Contents lists available at ScienceDirect



Journal of International Economics



journal homepage: www.elsevier.com/locate/jie

"Rules of thumb" for sovereign debt crises $\stackrel{\leftrightarrow}{\sim}$

Paolo Manasse ^{a,*}, Nouriel Roubini ^b

^a Economics Department, Faculty of Political Sciences, University of Bologna, Strada Maggiore, 45, 40100 Bologna, Italy
^b Stern School of Business, New York University, 269 Mercer Street, 7FL New York, NY 10003, USA

ARTICLE INFO

Article history: Received 5 July 2005 Received in revised form 10 September 2008 Accepted 28 December 2008

Keywords: Sovereign debt Crises Default

JEL classification: F33 F34 F37

1. Introduction

Following the debt crises of the 1980s, sovereign debt defaults have become more frequent. Episodes of outright default include Russia, Ecuador, and Argentina. In other cases, formal default was avoided via a debt restructuring under a coercive threat of default as in Ukraine, Pakistan, and Uruguay. Default was averted through largescale IMF financial support in cases such as Mexico, Brazil, and Turkey.

While there has been a significant amount of research regarding debt crises in general, and about the policy responses to these defaults, in particular,¹ the macroeconomic and structural weaknesses leading to them are still not properly understood: there is little comparative empirical work on the sovereign debt crises of the last decade. Many policymakers and analysts continue to use simple rules of thumb to judge risks and to assess fiscal sustainability (Mody and Saravia, 2003), as well as the soundness of macroeconomic policies. Too often, these rules are not based on a rigorous quantitative analysis, and may miss some core elements that led to these sovereign debt crises.

Our aim is to provide answers to the following basic questions. What set of economic and political conditions is empirically associated to the

ABSTRACT

This paper investigates the economic and political conditions that are associated to the occurrence of a sovereign debt crisis. We use a new statistical approach (Classification and Regression Tree) that allows us to derive a collection of "rules of thumb" that help identify the typical characteristics of defaulters. We find that not all crises are equal: they differ depending on whether the government faces insolvency, illiquidity, or various macroeconomic risks. We also characterize the set of fundamentals that can be associated with a relatively "risk-free" zone. This classification is important for discussing appropriate policy options to prevent crises and improve response time and prediction. © 2009 Elsevier B.V. All rights reserved.

likely occurrence of a sovereign debt crisis? Can one derive thresholds for vulnerability indicators that will effectively signal the risk of a sovereign debt crisis? Part of the motivation for the paper stems from so-called surveillance failures, namely cases where international financial institutions, such as the IMF, as well as rating agencies, private sector agents, and academics, were taken "by surprise" and grossly under-estimated the likelihood of a sovereign default.

In the paper, we use a new statistical approach and derive a set of "rules of thumb" that help identify the typical characteristics of defaulters. We find that not all crises are equal: they differ depending on whether the government faced insolvency, illiquidity, or various macroeconomic weaknesses and risks. This classification is crucial for discussing appropriate policy options for preventing crises and responding to them once they occur. For example, it is often argued that solvent but illiquid countries with large amounts of short-term debt may need IMF support to avoid a liquidity run or "roll-off" crisis. Conversely, highly indebted countries may face a debt crisis, unless there is a strong and credible fiscal consolidation. In addition, it is argued that conditionality should set targets indicating that a country's macroeconomic fundamentals are heading towards a relatively "safe" zone. In the paper these concepts of liquidity crisis, insolvency crisis, crisis triggered by weak macro-fundamentals, and relatively "safe zone" are made precise. Unless the diagnosis is correct, it is hard to get the policy cure right.

This empirical analysis is based on a dataset containing annual observations for 47 emerging market economies from 1970 to 2002. A country is defined to be in a state of "debt crisis" if it is classified as being in default by Standard & Poor's, or if it receives a large non-concessional IMF loan (where "large" means in excess of 100% of IMF quota). Standard

[☆] We wish to thank Guido Ascari, James Daniel, Mark De Broeck, Bob Flood, Christian Keller, Manmohan S. Kumar, Pier Carlo Padoan, Indira Rajaraman, as well as participants at seminars at the International Monetary Fund, Bocconi and Milan State University. Andy Berg and Rex Gosh provided great comments at an early stage of this project.

^{*} Corresponding author. Tel.: +39 051 209 2616; fax: +39 02 700 514 895.

E-mail address: paolo.manasse@unibo.it (P. Manasse).

¹ See for example Roubini and Setser (2004) for a systematic analysis of the crises in emerging market economies in the last decade, and on how they were resolved.

^{0022-1996/\$ –} see front matter 0 2009 Elsevier B.V. All rights reserved. doi:10.1016/j.jinteco.2008.12.002

Table 1

Countries and default episodes in the full sample.

Algerina 1 6.0 6 1991-1997 Argerina 3 5.0 15 1982-1982, 1985-1986, 2001, 2002 Bolivia 2 6.5 13 1980-1985, 1985-1994, 1993, 1995, 1995, 1997, 2000, 2001*, 2002* Brazil 3 5.3 16 1983-1991 Chile 1 8.0 8 1983-1991 Colombia 0 0 Colombia 0 0 Cyrus 0 0 Dominican Republic 1 2.0 22 1981- Ecudor 1 1.00 1 1984-1997 Export 1 1.00 1 1984-1997 Extoriar 0 0 Caternala 1 1.00 1 1986-1987 Extoriar 0 0 Isstandri 1 0.0 1997-2001, 2002 Isstandriar		Number of crisis	Average length	Years in crisis	Crisis episodes (starred are added by IMF loans)
Agentina Bolivia350151982-1994, 1995, 1996, 2001, 2002Bazi33.3161983-1995, 1998-1999, 2000, 2001*, 2002**Brazi33.3161983-1995, 1998*1999, 2000, 2001*, 2002**China00Colonbia00Costa Rica110.0101981-1991Costa Rica110.0101981-1991Costa Rica00Cacch Republic*00Cacch Republic12.02.21981-Ecuador28.0161982-1995, 1999-2001Egypt110.011984-1985Ecuador28.0161981-1987Egypt110.011984-1985El Salvador110.011984-1985El Salvador110.011984-1985Endia001Indias01Indias11.011984-1985Indias22.041988-1981, 1981, 1986, 1987-1994Jordan15.011Indias11.011Indias11.011Indias11.011Indias11.011Indias11.011Indias11.011Ind	Algeria	1	6.0	6	1991–1997
Bairlar26.5131990-1935, 1995. 1994.Barai33.3161983-1991.Chile18.081993-1991.Chile110.0101991.Colombia00Colombia110.0101991.Cyros001991.Cyros001991.Cyros110.0161982-190, 19992001.Cyros110.0161982-190.1Cyros28.0161982-190.1Cyros110.0161984-190.1Eavador110.0161984-190.1Eavador110.01994190.1Eavador110.01994190.1Eavador110.01994190.1Eavador110.01994190.1Eavador110.01994190.1Indonesia22.551989-194.1Indonesia22.551989.1Indonesia22.551989.1Indonesia34.7141975.1Israel019972001.2002Israel019972001.2002Israel019972001.2002Israel019972001.2002Israel019972001.2002Israel019972001.2002 <t< td=""><td>Argentina</td><td>3</td><td>5.0</td><td>15</td><td>1982–1994, 1995*,1996, 2001, 2002</td></t<>	Argentina	3	5.0	15	1982–1994, 1995*,1996, 2001, 2002
Bazil5.3161983-1995, 2000, 2001*, 2002*Chile18.08.1983.1991China00Costa Rica110.0101981-1991Costa Rica10.0101981-1991Costa Rica22.0221981-Carch Republic0010Carch Republic12.0221981-Carch Republic11.0161982-1996, 1999-2001Expander11.01.01.0Expander11.01.01.0Expander11.01.01.0Expander11.01.01.0Expander11.01.01.0Itangary*00Indonesia22.551997+2001,2002Itangary*00Indonesia22.551997+2001,2002Itanda151997+2001,2002Itanda13.051998-1994Itanda101.0Itanda11.01010Itanda101.0Itanda101.0Itanda101.0Itanda101.0Itanda11.0101982-1991, 1985, 1987, 1989, 1981, 1981, 1981, 1981, 1981, 1981, 1981, 1	Bolivia	2	6.5	13	1980-1985, 1986-1994
Chile18.081983-1991Colombia00Colombia00Corports00Cypris00Cent Republic12.02.21981-1991Dominan Republic12.02.21981-1992Exprit11.011984-1985Exprit11.011984-1985Exprit11.011984-1985Exprit11.011984-1985Exprit11.011984-1985Exprit11.011984-1985Exprit11.011984-1985Exprit11.011984-1985Exprit11.011984-1985Exprit11.011984-1985Exprit11.011984-1985Indonesia22.551987-1994Iordan12.021984-1985Exprit22.041984-1985Exprit33.011984-1985Iordan12.021984-1985Iordan12.021984-1985Iordan12.021984-1985Iordan12.021984-1985Iordan12.021984-1985Iordan12.011984-1985	Brazil	3	5.3	16	1983–1995, 1998*,99*,2000, 2001*,2002*
China Colombia00Costa Rea110.0101981-1991Costa Rea110.0101981-1991Corch Republic00Carch Republic12.02.21981-Ecuador28.0161982-1996, 1999-2001Egypt110.011984-1985Ecuador110.011984-1985Estaviar001Gatemala110.011986-1987Itangary001Indonesia22.551997*-2001,2002Israel001Indonesia22.551986-1987-1994Jordan15.01986-1987-1994Jordan15.01986-1987-1994Jordan101197*-2001,2002Jarafa00Indonesia22.55Jordan151986-1981-1986, 1987-1994Jordan13.051986-1991Karahtsari00Libuaria00Malysia00Maysia1101982-1991, 1995*, 96Jordan12.021988-1991Jordan12.02Panama11010Panama1101982-1991, 1997-1981, 1983	Chile	1	8.0	8	1983–1991
Colombia 0 0 Corst Rka 1 0.0 101-1991 Cypus 0 0 Cech Republic 1 2.0 2.2 181- Dominican Republic 1 2.0 2.2 1831- Ecuador 2 8.0 16 1982-1966, 1999-2001 Egypt 1 1.0 1 1984-1985 Etaviar' 0 0 Caternable 1 1.0 1 1986-1987 India 0 0 India 0 0 India 0 0 India 0 0 India 10 1.0 1978-1980, 1981-1986, 1987-1994 India 0 0 India 1978-1980, 1981-1986, 1987-1994 1 India 1.0	China	0		0	
Costa Rica 1 10.0 10 1981-1991 Cyprus 0 0 Cacch Republic 0 0 Dominican Republic 2 2.0 2.2 1981- Ecador 2 8.0 16 1982-1996, 1999-2001 Ecador 1 10.0 1 1984-1895 Exador 1 10.0 1 1984-1895 Extorial* 0 0 Catternala 1 10.0 1 1986-1987 Indonesia 2 2.5 5 197*-2001, 2002 Isracl 0 0 Jamaica 3 4.7 14 1978-1986, 1987-1994, 598-1984, 1987-1994 Korzakhstan* 0 0 10 Lintuaria* 0 0 10 11 Maxisa 0 0 10 10	Colombia	0		0	
Cypins00Corch Republic122.0221981-Dominsan Republic122.01221981-Eraudor11011982-1968, 1999-2001Egypt11011984-1895Egypt11011981-1997Estonia'00Catemala11011986-1987India00India22551997*-2001, 2002India22551997*-2001, 2002India22.551997*-2001, 2002India34.741986-1987, 1986, 1987-1994Jordan15.051989-1994Kazakhstan'a00Lithuania'00Lithuania'00Makysia00Mexico25.010Malaysia00Mexico25.010Panama14.014Mexico29.0Panama110.010Paraguy110.01987-1997, 1978, 1979-1981, 1983-1984, 1986-1991Paraguy110.01976-1977, 1978, 1979-1981, 1983-1984, 1986-1991Paraguy110.01976-1977, 1978, 1979-1981, 1983-1984, 1986-1991Paraguy110.01976-1977, 758, 1985, 1984, 1984-1984, 1986-1991 <td>Costa Rica</td> <td>1</td> <td>10.0</td> <td>10</td> <td>1981-1991</td>	Costa Rica	1	10.0	10	1981-1991
Cach Republic00Dominican Republic122.0221981-Ecuador28.0161982-1996, 1999-2001Egypt11.011984-1985Egypt11.6.0161981-1997Estonia*00Catternala11.011986-1987India00Indoresia22.551997-2001, 2002Israel00Jamaica34.7141978-1980, 1981-1986, 1987-1994Jordan15.051999-1994Jardaica34.7141978-1980, 1981-1986, 1987-1994Jordan15.051999-1994Latvia*00Latvia*00Lithuana*00Masysia00Mexico25.0101982-1991, 1995*, 96Oman00Paraguay17.07Paraguay17.01986-1991Oman00Paraguay13.01998-1994, 1983-1998, 1983-1998Politopines110.01976-1977, 1978, 1979*-1981, 1983-1998Polad*00Paraguay13.03Polad*00Rossia*13.01998-2001S	Cyprus	0		0	
Dominican Republic 1 220 1921 Exaudor 2 8.0 16 1982-1996, 1992-001 Exypt 1 1.0 1 1982-1996, 1992-001 Extoniar 0 0 Guatemala 1 1.0 1 1997-2001, 2002 India 0 0 India 0 0 India 0 0 India 0 0 Jamaica 2 2.5 5 1997-2001, 2002 Israel 0 0 Jamaica 3 4.7 14 1989-1994 Kazakhstarå 0 0 Latviar 0 0 Malsysia 0 0 Makrisan 1 1.0 1982-1991, 1983-1984, 1986-1991	Czech Republic ^a	0		0	
Ecuador 2 8.0 16 1982-1996, 1999-2001 Expyt 1 10.0 1 1984-1985 Exputor 1 16.0 16 1981-1997-1000 Extonia* 0 0 Catternala 1 0 1986-1987 Indonesia 2 2.5 5 1987-2001, 2002 Israel 0 0 Jamaica 2 2.5 5 1988-1996, 1987-1994 Jordan 1 5.0 5 1989-1994 Jordan 5 1980*,81*82, 1997**98*.99 1984 Lithuania* 0 0 Korea, Rep. of 2 2.0 4 1980*,81*82, 1997*,98*.99 Lithuania* 0 0 Matoco 2 2.0 4 1980*,1991*,1995*, 96 Moreco 2 3.0 6 1982-1991, 1995*, 96 Moreco	Dominican Republic	1	22.0	22	1981-
Expt 1 10 1 1984-1985 B Salvador 1 16.0 16 1981-1997 B Salvador 0 Guatemala 1 10 1 1986-1987 India 0 0 India 0 0 India 0 0 Jamaica 2 2.5 5 1997+2001,2002 Jamaica 3 4.7 14 1978-1980,1981-1986,1987-1994 Jordan 1 5.0 5 1989-1994 Latvia* 0 0 Korak kep, of 2 2.0 4 1980*,81*82,1997*,98*,99 Latvia* 0 0 Makysia 0 0 Makysia 1 1.0 1.0 1982-1991,1955*,96 Morocco 2 1.0 1.0	Ecuador	2	8.0	16	1982-1996, 1999-2001
I 1 1.6.0 16 1981-1997 Estonia' 0 0 Cuaternala 1 10 1 1986-1987 India 0 0 India 0 0 Indonesia 2 2.5 5 1997*-2001,2002 Jamaica 3 4.7 14 1978-1980, 1981-1986, 1987-1994 Jordan 3 4.7 14 1978-1980, 1981-1986, 1987-1994 Jordan 3 4.7 14 1989-1994 Kazakhstan* 0 0 Korea, Rep. of 2 2.0 4 1989-1994 Korea, Rep. of 2 2.0 4 1989-1994 Malayia 0 0 0 Malayia 0 0 1982-1991, 1995*, 96 Moracco 2 5.0 10 1982-1991, 1995*, 96 Parauay 1	Egypt	1	1.0	1	1984–1985
Estonia ¹ 0 0 Guatemala 1 1.0 1 1986-1987 India 0 0 India 0 0 India 2 2.5 1997*-2001, 2002 Israel 0 0 Jamaica 3 4.7 14 1988-1980, 1981-1986, 1987-1994 Jordan 1 5.0 5 1989-1994 Kazaktstan ² 0 0 Korea, Rep, of 2 2.0 4 1880*,81*,82, 1997*,98*,99 Latvia ³ 0 0 0 Malaysia 0 0 0 Markota 1 2.0 2 1982-1991, 1995*, 96 Morecco 2 3.0 6 1983-1984, 1986-1981 Paraguay 1 7.0 7 1986-1993 Paraguay 1	El Salvador	1	16.0	16	1981–1997
Guatemala 1 10 1 1986-1987 Hungary' 0 0 India 0 0 Indonesia 2 2.5 5 1987-1900, 1901, 2002 Jamaica 3 4.7 14 1978-180, 1981-1986, 1987-1994 Jordan 3 4.7 14 1978-180, 1981-1986, 1987-1994 Kazakhstan'a 0 0 Kazakhstan'a 0 0 Korea, Rep. of 2 2.0 4 1980*, 81*, 82, 1997*, 98*, 99 Kazakhstan'a 0 0 Malaysia 0 0 Malaysia 0 0 Oman 0 0 Panama 1 14.0 14 1983-1997 Paraguay 1 7.0 7 1986-1993 Peru 3.0 3 198 1907	Estonia ^a	0		0	
Hungary ⁴ 0 0 India 0 0 India 2 2.5 1997*-2001, 2002 Israel 0 0 Jamaica 3 4.7 14 1978-1980, 1981-1986, 1987-1994 Jordan 1 5.0 5 1989-1994 Kazakhstan ⁴ 0 0 1 Korea, Rep, of 2 2.0 4 1980*,81*,82, 1997*,98*,99 1 Latvia ⁴ 0 0 1 1 1 1 Malysia 0 0 1	Guatemala	1	1.0	1	1986–1987
India 0 0 Indonesia 2 2.5 5 1997*-2001, 2002 Israel 0 0 Jamaica 3 4.7 14 1978-1980, 1981-1986, 1987-1994 Jordan 1 5.0 5 1989-1994 Kazakhstan ³ 0 0 Korea, Rep. of 2 2.0 4 1980*,81*,82, 1997*,98*,99 Lithuania ^a 0 0 1 Korea, Rep. of 2 2.0 4 1980*,81*,82, 1997*,98*,99 Lithuania ^a 0 0 1 Malaysia 0 0 1 Mexico 2 5.0 10 1982-1991, 1995*, 96 Morocco 2 3.0 6 1983-1991 Orman 0 0 1 Paraguay 1 7.0 7 1986-1993 Peru 3 6.3 19 1	Hungarv ^a	0		0	
Indonesia 2 2.5 5 1997*-2001,2002 tsrael 0 0 Jamaica 3 4.7 14 1978-1980,1981-1986,1987-1994 Jordan 1 5.0 5 1989-1994 Kazakhstan ^a 0 0 Kazakhstan ^a 0 0 Latvia ^a 0 0 Latvia ^a 0 0 Malaysia 0 0 Morocco 2 5.0 10 1982-1991,1995*,96 Morocco 2 3.0 6 1983-1984,1986-1991 Oman 0 0 Paraguay 1 2.0 2 198-6193 Paraguay 1 7.0 7 1986-193 Paraguay 1 10.0 10 1983-1984 Poland ^a 0 0 Romania ^a 0 <	India	0		0	
Israel 0 0 Jamaica 3 4.7 14 1978-1980, 1981-1986, 1987-1994 Jordan 1 5.0 5 1989-1994 Kazakhstan ^a 0 0 Korea, Rep. of 2 2.0 4 Jahayia* 0 0 Lithuania* 0 0 Malayia 0 0 Mexico 2 5.0 10 1982-1991, 1905*, 96 Morocco 2 3.0 6 983-1984, 1986-1991 Oman 0 0 0 Paraguay 1 2.0 2 1988-2000 Paraguay 1 7.0 7 1986-1993 Peru 3 6.3 19 1976-1977, 1978, 1979*-1981, 1983-1998 Philippines 1 0.0 10 1983-1993 Poland* 0 0 1 Russia* 1 3.0 3 1988-1990, 1993-1994, 1981, 1983-1998 South Africa	Indonesia	2	2.5	5	1997*-2001, 2002
Janaica 3 4.7 14 1978-1980, 1981-1986, 1987-1994 Jordan 1 5.0 5 1989-1994 Kazakhstan ^a 0 0 Korea, Rep. of 2 2.0 4 1980*,81*,82, 1997*,98*,99 Latvia ^a 0 0 Malaysia 0 0 Malaysia 0 0 Morocco 2 5.0 10 1982-1991, 1995*, 96 Morocco 2 3.0 6 1983-1984, 1986-1991 Oman 0 0 Pakistan 1 2.0 2 1989-2000 Panama 1 14.0 14 1983-1997 Paraguay 1 10.0 10 1983-1993 Poland ^a 0 0 Romania ^a 0 0 South Africa 1 3.0 3 198-201 Romania ^a 0 0 <td>Israel</td> <td>0</td> <td></td> <td>0</td> <td>··· , ··· ,</td>	Israel	0		0	··· , ··· ,
Jordan15.051989–1994Kazakhstan ^a 00Korea, Rep. of22.041980*,81*,82,1997*,98*,99Latvia ^a 00Lithuania ^a 00Malaysia00Mexico25.0101982–1991, 1995*, 96Morocco23.061983–1984, 1986–1991Oman00Pakistan12.021998–2000Paraguay17.071986–1933Peru36.3191976–1977, 1978, 1979*–1981, 1983–1998Philippines110.0101983–1933Poland ^a 00Russia ^a 13.03198–2001Stouth Africa41.871976+177, 1978, 1979*–1981, 1983–1998Stouth Africa41.871976+1977, 1978, 1979*, 1999, 1993–1994Thailand21.021988–2001South Africa41.871976*,77*,78, 1985–1988, 1989–1990, 1993–1994Thailand22.021988-2001Tunisia11.011991*,92Tunkey23.571978, 1979, 1984*, 1981*, 1983, 2000*, 2001*, 2002Ukraine ^a 33.031988–2001Uurguay32.061983–1986, 1987–1988, 1990–1992Venezuela33.3101983–1985, 1989–	Iamaica	3	4.7	14	1978-1980, 1981-1986, 1987-1994
Kazakhstan ^a 0 0 Korea, Rep. of 2 2.0 4 1980*,81*,82, 1997*,98*,99 Latvia ^a 0 0 Lithuania ^a 0 0 Malaysia 0 0 Mexico 2 5.0 10 1982-1991, 1995*, 96 Morocco 2 3.0 6 1983-1984, 1986-1991 Oman 0 0 Pakistan 1 2.0 2 1998-2000 Panma 1 14.0 14 1983-1997 Paraguay 1 7.0 7 1986-1993 Peru 3 6.3 19 1976-1977, 1978, 1979*-1981, 1983-1998 Philippines 1 10.0 10 1983-1993 Poland ^a 0 0 Romania ^a 0 0 Stovak Republic ^a 0 0 Stovak Republic ^a 1 3.0 3 1998-2001	Iordan	- 1	5.0	5	1989–1994
Korea, Ren. 2 2.0 4 1980*,81*,82, 1997*,98*,99 Latvia ^a 0 0 Lithuania ^a 0 0 Malaysia 0 0 Mexico 2 5.0 10 1982-1991, 1995*, 96 Morocco 2 3.0 6 1983-1984, 1986-1991 Oman 0 0 1 Pakistan 1 2.0 2 1988-2000 Paraguay 1 7.0 7 1986-1993 Peru 3 6.3 19 1976-1977, 1978, 1979*-1981, 1983-1998 Philippines 1 10.0 10 1983-1993 Poland ^a 0 0 10 Russia ^a 1 3.0 3 1998-2001 Slowak Republic ^a 0 0 10 Slowak Republic ^a 1 3.0 3 1998-2001 Slowak Republic ^a 0	Kazakhstan ^a	0		0	
Latvia* 0 0 Lithuania* 0 0 Malaysia 0 0 Mexico 2 5.0 10 1982–1991, 1995*, 96 Morocco 2 3.0 6 1983–1984, 1986–1991 Oman 0 0 Pakistan 1 2.0 2 1998–2000 Panama 1 14.0 14 1983–1997 Paraguay 1 7.0 7 1986–1993 Peru 3 6.3 19 1976–1977, 1978, 1979*–1981, 1983–1998 Philippines 1 10.0 10 1983–1993 Poland* 0 0 Russia* 1 3.0 3 1998–2001 Slovak Republic* 0 0 South Africa 4 1.8 7 1976*,77*,78, 1985–1988, 1989–1990, 1993–1994 Thailand 2.0 2 1988–1990 Turkey 2 3.5 7 1978, 1977*, 78, 198	Korea, Rep. of	2	2.0	4	1980*.81*.82, 1997*.98*.99
Lithuania ^a 00Malaysia00Mexico25.0101982–1991, 1995*, 96Morocco23.061983–1984, 1986–1991Oman00Pakistan12.021998–2000Panama114.0141983–1997Paraguay17.071986–1993Peru36.3191976–1977, 1978, 1979*–1981, 1983–1998Philippines110.0101983–1993Poland ^a 001Russia ^a 001Stovak Republic ^a 001South Africa41.871976*,77*,78, 1985–1988, 1989–1990, 1993–1994Thriland21.02198*,2001Tunisia11.011991*,92Turkey23.571978, 1979, 1980*, 1981*, 1982, 1933, 2000*, 2001*, 2002Ukraine ^a 13.031988–2001Uruguay32.061983–1980, 1981*, 1982, 1983, 2000*, 2001*, 2002Venezuela33.3101983–1980, 1991-1992Venezuela33.3101983–1980, 1990–1992	Latvia ^a	0		0	, , , , ,
Malaysia00Mexico25.0101982-1991, 1995*, 96Morocco23.061983-1984, 1986-1991Oman00Pakistan12.021998-2000Panama114.0141983-1997Paraguay17.071986-1993Peru36.3191976-1977, 1978, 1979*-1981, 1983-1998Philippines110.0101983-1993Poland ^a 00Russia ^a 13.031998-2001Stoak Republic ^a 00Souk Republic ^a 00Trinidad and Tobago12.021988-1989, 1989-1990, 1993-1994Tunisia11.011991*, 92Turkey23.571978, 1979*, 1981*, 1982, 1983, 2000*, 2001*, 2002Ukraine ^a 13.031998-2001Uruguay32.061983-1986, 1987-1988, 1980-1992Venezuela33.3101983-1986, 1987-1988, 1980-1992Total5455261	Lithuania ^a	0		0	
Initial of the second	Malavsia	0		0	
Instruct Image: Section of the sectin of the sectin of the section of the section of the section of t	Mexico	2	50	10	1982-1991 1995* 96
noman 0 0 Pakistan 1 2.0 2 1998-2000 Panama 1 14.0 14 1983-1997 Paraguay 1 7.0 7 1986-1993 Peru 3 6.3 19 1976-1977, 1978, 1979*-1981, 1983-1998 Philippines 1 10.0 10 1983-1993 Poland ^a 0 0 Russia ^a 1 3.0 3 1998-2001 Slovak Republic ^a 0 0 1 South Africa 4 1.8 7 1976*,77*,78, 1985-1988, 1989-1990, 1993-1994 Thailand 2 1.0 2 1981*,82, 1997*, 98 Trinidad and Tobago 1 2.0 2 1988-1990 Tunisia 1 1.0 1 1991*, 92 Ukraine ^a 1 3.0 3 1998-2001 Uruguay 3 2.0 6 1983-1986, 1987-1988, 1990-1992 Ukraine ^a 1 3.0 3 1998-2001 Uruguay	Morocco	2	3.0	6	1983-1984 1986-1991
Dataset Dataset Dataset Description Paraguay 1 14.0 14 1983-1997 Paraguay 1 7.0 7 1986-1993 Peru 3 6.3 19 1976-1977, 1978, 1979*-1981, 1983-1998 Philippines 1 10.0 10 1983-1993 Poland ^a 0 0 Romania ^a 0 0 Russia ^a 1 3.0 3 1998-2001 Slovak Republic ^a 0 0 South Africa 4 1.8 7 1976*,77*,78, 1985-1988, 1989-1990, 1993-1994 Thailand 2 1.0 2 1988-1990 Trinidad and Tobago 1 2.0 2 1988-1990 Turkey 2 3.5 7 1978, 1979, 1980*, 1981*, 1982, 1983, 2000*, 2001*, 2002 Ukraine ^a 1 3.0 3 1998-2001 Uruguay 3 2.0 6 1983-1986, 1987-1988, 1990-1	Oman	0		0	
Ranama 1 100 140 1440 1983–1997 Paraguay 1 7.0 7 1986–1993 Peru 3 6.3 19 1976–1977, 1978, 1979*–1981, 1983–1998 Philippines 1 10.0 10 1983–1993 Poland ^a 0 0 Romania ^a 0 0 Russia ^a 1 3.0 3 1998–2001 Slovak Republic ^a 0 0 South Africa 4 1.8 7 1976*,77*,78, 1985–1988, 1989–1990, 1993–1994 Thailand 2 1.0 2 1981*,82, 1997*, 98 Tunisia 1 1.0 1 1991*, 92 Turkey 2 3.5 7 1978, 1979, 1980*, 1981*, 1982, 1983, 2000*, 2001*, 2002 Ukraine ^a 1 3.0 3 1998–2001 Uruguay 3 2.0 6 1983–1986, 1987–1988, 1990–1992 Venezuela 3 3.3 10 1998–2001 Uruguay 3 2.0 6 1983–1986, 1987	Pakistan	- 1	2.0	2	1998-2000
Paraguay 1 7.0 7 1986–1993 Peru 3 6.3 19 1976–1977, 1978, 1979*–1981, 1983–1998 Philippines 1 10.0 10 1983–1993 Poland ^a 0 0 Russia ^a 0 0 Russia ^a 1 3.0 3 1998–2001 Slovak Republic ^a 0 0 South Africa 4 1.8 7 1976*,77*,78, 1985–1988, 1989–1990, 1993–1994 Thailand 2 1.0 2 1981*,82, 1997*, 98 Trinidad and Tobago 1 2.0 2 1988–1990 Turkey 2 3.5 7 1976*,1981*, 1981*, 1982, 1983, 2000*, 2001*, 2002 Ukraine ^a 1 3.0 3 1998–2001 Uruguay 3 2.0 6 1983–1988, 1980–1992 Venezuela 3 3.3 10 1983–1988, 1990–1992 Venezuela 3 3.3 10 1983–1989, 1990–1991, 1995–1998	Panama	1	14.0	14	1983–1997
Autgory A A A A A A B </td <td>Paraguay</td> <td>1</td> <td>70</td> <td>7</td> <td>1986–1993</td>	Paraguay	1	70	7	1986–1993
Philippines 1 10.0 10 1983-1993 Poland ^a 0 0 Romania ^a 0 0 Russia ^a 1 3.0 3 1998-2001 Slovak Republic ^a 0 0 South Africa 4 1.8 7 1976*,77*,78, 1985-1988, 1989-1990, 1993-1994 Thailand 2 1.0 2 1981*,82, 1997*, 98 Trinidad and Tobago 1 2.0 2 1988-1990 Turkey 2 3.5 7 1978, 1979, 1980*, 1981*, 1982, 1983, 2000*, 2001*, 2002 Ukraine ^a 1 3.0 3 1998-2001 Uruguay 3 2.0 6 1983-1986, 1987-1988, 1990-1992 Venezuela 3 3.3 10 1983-1980, 1990-1991, 1995-1998	Peru	3	63	19	1976-1977 1978 1979*-1981 1983-1998
Imprint Interpreter Interpreter Interpreter Poland ^a 0 0 Romania ^a 0 0 Russia ^a 1 3.0 3 1998–2001 Stovak Republic ^a 0 0 South Africa 4 1.8 7 1976*,77*,78, 1985–1988, 1989–1990, 1993–1994 Thailand 2 1.0 2 1981*,82, 1997*, 98 Trinidad and Tobago 1 2.0 2 1988–1990 Tunisia 1 1.0 1 1991*, 92 Turkey 2 3.5 7 1978, 1979, 1980*, 1981*, 1982, 1983, 2000*, 2001*, 2002 Ukraine ^a 1 3.0 3 1998–2001 Uruguay 3 2.0 6 1983–1988, 1990–1992 Venezuela 3 3.3 10 1983–1989, 1990–1991, 1995–1998 Total 54 55 261	Philippines	1	10.0	10	1983–1993
Romania ^a 0 0 Russia ^a 1 3.0 3 1998–2001 Slovak Republic ^a 0 0 South Africa 4 1.8 7 1976*,77*,78, 1985–1988, 1989–1990, 1993–1994 Thailand 2 1.0 2 1981*,82, 1997*, 98 Trinidad and Tobago 1 2.0 2 1988–1990 Tunisia 1 1.0 1 1991*, 92 Turkey 2 3.5 7 1978, 1979, 1980*, 1981*, 1982, 1983, 2000*, 2001*, 2002 Ukraine ^a 1 3.0 3 1998–2001 Uruguay 3 2.0 6 1983–1986, 1987–1988, 1990–1992 Venezuela 3 3.3 10 1983–1989, 1990–1991, 1995–1998 Total 55 261 261 261	Poland ^a	0	1010	0	1000 1000
Russia 1 3.0 3 1998–2001 Slovak Republic ^a 0 0 South Africa 4 1.8 7 1976*,77*,78, 1985–1988, 1989–1990, 1993–1994 Thailand 2 1.0 2 1981*,82, 1997*, 98 Trinidad and Tobago 1 2.0 2 1988–1990 Tunisia 1 1.0 1 1991*, 92 Turkey 2 3.5 7 1978, 1979, 1980*, 1981*, 1982, 1983, 2000*, 2001*, 2002 Ukraine ^a 1 3.0 3 1998–2001 Uruguay 3 2.0 6 1983–1986, 1987–1988, 1990–1992 Venezuela 3 3.3 10 1983–1989, 1990–1991, 1995–1998 Total 55 261 261 261	Romania ^a	0		0	
Nation Image: State of the state of t	Russia ^a	1	3.0	3	1998-2001
South Republic S S South Republic 6 1.0 7 1976*,77*,78, 1985–1988, 1989–1990, 1993–1994 Thailand 2 1.0 2 1981*,82, 1997*, 98 Trinidad and Tobago 1 2.0 2 1988–1990 Tunisia 1 1.0 1 1991*, 92 Turkey 2 3.5 7 1978, 1979, 1980*, 1981*, 1982, 1983, 2000*, 2001*, 2002 Ukraine ^a 1 3.0 3 1998–2001 Uruguay 3 2.0 6 1983–1986, 1987–1988, 1990–1992 Venezuela 3 3.3 10 1983–1989, 1990–1991, 1995–1998 Total 55 261 261 261	Slovak Republic ^a	0	510	0	1000 2001
Solution Instant <	South Africa	4	 18	7	1976* 77* 78 1985-1988 1989-1990 1993-1994
Inimital Imital Imital<	Thailand	2	10	2	1981* 82 1997* 98
Tunisa 1 2.0 2 1500 Tunisa 1 1.0 1 1991*, 92 Turkey 2 3.5 7 1978, 1979, 1980*, 1981*, 1982, 1983, 2000*, 2001*, 2002 Ukraine ^a 1 3.0 3 1998–2001 Uruguay 3 2.0 6 1983–1986, 1987–1988, 1990–1992 Venezuela 3 3.3 10 1983–1989, 1990–1991, 1995–1998 Total 55 261	Tripidad and Tobago	1	2.0	2	1988_1990
Turkey 2 3.5 7 1978, 1979, 1980*, 1981*, 1982, 1983, 2000*, 2001*, 2002 Ukraine ^a 1 3.0 3 1998-2001 Uruguay 3 2.0 6 1983-1986, 1987-1988, 1990-1992 Venezuela 3 3.3 10 1983-1989, 1990-1991, 1995-1998 Total 54 55 261	Tunisia	1	10	1	1991* 92
Variance ⁴ 1 3.0 3 1998-2001 Uruguay 3 2.0 6 1983-1986, 1987-1988, 1990-1992 Venezuela 3 3.3 10 1983-1989, 1990-1991, 1995-1998 Total 54 55 261	Turkey	2	3.5	7	1978 1979 1980* 1981* 1982 1983 2000* 2001* 2002
Uruguay 3 2.0 6 1983-1986, 1987-1988, 1990-1992 Venezuela 3 3.3 10 1983-1989, 1990-1991, 1995-1998 Total 54 55 261	Likraine ^a	1	3.0	3	1998-2001
Venezuela 3 3.3 10 1983–1989, 1990–1991, 1995–1998 Total 54 55 261	Uruguay	3	2.0	6	1983_1986_1987_1988_1990_1992
Total 54 55 261	Venezuela	3	2.0	10	1983_1980, 1987-1988, 1990-1992
	Total	54	5.5	261	1565 1565, 1556 1551, 1555 1556

Sources: IMF, Standard & Poor's, World Bank, and authors' calculations. A star indicates according to IMF loan.

^a Transition countries are included only from 1995 onwards.

& Poor's rates sovereign issuers in default when a government fails to meet principal or interest payment on an external obligation on due date (including exchange offers, debt equity swaps, and buy back for cash).

We employ the Classification and Regression Tree methodology (CART) for classification and prediction.² CART is a computerintensive data mining technique that selects explanatory variables, their critical values, and their interactions in order to identify "safe" from "crisis-prone" types. The main conclusions of our empirical analysis are as follows.

First, out of 50 candidate variables, 10 predictor variables turn out to be sufficient for classification and prediction: total external debt/GDP ratio; short-term debt reserves ratio; real GDP growth; public external debt/fiscal revenue ratio; CPI inflation; number of years to the next presidential election; U.S. treasury bills rate; external financial requirements (current account balance plus short-term debt as a ratio of foreign reserves); exchange rate overvaluation; and exchange rate volatility.

Second, a relatively "safe" country type is described by a handful of economic prerequisites: low total external debt (below 49.7% of GDP);

low short-term debt (below 130% of reserves); low public external debt (below 214% of fiscal revenue); and an exchange rate that is not excessively over-appreciated (overvaluation below 48%).

Third, three major types of risks are identified: (i) solvency (or debt unsustainability); (ii) illiquidity; and (iii) macro-exchange rate risks. The debt unsustainability risk types are characterized by: external debt in excess of 49.7% of GDP, together with monetary or fiscal imbalances, as well as by large external financing needs that signal illiquidity as an element of debt unsustainability. Liquidity risk types are identified by moderate debt levels, but have short-term debt in excess of 130% of reserves coupled with political uncertainty and tight international capital markets. Macro-exchange rate risk types arise from the combination of low growth and relatively fixed exchange rates. Each of these risk types differ in their likelihood of producing a crisis. Finally, our model has excellent predictive capacity in-sample, while the out-of-sample forecast have both less false alarms and less correct predictions than the Early Warning Signal (EWS) literature.

The analysis has one important, albeit simple, implication for sustainability analysis. It shows that *unconditional* thresholds, for example for debt–output ratios, are of little value per se for assessing the probability

² The analysis employs the data mining software CART developed by Salford Systems.

Download English Version:

https://daneshyari.com/en/article/963106

Download Persian Version:

https://daneshyari.com/article/963106

Daneshyari.com