but it remains significant for the larger sample (March 5 and 6). If China is excluded we can reject the hypothesis that the data are non-normal (i.e. have fat tails or are skewed).

In two out of three cases, the interaction with Transparency International's Corruption Perception Index is significant at the 5 percent level and goes in the predicted direction (more transparent countries experience less of a decline in spreads). With the larger sample (covering March 5 and 6) the interaction with the rule of law and the size of debt market are significant at the 1 percent level. Only the size of debt market interaction goes in the expected direction however.

VI. CONCLUSION

Following the emerging market crises of the 1990s, there was considerable debate about whether more transparency could have avoided these crises. If, for example, the Thai authorities had been required to be more transparent about the extent of intervention in the exchange rate, would they have taken actions to curb the asset price bubble and the offshore borrowing that fueled it? If the IMF's private warning to the Thai authorities had been made public, would capital inflows have been less extensive in the run up to the crisis and the turn-around in investor sentiment less severe?

We cannot know the answers to these what-if questions. This paper does, however, assess whether the dramatic increase in information and analysis that resulted from a change in attitudes towards transparency following these crises has had an impact on markets perceptions of risk in emerging markets.

We conclude that the series of reforms introduce by the IMF designed to increase transparency in those areas highlighted by the crises of the 1990s have led to better informed markets. For those countries that have adopted these reforms they have also led to a decline in relative borrowing costs.

This decline in borrowing costs may reflect the role that transparency has in influencing behavior—when a country signs up to a system of external monitoring it is less likely to take actions that investors see as damaging. The lower borrowing costs may also reflect the fact that transparency allows countries with good underlying quality to signal this to investors. This type of signaling may be good for the world economy because it allows investors to allocate their capital more efficiently. While our model suggests that there are also cases where allowing countries to signal may actually be inefficient we are able to rule out the possibility that the reforms introduced by the IMF fell into this category.

Finally, this paper provides evidence that the IMF plays a useful role in monitoring member countries' policies and prospects and creating better informed markets. As information is a public good there is reason to think that the private sector will under invest in research on countries' macroeconomic positions. This is because the private sector cannot capture the full benefits of their research—when they start to trade on the basis of their private information they move prices and so convey their private information to the rest of the market. This is a particular problem when markets are thin and small trades will have a bigger impact on prices.

Appendix I: Publication Procedures for IMF Country Documents

There are standard timetables for the preparation, discussion, and publication of IMF country documents that are, for the most part, independent of events in the country concerned. Article IV reports are usually produced on an annual basis while programs are usually reviewed every six months. In exceptional cases, members receive an Article IV report every 2 years but this timetable is agreed well in advance and none of the countries in our sample fall into this category. The intermediate steps in the production of reports also follow a standard timetable.

After returning from a mission, staff draft a report which, after internal review, is circulated to the Executive Board at least three weeks prior to the Board discussion. The date of the Board discussion has to be booked several months in advance given the limited slots available and is chosen to allow staff time to write the report and guide it through the review process. The Board date is generally unrelated to events in the country but there are two main exceptions. The IMF tries to avoid discussions in the run up to elections or shortly after a change in government, and, for program countries, a discussion may be delayed due to the failure to meet one of the conditions. However, this type of delay (which usually occurs before the publication of the staff paper) will typically lead to a delay of several months. Thus while events in a country can determine whether a Board meeting takes place in the spring or fall, given the lead times involved, events in the country will not determine whether the Board or the publication takes place on the April 5 or 12. Endogeneity in timing is therefore an issue when we use quarterly data but not for our GARCH estimation, where we compare the volatility on two days with the volatility in surrounding days.

Following Board discussion of the report, minor modifications may be made (see below) and, if the authorities agree, the report is made public usually within 10 days of the Board discussion. In most cases several different documents (e.g. an Article IV report, background material, PIN and/or Press Release, and Executive Director's statement) are posted on the IMF's external website at the same time. Those, including many market participants, who have signed up to the service are notified electronically of new releases on the website.

The authorities, who see the report for the first time when it is circulated to the Board, must indicate ahead of time whether they intend to publish (although they can change their mind later). They can request factual corrections and the deletion of highly market sensitive material (usually referring to the exchange rate). Any changes must be circulated to the Board and any deletions must go through an internal review procedure.

Appendix II. Areas where Standards have been Endorsed by the IMF and World Bank As Useful For their Work and For Which ROSCs will be Produced

Transparency Standards

- **Data:** the Fund's *Special Data Dissemination Standard* and *General Data Dissemination System.*

- **Fiscal Transparency**: the Fund's *Code of Good Practices on Fiscal Transparency.*

- **Monetary and Financial Policy Transparency**: the Fund's *Code of Good Practices on Transparency in Monetary and Financial Policies*.

Financial Market Regulation and Infrastructure Standards

- **Banking Supervision:** the Basel Committee's *Core Principles for Effective Banking Supervision*.

- **Securities:** the International Organization of Securities Commissions' (IOSCO) *Objectives and Principles for Securities Regulation.*

- **Insurance:** the International Association of Insurance Supervisors' (IAIS) *Insurance Supervisory Principles*.

- **Payments and Settlement Systems:** Committee on Payments and Settlements Systems' (CPSS) *Core Principles for Systemically Important Payments Systems*. CPSS/IOSCO's *Recommendations for Securities Settlement Systems*.

- **Anti-Money Laundering and Combating the Financing of Terrorism:** the Financial Action Task Force's (FATF) 40+8 *Recommendations for Anti-Money Laundering and Combating the Financing of Terrorism*.

Corporate Governance Standards

- **Corporate Governance:** the OECD's *Principles of Corporate Governance.*

- **Accounting:** the International Accounting Standards Committee's *International Accounting Standards*.

- **Auditing:** the International Federation of Accountants' *International Standards on Auditing*.

- **Insolvency and Creditor Rights:** World Bank's *Draft Principles and Guidelines for Effective Insolvency and Creditor Rights Regimes.*

Appendix III Impact of Transparency: First Stage

Table. Impact of Transparency on Level and Volatility of Spreads: First Stage

	(1) pub	(2) rosc	(3) sdds	(4) pub*sdds	(5) pub*rosc	(6) sdds*rosc
fop	0.44	2.20	1.31	0.34	0.28	1.20
	(0.43)	(0.49) ***	(0.67) *	(0.38)	(0.32)	(0.49) **
fop*europe	1.22	-0.21	0.52	0.54	0.01	-0.32
	(0.12) ***	(0.23)	(0.18) ***	(0.15) ***	(0.20)	(0.19) *
fop*latin	0.56	-0.47	0.07	0.58	0.01	-0.36
	(0.09) ***	(0.11) ***	(0.13)	(0.10) ***	(0.04)	(0.10) ***
fop*middleeast	-0.23	-0.54	0.11	-0.09	-0.27	-0.30
	(0.16)	(0.20) ***	(0.25)	(0.12)	(0.11) **	(0.25)
fop*ln(debt)	-0.05	-0.20	-0.12	-0.03	-0.02	-0.09
	(0.04)	(0.05) ***	(0.06) *	(0.04)	(0.03)	(0.05) *
fop*law	0.21	0.16	-0.66	-0.01	0.32	0.11
	(0.17)	(0.16)	(0.28) **	(0.16)	(0.13) **	(0.17)
fop*voice	-0.02	0.37	-0.05	-0.08	0.10	0.16
	(0.09)	(0.12) ***	(0.14)	(0.08)	(0.05) **	(0.10)
fop*corruption	-0.05	-0.20	1.47	0.47	-0.40	0.07
	(0.21)	(0.26)	(0.39) ***	(0.23) **	(0.19) **	(0.24)
sop	-98.86	105.54	63.46	-27.99	-38.22	73.97
	(14.80) ***	(21.51) ***	(18.80) ***	(16.29) *	(11.00) ***	(17.72) ***
sop*europe	-3.01	6.52	4.28	2.56	2.39	5.06
	(0.67) ***	(0.68) ***	(0.60) ***	(0.64) ***	(0.72) ***	(0.64) ***
sop*asia	-6.42	4.30	2.39	-3.13	-3.72	2.79
	(0.84) ***	(1.13) ***	(1.06) **	(0.96) ***	(0.56) ***	(0.94) ***
sop*latin	-0.67	5.45	3.24	3.77	4.09	4.25
	(0.71)	(0.58) ***	(0.62) ***	(0.68) ***	(0.61) ***	(0.55) ***
sop*middleeast	-8.07	2.80	2.14	-6.24	-7.60	1.75
	(1.49) ***	(1.85)	(1.79)	(1.69) ***	(0.99) ***	(1.55)
sop*law	6.59	-2.34	-1.74	5.55	6.70	-1.78
	(1.22) ***	(1.55)	(1.48)	(1.39) ***	(0.81) ***	(1.28)
sop*ln(gdp)	26.82	-26.03	-15.70	8.76	11.87	-18.31
	(4.05) ***	(5.82) ***	(5.15) ***	(4.51) *	(2.92) ***	(4.79) ***
sop*ln(debt)	0.19	-0.53	-0.53	-0.11	0.03	-0.47
	(0.08) **	(0.08) ***	(0.06) ***	(0.07)	(0.09)	(0.08) ***
sop*corruption	-4.01	5.19	3.06	-1.67	-1.24	4.31
	(0.57) ***	(0.85) ***	(0.77) ***	(0.66) **	(0.44) ***	(0.71) ***
sop*voice	-1.27	-0.56	-1.08	-2.16	-2.09	-0.94
	(0.37) ***	(0.39)	(0.39) ***	(0.40) ***	(0.27) ***	(0.34) ***

Table. Impact of Transparency on Level and Volatility of Spreads: First Stage Continued

	(1) pub	(2) rosc	(3) sdds	(4) pub*sdds	(5) pub*rosc	(6) sdds*rosc
sop*ln(debt)2	0.62	0.34	-0.12	0.39	0.68	0.30
	(0.17) ***	(0.15) **	(0.17)	(0.18) **	(0.12) ***	(0.13) **
sop*ln(gdp)2	-1.83	1.62	1.02	-0.68	-0.94	1.15
	(0.28) ***	(0.40) ***	(0.36) ***	(0.32) **	(0.20) ***	(0.33) ***
sop*law2	6.04	0.90	-0.43	6.42	6.97	1.07
	(1.44) ***	(1.58)	(1.57)	(1.61) ***	(1.03) ***	(1.35)
sop*voice2	1.13	-1.38	-0.74	0.41	0.34	-0.77
	(0.17) ***	(0.26) ***	(0.21) ***	(0.18) **	(0.14) **	(0.20) ***
sop*corruption2	-1.57	-3.85	-1.72	-5.03	-4.35	-2.77
	(0.93) *	(0.90) ***	(0.93) *	(0.96) ***	(0.79) ***	(0.85) ***
tsub	0.05	-0.25	-0.23	0.06	-0.04	-0.22
	(0.04)	(0.07) ***	(0.08) ***	(0.03) *	(0.03)	(0.07) ***
tsub*asia	0.01	-0.04	0.02	0.01	-0.03	-0.05
	(0.01)	(0.02)	(0.02)	(0.01)	(0.01) **	(0.02) **
tsub*europe	0.01	0.00	-0.09	-0.01	0.03	-0.01
	(0.01)	(0.03)	(0.02) ***	(0.02)	(0.03)	(0.03)
tsub*law	-0.02	0.02	0.04	0.00	0.01	0.04
	(0.01)	(0.02)	(0.03)	(0.01)	(0.01)	(0.02)
tsub*ln(debt)	0.00	0.02	0.03	0.00	0.00	0.02
	(0.00)	(0.01) ***	(0.01) ***	(0.00)	(0.00)	(0.01) ***
tsub*voice	-0.02	-0.02	0.04	-0.01	0.00	0.00
	(0.01) ***	(0.01)	(0.02) **	(0.01)	(0.00)	(0.01)
tsub*corruption	0.04	0.01	-0.11	0.01	0.01	-0.01
	(0.02) **	(0.03)	(0.05) **	(0.02)	(0.01)	(0.02)
Constant	-0.21	0.55	-0.18	-0.40	0.19	0.54
	(0.15)	(0.23)	(0.28)	(0.19) **	(0.20)	(0.21) ***
quarterly dummies	yes	yes	yes	yes	yes	yes
Observations	322	322	322	322	322	322
R-squared	0.85	0.79	0.81	0.80	0.81	0.77
Joint F-stat	17.7	22.1	37.1	61.7	16.4	21.9

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

OLS was used in the first stage despite the fact that the dependent variables took the value 0 or 1 because it is more robust to functional form misspecification than logit. The predicted value of the instruments were close to the 0-1 range (all falling within the range –0.4 to 1.3 and the vast majority falling within the 0-1 range.

Appendix IV. Model of Transparency:
How the Decision on Commitment Varies with the Cost

In the model described in Section C, whether a country commits or not depends on C_i. This can be seen by comparing the payoff from borrowing when a country commits to not take the action with the payoff from borrowing when it does not make a commitment. The gain from committing depends on whether the market would collapse in the absence of a commitment. Note that in this version of the model the equilibrium without commitment is identical to the equilibrium when commitment is not possible. Thus the condition:

$$[P_1 X_1 /(1+R)]-1 \tag{V.A}$$

also represents the condition under which non-committing countries borrow even after the commitment technology has been invented. If (A) holds the gain (or loss) from commitment is:

$$\left[\frac{P_0 X_0}{(1+R)}-1-C_i\right]-\left[\frac{P_1 X_1}{(1+R)}-1\right]=\left[\frac{P_0 X_0 - P_1 X_1}{(1+R)}\right]-C_i \tag{V.B}$$

If (A) does not hold (and the market does not exist in the absence of commitment), the gain (or loss) would be,

$$\frac{P_0 X_0}{(1+R)}-1-C_i \tag{V.C}$$

If C_i is high enough, there will be no gain from commitment, and hence countries will not commit. If C_i is zero, then, by previous assumptions, (B) and (C) are both positive, and so countries will commit. If (A) holds, countries will commit if:

$$Ci < \frac{P_0 X_0 - P_1 X_1}{(1+R)}$$

If (A) does not hold then countries will commit if:

$$Ci < \frac{P_0 X_0}{(1+R)}-1 \tag{V.D}$$

Appendix V: Model of Transparency:
Conditions for Pooling and Separating Equilibria

Under the signaling version of the model set out in Section IV. C, if monitoring/transparency is possible, then depending on parameter values, there may be either a separating equilibrium, a pooling equilibrium, or both. In particular, there may be a separating equilibrium in which lenders believe countries have received bad news (i.e. have probability P_1) if they do not pay the cost of transparency C_i. They therefore require interest rate $(1+R)/P_1$ from these countries. This equilibrium will exist if countries that receive good news (i.e. have P_0) prefer to pay the cost of transparency and get the lower interest rate, over the alternative of not borrowing, i.e. when:

$$C_i < \frac{P_0 X_0}{(1+R)} - \frac{(1+R)}{P_1(1+R)} \qquad\qquad \text{(VI.A)}$$

or over the other alternative of paying the high interest rate associated with not signaling, i.e. when:

$$Ci < P_0 \left[\frac{(1+R)}{P_0(1+R)} - \frac{(1+R)}{P_1(1+R)} \right] = 1 - \frac{1}{P_1} \qquad\qquad \text{(VI.B)}$$

If C_i is high enough then there is a pooling equilibrium where no country signals even if they receive a positive shock. This equilibrium exists when:

$$Ci > \frac{1}{\overline{P}} - \frac{P_0 X_0}{(1+R)} \qquad\qquad \text{(VI.C)}$$

For intermediate values of C_i, both separating and pooling equilibrium exist.

Appendix VI. Description of Types of IMF Country Documents

Article IV Staff Reports and Background Documents

These are written on every IMF member on a regular (usually annual) basis. The main report, typically around 20-30 pages plus tables, contains a description of recent economic developments, a short-term projection, and policy suggestions. The reports are written to inform other members of developments and advise the member country involved. They are explicitly not designed to provide a rating of a member's performance or policies.

Background documents are also produced and can be in the form of detailed tables (Statistical Appendices), a description of recent developments and institutions (Recent Economic Developments, which are no longer produced), and more analytical studies such as an estimation of potential growth or the real equilibrium exchange rate (Selected Issues). Reports on the Observance of Standards and Codes (ROSCs) are also background documents to Article IV reports.

Member countries that agree to the publication of their Article IV staff report can have a response published alongside the report. This "right of reply" usually takes the form of a statement by the member's Executive Director and is about 2-4 pages.

Program Documents

These are produced only for countries that have an arrangement (i.e. are borrowing) from the IMF. Some simply describe the timing, amounts, and conditions of the arrangement and are signed by the authorities (Letters of Intent, Memoranda on Economic and Fiscal Policy, and Technical Memoranda of Understanding). Requests or reviews of arrangements evaluate how a member has performed under an arrangement, whether it has met its targets, and recommend whether the member should receive additional money. These tend to be shorter than Article IV staff reports and some provide more detailed forecasts. They also come closer to a quantitative rating in that they indicate whether, in the view of the staff, the country should receive the next tranche of a loan. However, as discussed above, the key points of the assessment are usually made public before the document is released.

In some cases, program requests and reviews are combined with an Article IV staff report. The integrated report assesses economic conditions and performance under the arrangement.

Public Information Notices, Press Releases, and News Briefs

Public Information Notices, Press Releases, and News Briefs provide short (usually 3-4 page) summaries of Executive Board discussions of Article IV reports (PINs) and program reviews (Press Releases and News Briefs). They are based on the staff report and modified to reflect the comments of Directors during the discussion. They usually also contain a summary table of the key economic statistics from the report.

Staff Concluding Statements

At the end of an Article IV or program mission, staff prepare a concluding statement which the authorities can choose to make public. Staff may also hold a press conference at the end of the mission, particularly if the concluding statement is to be made public. Concluding statements are a few pages and provide a summary assessment of the economy. In program cases, the statement will announce whether an agreement on an arrangement has been reached in principle. It will indicate the amount of money a country is expected to receive from the IMF and the timing and main conditions of a program. These tentative agreements are rarely overturned either by senior management or the Executive Board.

For IMF procedures on document preparation and publication, see Appendix I.

Appendix VII. GARCH Estimation

The first step in GARCH estimation is to make a distributional assumption on the error term, $\varepsilon_{i,t}$. We choose a mixture normal distribution as it is a good description of the data and has a known density function. For a given country spread series i, $\varepsilon_{i,t}$ is identically and independently distributed over time. $\varepsilon_{i,t}$ is assumed to be drawn from a mixture normal distribution $N(0,\sigma_i^2)$ with probability 0.8, $N(v_i,\sigma_i^2)$ and $N(-v_i,\sigma_i^2)$ with probability 0.1 respectively. The mixture distribution is constructed to be symmetric, because the $s_{i,t}$ series do not exhibit significant skewness. In this type of mixture normal models, the probability of each normal distribution must be given, possibly somewhat arbitrarily. The reason is that the probabilities cannot be estimated unless we know which distribution each $\varepsilon_{i,t}$ is drawn from. The probabilities chosen here have an intuitive appeal, since our data exhibits extreme movements in either direction that happen with a very low probability. These extremities are the very reason why we cannot use a homoskedastic model to make valid statistical inferences with regard to the new effect. At first, we tried a normal distribution specification for $\varepsilon_{i,t}$, but the excess kurtosis could not be explained away by the GARCH effect alone. The estimation procedure is described below.

1. Determine the number of lags, q_i, for each individual mean equation: the top equation of (G1). We applied Schwarz Bayesian Information Criterion.
2. Estimate GARCH(1,1) of individual series, and compute the kurtosis of the standardized residuals.
3. Solve for (v_i,σ_i^2) to match the kurtosis from 2 and to match the second moment of $\varepsilon_{i,t}$.
4. Proceed with a maximum likelihood estimation of parameters, with σ_i^2 and v_i from 2.
5. The result from steps 2 through 4 provides useful starting point for a joint maximization. We combine steps 3 and 4 to jointly estimate the components of the mixture normal with GARCH coefficients.

One caveat is that $h_{i,t}$, the conditional variance process, must remain non-negative. To ensure non-negativity of the conditional variance for GARCH(1,1) processes, it suffices to have $\lambda_i, \beta_{1i}, \beta_{2i} > 0$, for all i. In addition, stationarity requires $\beta_{1i} + \beta_{2i} < 1$, for all i.

As we calibrate up to the fourth moment of the process, the quasi-maximum likelihood function is a close approximation of the true distribution. (We do not try to match any higher moments, as their estimation is notoriously imprecise.) As we can easily write down the likelihood function of the mixture normal distribution, the computation is tractable. The statistical inference is straightforward, in that we can readily apply the standards results (e.g. consistency and asymptotic normality) of quasi-MLE asymptotics.

Note that we can easily incorporate contemporaneous and/or cross-country serial correlation in $\varepsilon_{i,t}$ and/or $h_{i,t}$, as long as we keep the correlation parameterization parsimonious.

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