Sovereign Default and Cheap Talk

Yasin Kırsat Önder *

January 18, 2013

Abstract

It is puzzling that advanced economies often have access to cheap borrowing even when they hold huge levels of debt, whereas emerging economies typically suffer from higher spreads even when they hold relatively low levels of debt. Standard sovereign debt models typically fail to explain both the “debt intolerance” that emerging countries inherit, and the “graduation” to cheaper rates that characterize developed countries. I develop a dynamic small open economy model with reputation acquisition to account for the puzzle. Information revelation is the key mechanism. A competent government wishes to transmit private information about its current income to uninformed lenders who, in turn, update their beliefs about the government’s reputation for transparency. When times are bad, governments gain in the short run from misrepresenting the health of their economy, but suffer the long run cost of a lower reputation by doing so. The government cares about its reputation only indirectly because bond markets respond favorably to high reputation countries in equilibrium. The model generates a separating equilibrium in which (i) governments with a lower-than-threshold reputation are trapped with high interest rates even though they hold low levels of debt and (ii) governments with higher reputation are able borrow at lower interest rates even when they hold higher levels of debt.

Key Words: sovereign default, sovereign debt, serial defaulters, debt intolerance, cheap talk, reputation

JEL Codes: F34, F30, D4, G15

*I am grateful to my advisors Roger Lagunoff, Mark Huggett, Leonardo Martinez and Jaun Carlos Hatchondo for their guidance and support. I appreciate the comments of seminar participants at the Richmond Fed, 2012 Midwest Economics Association, 2012 Midwest Macroeconomics, Central Bank of the Republic of Turkey (2012) and workshop participants at several institutions. I have benefited from conversations with Luis Catao, Satyajit Chatterjee, Bora Durdu, Pedro Gete, Burcu Eyigungor, Guido Sandleris and Mark Wright. All errors are my own. Email: yko2@georgetown.edu
Contents

1 Introduction 3

2 Environment 5
   2.1 Information Structure ................................................. 6
   2.2 Time Line .......................................................................... 6
   2.3 Government’s Problem ........................................................ 7
   2.4 Foreign Investors Problem .................................................... 11
   2.5 International Risk Neutral Investors .......................................... 12
   2.6 Strategies ........................................................................... 13

3 Equilibrium Definition 14

4 Characterization and Existence of Equilibrium 15

5 Computational Algorithm 17

6 Main Results 17

7 Conclusion 24

8 References 25

A Appendix A 27

B Appendix B 34
1 Introduction

Relative to its GDP, Canada’s debt is twice as large as that of Mexico. Yet, it receives far more favorable treatment in bond markets than does Mexico, despite the fact that both countries had similar growth paths in recent years. The comparison is representative of a broader pattern: emerging economies must pay significantly higher rates on new borrowing than advanced economies, despite carrying substantially lower debt (Table B.1).

A large empirical literature has emerged to examine this anomaly. Much of it points toward a process of “graduation” through which some economies make the successful transition from high interest rate spreads to lower ones as markets gain confidence over time in the country’s ability to repay. However, the underlying mechanism that drives this “reputation-gaining” process remains a mystery. This paper explores one such mechanism in a dynamic model of sovereign debt with reputation acquisition.

Previous studies have shown that conditioning on macro-indicators is not sufficient enough to explain the graduation. The existing literature on sovereign default and reputation heavily relies on the government’s default-repayment decision. A default decision reveals the type of the government once and for all. However, it is a well known fact that among current advanced economies there exist several that were once serial defaulters. Over time, those countries were able to escape from the “debt trap” and begin to borrow with a lower interest rate (Table B.3). I address this problem with an information transmission mechanism. In particular, countries have private information about the current state of the economy. Transparent countries are willing to disclose this information to the public to be perceived accountable in the eyes of the lenders.

This paper develops a dynamic model of sovereign debt with reputation acquisition where the country is subject to aggregate i.i.d. income shocks. I consider an open economy with a benevolent government, a private sector that crucially depends on the foreign capital and competitive lenders that trades one-period zero coupon bonds. In this environment, as in the noble framework of [Eaton and Gersovitz, 1981], the government is not committed to repay the debt. Reputation acquisition is introduced following [Morris, 2001]. I assume that the government receives a private signal about the current state of the economy. A government is classified as “competent” if it is better at collecting taxes and receiving informative signal. A competent government wishes to disclose private information about its current income to uninformed lenders. Current income is fully revealed in the next period, and lenders update their belief about the government’s transparency. Government cares about its reputation because bond markets respond favorably to high reputation countries and the productivity of capital is higher when countries are believed to be more transparent. Government makes two strategic decisions: (i) it decides to repay or not, (ii) if it decides to repay, it decides to lie or to tell the truth about its private information when borrowing in new
terms. When times are bad, conveying the true health of the economy may sometimes be costly. For instance, if the government observes a low (L) signal about its current income, announcing L would mean higher spreads and thus costly borrowing. Governments gain from misrepresenting the health of the economy in the short-run, but face the cost of a lower reputation in the long run. In the event of a default, government stays in the financial autarky for an exogenous period of time.

A contribution of this paper is to provide an explanation on country’s transition from costly borrowing to cheap borrowing. In particular, this paper shows that as market’s assessment about government’s transparency increases, government receives favorable interest rates.

It is natural to think that market usually reacts to information that the governments report. Announcements about current fundamentals of the economy influence agents expectations and can therefore be a significant source of economic fluctuation. There are many examples of announcements influencing the behavior of the bond prices. For instance, after the announcement of Greece’s cheating on its national accounts; investors lost their confidence and spreads soared, leading to a deeper crisis (figure 1). It takes time to rebuild the confidence lost by international creditors. In the case of the Argentinean default episode of 2001, it was announced that Argentina’s inflation reports were cooked and unreliable. Even though it has been more than 10 years, any announcements from Argentinean government officials regarding macro indicators are not perceived as creditworthy by the international community. In 2011, the IMF World Economic Outlook [Outlook, 2011] stated that “Until the quality of data reporting has improved, IMF staff will also use alternative measures of GDP growth and inflation for macroeconomic surveillance”. The Economist also stopped publishing deceiving numbers provided by INDEC, statistical office of Argentina, and harshly criticizes the government for cooking the books. [Economist, 2012]

In the theory developed here, lenders form beliefs about government’s type much like private agencies specializing in assessing government’s accountability. In essence, providing a truthful data builds/deteriorates the trust between the governments and the lenders. The model predicts that as the government’s transparency improves, the interest rate on the government debt decreases even though a government increases its debt holdings. My model also proposes that in order for a government’s reports to be anticipated by the lenders, government’s debt holdings have to be lower than a threshold level of debt. Since lenders do not anticipate the government’s messages for higher levels of debt, government cannot improve its reputation, and thus cannot graduate.

In line with the results, majority of the current advanced economies had long periods of low levels of debt during the graduation process as illustrated in figure B.2, and there is a highly negative correlation between the government’s transparency and spreads. For the evaluation of transparency I chose to use World Bank’s “regulatory quality index”. It captures the market’s perception of a
government’s ability to implement sound policies and institutions that boost transparency and development. A higher regulatory quality index translates into lower spreads. Table 1 shows a high negative correlation between market’s perception of government’s transparency and spreads. So, one way to influence the creditors’ beliefs on government’s transparency is through disclosure of private information.

Table 1: Correlation of regulatory quality index and spreads

<table>
<thead>
<tr>
<th>Country</th>
<th>corr(spread, reg. qual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>-0.56</td>
</tr>
<tr>
<td>Chile</td>
<td>-0.45</td>
</tr>
<tr>
<td>Turkey</td>
<td>-0.74</td>
</tr>
<tr>
<td>Mexico</td>
<td>-0.82</td>
</tr>
</tbody>
</table>

In summary, the current literature fails to explain the fact that some countries receive far more favorable bond prices even though they hold high levels of debt, have a history of default and similar GDP growth paths. My paper is the first in the sovereign debt literature to address the graduation puzzle in a dynamic model of sovereign debt with reputation acquisition.

2 Environment

This paper studies the sovereign default with a reputation acquisition mechanism in a dynamic model with asymmetric information. There are three agents in the economy: a benevolent gov-
ernment that maximizes the utility of the representative agent, international creditors who trades one-period zero-coupon non-contingent bonds and lastly the foreign capital owners that invests in domestic firms. The country receives i.i.d. income shock with equal probabilities, a high \((H)\) or a \((L)\) shock. Countries are not committed to repay its debt.

2.1 Information Structure

Competent government observes an informative signal about its current period’s income with a probability of \(\gamma \in (\frac{1}{2}, 1)\), \(p(s = y|y, t_c) = \gamma\), whereas non-competent type does not observe any informative signal, \(p(s = y|y, t_{nc}) = 1/2\). Informativeness of the signal comes from the government’s institutions such as tax collection or national statistical agencies. Lenders do not have any information about government’s income but they communicate with a government who may have been partially informed. Lenders do not know the type of the borrower but assign a probability \(\lambda\) that it is a competent (informed) type. The borrower announces a message \(m(s)\) depending on the signal it has observed. Given the message, the lenders set the bond prices. After the state is observed, lenders rationally update their beliefs about the government’s type. In particular, \(\lambda'(b', y, \lambda, m)\) is the posterior probability that the government is competent given message \(m\), debt holdings \(b'\) and realized state \(y\).

This set up is an example of a cheap talk game in which government’s message does not directly influence its utility; it indirectly affects its utility through influencing lenders’ beliefs about next period’s income. In this sense government has a costless communication with the lenders. (see [Crawford and Sobel, 1982]).

Every cheap talk game has equilibria where players of the game ignore the messages. If lenders do not infer any meaning in the messages, then there exists no incentive for the competent government to influence the expectations. If sending messages do not imbue the lenders’ beliefs, then the competent government simply randomizes 50 – 50 between sending an \(H\) and an \(L\) message regardless of the signal it has observed. Such equilibria in which no information is conveyed is known as “babbling equilibria.” Interesting case, in all cheap talk models, is to focus on equilibria where cheap talk conveys meaning.

2.2 Time Line

The timing of events can be summarized as follows:

1. Period \(t\) begins with a level of debt \(b\). Last period’s income \(y_{t-1}\) is revealed at the beginning

\(^{1}\)For endogenous output please see [Mendoza and Yue, 2012]
of the period, and market’s belief of government being a competent type with a probability \( \lambda \) is updated.

2. Government observes a private signal, \( H \) or \( L \), about today’s income which is going to be public in time \( t + 1 \).

3. The government chooses to default or not-default:
   - If it chooses to default, its income for the current period will be \( y^{aut} \) and it will come back to the markets with an exogenous probability of \( \eta \) next period.
   - If the government chooses not to default:
     - Labor market clears and households receive \( w \).
     - Foreign domestic owners make an investment \( k \) to be used in the next period’s production process.
     - Government sends a strategic message \( m \) about its signal \( s \) to the lenders, in particular it decides to tell-the-truth or to lie about its signal, and chooses \( b' \) at a price \( q(b',y_-,\lambda,m) \).

4. Period \( t + 1 \) begins with \( b' \), realized \( y \) and updated reputation \( \lambda' \), which is determined according to Bayes’ rule.

2.3 Government’s Problem

I will use the noble framework of [Eaton and Gersovitz, 1981] in modeling sovereign default. The households are identical and have preferences given by:

\[
E_0 \sum_{t=0}^{\infty} \beta^t u(c_t)
\]  

where \( E \) denotes the expectation operator, \( 0 < \beta < 1 \) is the discount factor, \( c_t \) denotes consumption at time \( t \), and \( u(c) \) is an increasing and strictly concave utility function given as:

\[
u(c) = \frac{c^{1-\rho}}{1-\rho}
\]

where \( \rho \) is the constant coefficient of relative risk aversion. It is a small open economy environment where in each period, households receive an i.i.d. income shock, in particular high (H) or low (L) with equal probabilities. The government’s objective is to maximize the expected discounted utility of the representative agent. Governments have private information about today’s income and they differ in their ability to receive private signals and trades one-period zero-coupon
bonds\textsuperscript{2} with international risk-neutral competitive creditors. The government can buy bonds at price \( q(b', y, \lambda, m) \) which will be determined in equilibrium. Lenders have perfect information on country’s last-period’s income and its current asset position. Investors lend or borrow at a risk free interest rate, \( r_f \). Lenders don’t have any private information about the government’s current income but they can communicate with the government who may have been partially informed about the state of the economy. Markets are incomplete, government can use one-period zero-coupon bonds to save and borrow. The resource constraint of an economy that chooses to repay its debt would be:

\[
c = y + b - q(b', y, \lambda, m)b' + w
\]  

(2.2)

If the government opts to default, then it will stay in autarky at least for one period and it is customary in the literature to denote debt as a negative asset.\textsuperscript{3} The government’s expected income in autarky is strictly less than its expected income when it has access to international credit markets. [Cole and Kehoe, 1998]

\[
c = E(y^{\text{aut}}) < E(y)
\]

If a sovereign country borrows, it receives \( q(b', y, \lambda, m)b' \) units of consumption good today and promises to pay back \( b' \) units of good tomorrow. If the government chooses to repay, it decides to tell-truth or to deviate about the signal it has observed. So the government’s maximization problem can be represented recursively as follows:

\[
v(b, y, \lambda, s) = \max_{\{nd,d\}} \{ v^{nd}(b, y, \lambda, s), v^d(y, \lambda, s) \} 
\]

(2.3)

Value of defaulting is given as:

\[
v^d(y, \lambda, s) = E(U(y^{\text{aut}})) + \beta E(y_{s'}|y, s)[\eta v(0, y, \lambda', s') + (1 - \eta)v^d(y, \lambda, s')]
\]

(2.4)

Value of not-defaulting can be obtained as follows:

\[
v^{nd}(b, y, \lambda, s) = \max_{m,b'} \{ E(U(y - q(b', y, \lambda, m)b' + b + w)) + \beta E(y_{s'}|y, s)v(b', y, \lambda', s') \}
\]

s.t. \( \lambda' = F(b', y, \lambda, m) \)

(2.5)

Similar to [Morris, 2001] and [Ottaviani and Sorensen, 2006], I focus on the equilibria in which competent government always tells the truth. This kind of formulation is relatively easier to analyze, to have a precise intuition of all possible equilibria, and to characterize non-competent government’s behavior. This formulation will allow to look at the incentives and costs of reputation to both types of governments. Finally I will check for the parameters in which telling the truth is indeed optimal for the competent government.

\textsuperscript{2}see [Hatchondo and Martinez, 2009] for long-term period bonds

\textsuperscript{3}Please see [Arellano, 2008] and [Aguirar and Gopinath, 2006]
In an environment in which competent government always tell the truth, what would be the best response of a non-competent government? Recall that non-competent type cannot draw any informative signal and would like to be perceived as a competent type. If there were no reputational cost of reporting $H$, the non-competent government would have an incentive to announce $H$ each period. Thus the non-competent government cannot always send an $H$ message. Let’s assume it chooses to report $H$ every period. Then announcing $L$ for any type regardless of the realized state would update the lenders’ beliefs of government being a competent type with probability one. More precisely, it can be shown that the non-competent type would like to mimic the competent type and thus mixes. The government’s strategy may be summarized as in the Table 2.

<table>
<thead>
<tr>
<th>$s = H$</th>
<th>$s = L$</th>
</tr>
</thead>
<tbody>
<tr>
<td>C gov’t</td>
<td>H</td>
</tr>
<tr>
<td>NC gov’t</td>
<td>$\nu$</td>
</tr>
</tbody>
</table>

Table 2: Government’s Strategies

Now given the borrower’s message, what inferences will the lenders draw about the current state of the economy? If a message, say $H$, comes from a competent type, lenders will assign probability $\gamma$ to state $H$; if it comes from a non-competent type, then lenders will assign probability $\frac{1}{2}$ to state $H$. By Bayes’ rule, lenders will assign probability to state $i$: $\pi(y = H)$ is the lenders’ posterior belief that the actual state is $H$ if message $H$ is reported. By Bayes’ rule,

$$\pi(y = H) = \frac{\lambda \theta_c(m|H, b') + (1 - \lambda) \theta_{nc}(m|H, b')}{\lambda \theta_c(m|H, b') + (1 - \lambda) \theta_{nc}(m|H, b') + \lambda \theta_c(m|L, b') + (1 - \lambda) \theta_{nc}(m|L, b')} \quad (2.6)$$

where $\theta_I(m|y, b')$ is the probability that government type $I$ (nc or c) sends a message $m$ given income $y$, and debt $b'$. Equation 2.6 is well defined as long as the denominator is nonzero. I adopt the convention that $\pi(y = H) = \frac{1}{2}$ if

$$\theta_c(m|y = i, b') = \theta_{nc}(m|y = i, b') = 0, \ i \in \{H, L\}.$$

Since $\gamma$ is larger than $\frac{1}{2}$, higher the reputation of the government $\lambda$, higher the informativeness of the message anticipated by the lender. Informativeness of a message will play a role on determining the bond prices. Observe that when the signal is uninformative, $\gamma = \frac{1}{2}$, or government’s reputation $\lambda$ is 0, probability of having a high or low state regardless of the message is the same.

After given these strategies, what does the lender infer about the government’s type? Let’s suppose, for instance, the government announced an $H$ message and an $H$ income is realized. Probability of truth-telling government sends an $H$ message if the true income is in fact $H$ is $\gamma$ (probability of observing an informative signal). Since non-competent government cannot observe any informative
signal, the probability that non-competent government reports \( H \) when the true state is \( H \) is \( \nu \).

Now by Bayes’ rule, posterior probability of the government being a competent type if it sends a message \( m \) and income \( y \) is realized for given level of debt \( b' \) will be

\[
\mathcal{F}(b', y, \lambda, m) = \frac{\lambda \theta_c(m|y, b')}{\lambda \theta_c(m|y, b') + (1 - \lambda) \theta_{nc}(m|y, b')}
\]  

(2.7)

\[
\lambda'(\lambda, 1, 1) = \frac{\lambda \gamma}{\lambda \gamma + (1 - \lambda) \nu}
\]

\[
\lambda'(\lambda, 0, 0) = \frac{\lambda \gamma}{\lambda \gamma + (1 - \lambda)(1 - \nu)}
\]

\[
\lambda'(\lambda, 1, 0) = \frac{\lambda(1 - \gamma)}{\lambda(1 - \gamma) + (1 - \lambda) \nu}
\]

\[
\lambda'(\lambda, 0, 1) = \frac{\lambda(1 - \gamma)}{\lambda(1 - \gamma) + (1 - \lambda)(1 - \nu)}
\]

where \( \theta_I(m|y, b) \) is the probability that government type \( I \) (nc or c) sends a message \( m \) given income \( y \), and debt \( b' \). Equation 2.7 is well defined as long as the denominator is nonzero. I adopt the convention that \( \mathcal{F}(b', y, \lambda, m) = \lambda \) if

\[\theta_c(m|y = i, b') = \theta_{nc}(m|y = i, b') = 0, \ i \in \{H, L\}.\]

Since \( \gamma > \frac{1}{2} \), equation 2.7 implies

\[\lambda'(\lambda, 0, 0) > \lambda'(\lambda, 1, 1); \lambda'(\lambda, 0, 1) > \lambda'(\lambda, 1, 0)\]

Thus competent government has a strict reputational incentive to tell the truth about its signal. Since non-competent government is assumed not to receive any informative signals at all, it is useful to focus our discussion on the competent government.

So far, it was assumed that the competent government always told the truth. It is true that government will always announce \( H \) whenever it observes an \( H \) signal, since this will provide a higher bond prices and enhance its reputation. However, if it observes an \( L \) signal and announces an \( H \) message, its gain will be cheaper debt for the current period but its reputation will go down in the next period. Thus if its reputational concerns are sufficiently large, truth-telling will be consistent in equilibrium.

In general, there exist equilibria in which the competent government sometimes lies. On observing \( L \) signal, the competent government may find it optimal to randomize between telling the truth (to enhance its reputation) and lying (to receive favorable interest rates). The sets in which the government indeed finds it optimal to tell the truth will be obtained as in equation 2.9.
From the optimal choices above, we can characterize the default set and deviating set as follows. Default set $D(b, \lambda)$ and deviating set $L(b, \lambda)$ are defined as the set of $y$’s and messages $m$ for which default and deviating are optimal respectively, given the reputation of the borrower and indebtedness.

$$D(b, \lambda) = \{(y, s) \in \mathcal{Y} \times \mathcal{S} : v^{nd}(b, y, \lambda, s) < v^d(y, \lambda, s)\}$$  \hspace{1cm} (2.8)

$$L(b, \lambda) = \{(y, s) \in \mathcal{Y} \times \mathcal{S} : v^{nd}(b, y, \lambda, s = m) \leq v^{nd}(b, y, \lambda, s \neq m)\}$$ \hspace{1cm} (2.9)

Since this paper investigates the effect of cheap talk on default decision, I do not explicitly model the renegotiation stage. [Benjamin and Wright, 2008], [D’Erasmo, 2010] and [Yue, 2010] endogenizes the renegotiation stage following a default. In my model, countries stay in autarky when they default at least for one period and regain access to international markets next period with an exogenous probability of $\eta$ and zero-debt $b$, or keep staying in autarky with an exogenous probability of $1 - \eta$. During an autarky there is no messaging since lenders are not interested in the country’s state of the world, so there is no reputation updating process during the exclusion state.

Within the information structure, competent government is assumed to receive a noisy signal $\gamma$. A slightly complicated version of the model could reconcile this discussion by allowing governments to receive more precise signals, particularly $\gamma \in \{\gamma, \overline{\gamma}\}$. Let’s assume that the ability of receiving an accurate signal $\gamma$ is larger in countries where fundamentals are better, this would help explaining why it takes so long for some countries to build up their reputation even though they tell the truth every period. This also implies that communication conveys more information in advanced economies and enables them to borrow more than the emerging countries. In addition, in our model the government’s type is chosen once and for all, but with a slight modification, in particular a shock to $\gamma$ with Markov switching probabilities would provide a type change, and relax this assumption.

### 2.4 Foreign Investors Problem

I will first present the foreign domestic investors problem. Taking wages given, firms choose $k_{t-1}$ and hires domestic labor $l_t$. So the investment takes place in time $t - 1$ and the production occurs at time $t$ given that the government does not default, (i.e.: $d \in \{0, 1\}$ $d = 1$ if the government defaults and $d = 0$ if the government does not default). Each firm’s total expected profit at time $t - 1$ is given as

$$E_{t-1}\left\{\sum_{s \geq t} \left(\frac{1}{1 + r}\right)^{s-t} g(y_{s-1}) F(k_{s-1}, l_s) - w_s l_s - k_{s-1}|d_s\right\}$$ \hspace{1cm} (2.10)
$F$ is a constant return to scale production function and takes the form of $k_t^{\alpha} l_{t-1}^{1-\alpha}$. For simplicity capital depreciates fully and $g(y)$ is either $y^H$ or $y^L$.

The first order conditions for firms that take the wages as given conditional on government’s repayment:

$$F_k(k_{t-1} l_t) = 1 + r^f$$
$$g(y_-) F_l(k_{t-1} l_t) = w$$

The equilibrium wage function is:

$$w_t(y_{t-1}, k_{t-1}) = (1 - \alpha) g(y_{t-1}) k_{t-1}^\alpha$$  \hspace{1cm} (2.11)

and the foreign direct investment given belief $\lambda$ is:

$$k^*(\lambda) = (\alpha \frac{\lambda y^H + (1 - \lambda) y^L}{1 + r^f})^{\frac{1}{1-\alpha}}$$  \hspace{1cm} (2.12)

The intuition for the equation 2.12 is as follows: as countries are more transparent, this will translate into governments being more accountable and better at allocating the resources. For instance, consider a government who has a better tax collection or an accurate auditing system such that it is better informed about the tax receipts and expenditures of the economy. Furthermore, this will undermine the strength of politically special groups, lead to healthy policies and institutions, and will in turn attract more investment. ([Stiglitz, 2001], [Sandleris, 2008]). Hence, if lenders assessment about government’s transparency increases, their investment level goes up and pushes up the labor demand and thus the wages. Also, to justify the assumption of more transparent economies receive more FDI, I used World Bank’s FDI data, and table B.2 suggests that advanced economies on average receive 30 percent more FDI than the emerging economies.

### 2.5 International Risk Neutral Investors

Government trades one-period zero coupon bonds with international risk-neutral competitive lenders. The opportunity cost of funds is given by the exogenous risk free interest rate $r^f$.

$$\Omega = -q(b', y_-, \lambda, m)b' + \frac{1 - \delta(b', y_-, \lambda, m)}{1 + r^f} b'$$

The first term on the right hand side of the equation indicates that when investors lend to the government in the current period, they buy government bonds at price $q(b', y_-, \lambda, m)$ and second term shows that investors may receive the present value of the face value of a bond with a probability of default. The probability of default correspondence $\delta(b', y_-, \lambda, m)$ on a loan $b'$ at state $(b, y_-, \lambda)$ will be determined endogenously using the default sets explained in 2.8 and 2.9.
It remains to describe how to obtain the default probabilities. For most of the states the government either prefers repaying over default or prefers default over repaying. However, it is possible that for some states the government is indifferent, and government randomizes between defaulting and repaying for those states. For the sake of proving the existence of price function (please see the appendix for the details), I define an indicator correspondence for default. Let \( \psi(b, y, \lambda, s) \) be an indicator for default correspondence for debt \( b \) in state \( (y, \lambda, s) \)

\[
\Psi(b, y, \lambda, s) = \begin{cases} 
1 & \text{if } v^d > v^{nd}, \\
0 & \text{if } v^d < v^{nd}, \\
[0, 1] & \text{if } v^d = v^{nd}.
\end{cases}
\]

Now I am ready to define the probability of default correspondence \( \delta(b', y_-, \lambda, m) \) on a loan \( b' \) at state \( (b, y_-, \lambda) \)

\[
\delta(b', y_-, \lambda, m) = \sum_{D(b', \lambda')} \psi(b, y, \lambda, s) \pi(y, m, y_-, m_-)
\] (2.13)

for some \( \psi(b, y, \lambda, s) \in \Psi(b, y, \lambda, s) \). Since it is a perfectly competitive market for international investors, the expected profit will be zero in equilibrium. For \( b' \) smaller than 0, the investors lend, and if it is bigger than 0, investors borrow. The price of the bonds can be showed as follows: Let \( \varphi(q) \) be a correspondence that takes point in \( Q \) to subsets of \( [0, \frac{1}{1+r}] \) given by

\[
\varphi(q(b', y_-, \lambda, m)) = \begin{cases} 
\frac{1}{1+r} & \text{if } b' \geq 0, \\
1-\delta(b', y_-, \lambda, m) \frac{1}{1+r} & \text{if } b' < 0.
\end{cases}
\]

So \( \varphi(q) \) is the set of prices of a bond for today that pays one unit of good tomorrow given the price vector \( q \), and that depends on the current state \( (\lambda, y_-, m) \) and total borrowing \( b' \).

2.6 Strategies

Given the stationary Markovian structure of the model, it is natural to restrict our attention on Markovian strategies. At any point in time \( t \), the signal \( s_t \), reputation \( \lambda_t \), and asset holdings \( b_{t+1} \), summarize the relevant history of the game. Strategies map the level of debt \( b \), income \( y \), reputation \( \lambda \) and signal \( s \) into a choice of actions. A government’s strategy is a pair \( (\sigma_c, \sigma_{nc}) \), each \( \sigma_I : \mathbb{B} \times \mathcal{V} \times \Lambda \times \mathcal{S} \rightarrow \{0, 1 \} \times \{0, 1 \} \). The first element of the right-hand side of the arrow is 1 if the government repays, and the last element takes value 1 if it tells the truth. A lender’s strategy is \( \sigma_{lender} : \mathbb{B} \times \mathcal{V} \times \Lambda \times \mathcal{M} \rightarrow \{0 \} \cup \{1 \} \cup \{2 \} \times \{b', y_- \} \in \mathbb{R} \times \mathbb{B} : q(b', y_-, \lambda, m) \in [0, \frac{1}{1+r}] \} \) where the first element 0 on the right-hand side of the arrow indicates no lending, 1 indicates lender borrows
at a risk free rate from the government and the third element indicates that positive lending has taken place.

3 Equilibrium Definition

Definition 1. A Markov Perfect Bayesian equilibrium (MPBE) is a collection of functions $v^*$, $F^*$, $m^*(s)$, $\pi^*$, $\delta^*$, bond price vector $q^*$, and sets $D^*$ and $L^*$ such that:

1. Given prices $q^*$ and type inference function $F^*$, the value functions $v^*$, government decisions and the sets $D^*$ and $L^*$ are consistent with the government’s optimization problem.

2. The equilibrium default probability $\delta^*(b', y_-, \lambda, m)$ is consistent with the government decisions.

3. Price of the bonds $q^*(b', y_-, \lambda, m)$ will be such that the international lenders will make zero expected profits, that is

   \[ \Omega^*(b', y_-, \lambda, m) = 0, \forall (b', y_-, \lambda, m). \]

4. The functions $\pi^*(y|m)$ and $F^*(b', y, \lambda, m,)$ must be consistent with Bayes’ rule and they are defined as in equations 2.6 and 2.7, respectively.

The equilibrium definition is standard and condition 4 deserves some attention. These functions must be consistent with Bayes’ rule wherever possible and off-equilibrium-path beliefs should be well-specified.

Off-Equilibrium-Path Beliefs - Let’s rewrite equations 2.6 and 2.7.

\[
F(b', y, \lambda, m) = \frac{\lambda \theta_c(m|y, b')}{\lambda \theta_c(m|y, b') + (1 - \lambda) \theta_{nc}(m|y, b')}
\]

\[
\pi(y = H) = \frac{\lambda \theta_c(m|H, b') + (1 - \lambda) \theta_{nc}(m|H, b')}{\lambda \theta_c(m|H, b') + (1 - \lambda) \theta_{nc}(m|H, b') + \lambda \theta_c(m|L, b') + (1 - \lambda) \theta_{nc}(m|L, b')}
\]

Both equations are well defined as long as denominators are non-zero. In the computation of the model, I adopt the convention that out-of-equilibrium beliefs are equal to their prior, that is $F(b', y, \lambda, m) = \lambda$. Allowing for other off-equilibrium-path beliefs does not lead to different equilibrium behavior.

Lemma 1. Every babbling strategy profile is equilibrium.

Proof. This is an immediate result of babbling strategy. If the government’s message doesn’t influence the belief ($\lambda$) of the lenders or his actions ($q$), then the government is indifferent between any strategies. Thus the government’s message does not convey any information on determining the type of the government and setting the bond prices. \qed
Thus, interesting case is to look at informative equilibria where the government’s message conveys information. There exist informative equilibria such that the competent government sometimes lies. The competent government on observing an \( L \) signal may announce \( H \) (despite the reputational concerns) and lies (to have a higher bond prices at the expense of its next period’s reputation).

**Proposition 1.** All informative equilibria satisfy the following properties: (1) The competent government always announces \( H \) when it observes an \( H \) signal and announces an \( L \) message when it observes an \( L \) signal for \( \lambda \geq \lambda^* \). (2) There is a strict reputational incentive for the government to tell the truth about its signal.

*Proof.* Please see appendix.

Intuitively, reporting truthfully when \( s \) is \( H \) is always optimal since it gives higher utility and improves the reputation. So far, it was assumed that competent government always tells the truth about its signal. However when the signal is \( L \), it can receive better prices from lying today, but its future reputation will be deteriorated. If the government’s current gain from lying is sufficiently small, then truth-telling will be consistent in equilibrium. However, all informative equilibria satisfy the above properties.

**Proposition 2.** Truth-telling equilibrium exists.

*Proof.* Please see appendix.

4 Characterization and Existence of Equilibrium

We can now characterize the equilibrium pricing function, show its existence, and show some of its properties. The strategy I will employ is to develop a set valued function (correspondence) whose fixed points satisfy the equilibrium price, then prove that a fixed point exists for a set valued function via Kakutani’s fixed point theorem. To begin with, it makes sense to show the basic continuity and monotonicity results concerning the value functions \( v, v^d, \) and \( v^{nd} \). (Please see the appendix for details)

**Proposition 3.** Given any \( q(b', y_-, \lambda, m) \geq 0 \), there exists a bounded function \( v(b, y_-, \lambda, s) \) continuous in \( \lambda \) and \( s \) that solves the equation 2.3. \( v^{nd}(b, y_-, \lambda, s) \) is strictly increasing in \( b, \lambda \) and \( s \) and continuous in \( s \); and \( v^d(y_-, \lambda, s) \) is strictly increasing and continuous in \( s \) and \( \lambda \) where repayment is feasible.

*Proof. Intuition* - The existence of bounded and continuous (in \( s \) and \( \lambda \)) value functions \( v, v^{nd}, \) and \( v^d \) follows from the standard contraction mapping arguments. The strict monotonicity properties
of value functions follow from the strict monotonicity of \( u \) with respect to \( c \) and the fact that \( c \) is strictly monotone in \( s, \lambda \) and \( b \) provided \( b' \). Please see appendix for the details.

**Proposition 4.** If defaulting is optimal for debt level of \( b^1 \) for some values of output \( y \) and reputation \( \lambda \), then it would be optimal to default as well for a debt level of \( b^2 \) for the same output \( y \) and reputation \( \lambda \) for all \( b^2 < b^1 \), that is; if \( b^2 < b^1 \), \( D(b^2, \lambda) \geq D(b^1, \lambda) \).

**Proof.** It is a standard result that default sets are increasing as debt holdings go up. Proof is similar to [Chatterjee et al., 2007], [Chatterjee and Eyigungor, 2011] and [Eaton and Gersovitz, 1981]. Please see appendix.

**Proposition 5.** If it is optimal for the higher reputation government \( \overline{\lambda} \) to default for given level of debt \( b \), and state \( y \), then it is also optimal for the lower reputation government \( \underline{\lambda} \) to default too for the same level of debt holdings \( b \), and state \( y \), that is, \( D(b, \overline{\lambda}) \subseteq D(b, \underline{\lambda}) \).

**Proof.** Please see appendix.

**Definition 2.** A price vector \( q^* \) is an equilibrium if, for all \( (b', y, \lambda, m) \in \mathbb{B} \times \mathcal{Y} \times \Lambda \times \mathcal{M} \), \( q^* \in \varphi(q^*) \).

The following analysis focuses on stationary Markov perfect Bayesian equilibria. The purpose is to show that the behavior explained in the two-period setting can be extended to a stationary infinite-horizon model with endogenous borrowing. First, it is shown that stationary Markov perfect equilibria do always exist and then it is shown that for periods in which decision making is sufficiently unimportant, babbling will exist.

**Proposition 6.** A stationary Markov perfect Bayesian equilibrium exists.

The intuition for the existence is as follows. Suppose some pair of valuations for the governments (competent vs. non-competent) and lenders \((v_c, v_{nc}, v_l)\) occur with very low probability \( \psi \). Suppose government always babbles unless \((v_c, v_{nc}, v_l)\) is not drawn and if \((v_c, v_{nc}, v_l)\) is drawn, then the competent government always tells the truth, non-competent government mixes and lenders make inferences from the message and set the bond prices. It can be established that for a small \( \psi \), these proposed strategies will be best responses to each other.

**Proof.** Please see appendix.

**Proposition 7.** (Characterization of Equilibrium Prices) In any MPBE: (i) \( q^*(b', y, \lambda, m) \) is increasing in \( b' \), and increasing in \( \lambda \); (ii) \( q^*(b', y, \lambda, m = H) \geq q^*(b', y, \lambda, m = L) \); (iii) if the grid for debt \( b \) is sufficiently fine, \( q^*(b^2, y, \overline{\lambda}, m) \geq q^*(b^1, y, \underline{\lambda}, m) \) for some \( b^1 > b^2 \).

**Proof.** Please see appendix.
The first property simply says that as the government’s debt level and reputation increases, the implied interest rate decreases. The second property says that when a government sends a message $H$, it receives a lower interest rate. The final property says that the price is higher (interest is lower) for the governments that have higher reputation even though they hold higher levels of debt.

5 Computational Algorithm

1. Set the grids over assets, endowments and reputation.

2. Make an initial guess for the bond price schedule $q^0(b', y-, \lambda, m) \in Q$. I particularly set it for $\frac{1}{17}$.

3. Given the bond price schedule and reputation, solve for the government problem to obtain the value functions and the default interval. This includes the following:
   • Find the set of $y$‘s and signal $s$ such that default is optimal
   • Find the set of $y$‘s and message $m$ such that deviating is optimal.

4. Using the default interval described above, solve for the new schedule of bond prices $q^1(b', y-, \lambda, m)$ until the convergence is satisfied such that $||q^0(b', y-, \lambda, m) - q^1(b', y-, \lambda, m)|| < \epsilon$, otherwise move to 3.

Below are the parameters that has been used in the paper.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk aversion rate $\rho$</td>
<td>2</td>
</tr>
<tr>
<td>Risk free interest rate $r^f$</td>
<td>0.015</td>
</tr>
<tr>
<td>Discount factor $\beta$</td>
<td>0.97</td>
</tr>
<tr>
<td>Production function parameter $\alpha$</td>
<td>0.33</td>
</tr>
<tr>
<td>Output loss $1 - \epsilon$</td>
<td>0.05</td>
</tr>
<tr>
<td>Prob excl ends $\eta$</td>
<td>0.282</td>
</tr>
<tr>
<td>Accuracy of the signal $\gamma$</td>
<td>0.75</td>
</tr>
<tr>
<td>Good shock $\bar{y}$</td>
<td>1.05</td>
</tr>
<tr>
<td>Bad shock $\underline{y}$</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Table 3: Model Parameters

6 Main Results
Figure 2: Blue region represents the default areas in which it is optimal for the government to default. Red region is the area in which lenders anticipate the government’s messages and the competent government separates whereas in the brown region lenders do not anticipate the government’s messages. Government that falls into the green region when its debt-to-income ratio is higher than 30% and reputation is below $\lambda^*$ is trapped in “debt intolerance”. In that region, its message is not anticipated by the lenders, so there is no way for a government to move right, thus cannot increase its reputation unless they pay its debt for the current period and demand a lower level of debt for the next period. The only for a government to improve its trustworthiness through messaging is in the blue region. The government that has a debt-to-income ratio of less than 30%, can either tell the truth about its signal and move to the safer region for the next period by increasing its reputation, or pay the current debt and borrow lesser amount of debt for the next period. However, getting out of the green region is costly because the lenders require a higher interest rate. Thus, the government who bears this cost may have a chance to graduate.
Figure 3: Price paid by emerging and advanced economies. Blue bubbles, upper left corner of the figure, represent the advanced economies; and the red bubbles on the lower right corner represent the emerging economies. Observe that emerging economies borrow at a lower price (higher interest rate) than the advanced economies even though they hold lower levels of debt given that they are subject to same income shock. Emerging economies represent the lower reputation $\Lambda$ countries, whereas advanced economies represent the higher reputation $\overline{\Lambda}$ governments.

Figure 4: These figures show the states in which government defaults when it observes an $L$ signal and when it observes an $H$ signal. It is clear that default sets are bigger with an $L$ signal, thus governments receiving an $L$ signal are more likely to default.
Figure 5: This picture shows how the bond-prices behave for each level debt $b$, and reputation $\lambda$ for a given message. To have a better picture of how the bond price behaves for given level of debt and reputation, please check figures (8) and (9).

Figure 6: If the lenders do not care about government’s reputation, and thus the government does not have any reputational concerns, similar to Arellano (2008) environment; with i.i.d shocks the model predicts the prices to be constant up to certain level of debt.
Figure 7: The left panel presents the government’s truth-telling and default decisions with a given level of bond holdings and stock of reputation when it receives a low signal. Blue, green and brown represents truth-telling, deviating and default regions respectively. Blue region represents the separating equilibrium in which a competent government always chooses to tell-the-truth about its signal and the competent government pools in the green region. The right panel shows the government’s decision rules when it receives a high signal, and not surprisingly it always reports truthfully when it receives a high signal.

Figure 8: Price function for a given level of debt with the government’s message. This graph shows that price function is higher with a $H$ message.
Figure 9: Price function for a low level of reputation with the government’s message. Observe that the lenders anticipate to the messages, and the price is lower (interest rate is higher) when the message is $L$.

Figure 10: This graph depicts how the government’s reputation is updated. For instance the dashed black line represents how government’s reputation is updated when the government reports a low state when the state of the economy is high. Observe that for a non-competent government, it is always reputationally costly to send a $H$ message since it cannot observe any informative signals.
Figure 11: This graph shows how government’s reputation is updated if a government’s report comes out the same as the real state of the economy. For instance, if a competent government always receives a high shock and it reports this information truly, market’s assessment about government’s reputation is depicted in the black line.

Figure 12: This figure shows how long it takes to graduate when the precision of the signal $\gamma = \gamma$. Notice that as the precision of the signal goes down, the curvature of the updating function decreases and it takes longer for a government to “graduate”
7 Conclusion

The average external debt-to-output ratio is 42% and the average spread is 7% for emerging economies, whereas external debt-to-output ratio is 81% and the average spread is 1.1% for advanced economies. Some of the current advanced economies once were once serial defaulters and through time they manage to “graduate” and begin borrowing at cheaper rates. Previous sovereign debt models fail to account jointly these two facts.

In the model developed here, lenders form beliefs about the existing government through communication. Current government have a private information about the state of the economy and communicates its information with the creditors. Lenders update their beliefs about the government being a competent type next period when the state of the economy becomes public.

The endogenously determined default probabilities and the information structure are essential ingredients to obtain the main results. Figure 6 shows how my model would behave with a full information model. In full-information models, reputation does not matter because states are observable and the government’s repayment decision does not influence the future bond prices. My model with private information sheds light on how some economies trapped in “debt intolerance” and provides one possible explanation of how a country can graduate. My model suggests that in order to graduate, a government has to hold small levels of debt, and should be transparent about its economy. Overtime, by communicating its private information with the lenders they can build trust, and thus reputation.

Empirically, my results seems to be in line with how countries gradually transitioned from costly borrowing to cheap borrowing. As figure B.2 suggests, United States and Germany had long periods of low levels of debt. Similarly Australia was suffering from high spreads and they paid the burden of high interest rates, decrease their debt levels and build up their reputation by providing non-deceiving numbers. [Reinhart and Rogoff, 2009] talk how Chile is in the process of “graduation”. As figure B.2 suggests, Chile is in fact doing things right; (i) they keep their debt levels low and (ii) provide truthful reports.
8 References


A Appendix A

Cheap talk games through communication and learning are the subject of [Lagunoff et al., 2012]. For setting out-of-equilibrium beliefs [Athreya et al., 2012] provides a good discussion of why it is essential for computational purposes.

Following notation will be handy and save some space. \( \hat{u}_I(\pi, s) \) for the expected value of type I government if it observed signal \( s \) and lenders believe that the true state in fact is 1 with probability \( \pi \)

\[
\begin{align*}
\hat{u}_c(\pi, 1) &= \gamma u_c(q(1), 1) + (1 - \gamma) u_c(q(1), 0), \\
\hat{u}_c(\pi, 0) &= \gamma u_c(q(0), 0) + (1 - \gamma) u_c(q(0), 1), \\
\hat{u}_{nc}(\pi, 1) &= \frac{1}{2} u_c(q(1), 1) + \frac{1}{2} u_c(q(1), 0), \\
\hat{u}_{nc}(\pi, 0) &= \frac{1}{2} u_c(q(0), 0) + \frac{1}{2} u_c(q(0), 1).
\end{align*}
\]

\( \Pi_C^I(s) \) stands for the net current gain to the type I government choosing a message 1 when it observes a signal \( s \) and \( \Pi_R^I(s) \) stands for the expected reputational gain to the type I government choosing a message 0 when it observes a signal \( s \), given that the lenders follow their optimal strategy, that is,

\[
\begin{align*}
\Pi_C^I(s) &= \hat{u}_c(\pi(1), s) - \hat{u}_c(\pi(0), s), \\
\Pi_{nc}^C(s) &= \hat{u}_{nc}(\pi(1)) - \hat{u}_{nc}(\pi(0)).
\end{align*}
\]

\[
\begin{align*}
\Pi_R^C(1) &= \gamma [w_c(\lambda'(0, 1)) - w_c(\lambda'(1, 1))] + (1 - \gamma) [w_c(\lambda'(0, 0)) - w_c(\lambda'(1, 0))], \\
\Pi_R^C(0) &= \gamma [w_c(\lambda'(0, 0)) - w_c(\lambda'(1, 0))] + (1 - \gamma) [w_c(\lambda'(0, 1)) - w_c(\lambda'(1, 1))], \\
\Pi_{nc}^R(s) &= \frac{1}{2} [w_{nc}(\lambda'(0, 1)) - w_{nc}(\lambda'(1, 1)) + w_{nc}(\lambda'(0, 0)) - w_{nc}(\lambda'(1, 0))].
\end{align*}
\]

Thus a type I government would report 1 if \( \Pi_C^I(s) \) exceeds \( \Pi_R^I(s) \). Lenders optimal decision depends on how likely a government is willing to report 0 when it observes 0 signal.
**Proof of proposition 1:** All informative equilibria satisfy the following properties: (1) The competent government always announces $H$ when it observes an $H$ signal and announces an $L$ message when it observes an $L$ signal for $\lambda \geq \lambda^*$. (2) There is a strict reputational incentive for the government to tell the truth about its signal.

*Proof*

**PROPERTY 1.** $\lambda'(\lambda, 0, 1) \geq \lambda'(\lambda, 1, 0)$ and $\lambda'(\lambda, 0, 0) \geq \lambda'(\lambda, 1, 1)$, and at least one of these inequalities is strict. So, there must always be weakly reputational incentive to announce $0$. That’s especially true if the government doesn’t observe any informative signal. It is going to be proved case by case and then it will be showed that there must always be a strict reputational incentive to announce $L$ otherwise we have a babbling equilibrium.

**PROPERTY 2.** $q(b', y_-, \lambda, m = 1) > q(b', y_-, \lambda, m = 0)$ at least for some states $(b', y_-, \lambda)$ If $q(b', y_-, \lambda, m = 1) = q(b', y_-, \lambda, m = 0)$, then the non-competent government would have a strict incentive to send $0$, leading to a contradiction. If we have $q(b', y_-, \lambda, m = 1) = q(b', y_-, \lambda, m = 0)$ for all $(b', y_-, \lambda)$, then we have a babbling equilibrium.

**PROPERTY 3.** $\sigma_c(1) = 1$. By property 1, $\Pi^R_c(1) > 0$; by property 2, $\Pi^C_c(1) > 0$; so $\sigma_c(1) = 1$.

*Proof of proposition 2: Truth-telling equilibrium exists.*

*Proof* - Suppose $\sigma_c(0) = 0$, $\sigma_c(1) = 1$; to have $\lambda'(\lambda, 0, 1) \geq \lambda'(\lambda, 1, 0)$, we must have $\sigma_{nc}(0) = \nu$ for some $\nu \geq \frac{1}{2}$. Under these strategies,

$$
\lambda'(\lambda, 1, 1) = \frac{\lambda \gamma}{\lambda \gamma + (1 - \lambda) \nu},
$$

$$
\lambda'(\lambda, 0, 0) = \frac{\lambda \gamma}{\lambda \gamma + (1 - \lambda)(1 - \nu)},
$$

$$
\lambda'(\lambda, 1, 0) = \frac{\lambda (1 - \gamma)}{\lambda (1 - \gamma) + (1 - \lambda) \nu},
$$

$$
\lambda'(\lambda, 0, 1) = \frac{\lambda (1 - \gamma)}{\lambda (1 - \gamma) + (1 - \lambda)(1 - \nu)}.
$$

Let $g(\nu)$ be the net utility gain to the non-competent government from announcing 1 (rather than 0).

$$
g(\nu) = \frac{1}{2} \left[ U(y^L + b_1 - q(b_2, y_0, \lambda_1, m = H)b_2 + w_1) - U(y^L + b_1 - q(b_2, y_0, \lambda_1, m = L)b_2 + w_1) \right]
$$
\[ +U(y^H + b_1 - q(b_2, y_0, \lambda_1, m = H)b_2 + w_1) \\
- U(y^H + b_1 - q(b_2, y_0, \lambda_1, m = L)b_2 + w_1) \\
+ w\left(b_2, y_1, \frac{\lambda_2(1 - \gamma)}{\lambda_2(1 - \gamma) + (1 - \lambda_{2})\nu}, s_2\right) \\
-w\left(b_2, y_1, \frac{\lambda_2(1 - \gamma)}{\lambda_2(1 - \gamma) + (1 - \lambda_{2})(1 - \nu)}, s_2\right) \\
+ w\left(b_2, y_1, \frac{\lambda_2\gamma}{\lambda_2\gamma + (1 - \lambda_{2})(1 - \nu)}, s_2\right) \\
-w\left(b_2, y_1, \frac{\lambda_2\gamma}{\lambda_2\gamma + (1 - \lambda_{2})(1 - \nu)}, s_2\right) \]

\(g(\nu)\) is strictly decreasing in \(\nu\), some terms in the above expression are weakly decreasing and some of them are strictly decreasing. There exists exactly one \(\nu\) such that \(g(\nu) = 0\) and denote \(\tilde{\nu}\) for that value of \(\nu\).

Now find the competent government’s incentive to tell the truth when it observes signal 0 under strategy profile \(\sigma_c(0) = 0, \sigma_c(1) = 1, \sigma_{nc}(0) = \tilde{\nu}\) and \(\sigma_{nc}(1) = 1-\tilde{\nu}\). The competent government will tell the truth if and only if

\[ \gamma U(y^L + b_1 - q(b_2, y_0, \lambda_1, m = L)b_2 + w_1) \\
+(1 - \gamma)U(y^H + b_1 - q(b_2, y_0, \lambda_1, m = L)b_2 + w_1) \\
- \gamma U(y^L + b_1 - q(b_2, y_0, \lambda_1, m = H)b_2 + w_1) \\
-(1 - \gamma)U(y^H + b_1 - q(b_2, y_0, \lambda_1, m = H)b_2 + w_1) \\
+ \gamma w\left(b_2, y_1, \frac{\lambda_2\gamma}{\lambda_2\gamma + (1 - \lambda_{2})(1 - \nu)}, s_2\right) \\
+(1 - \gamma)w\left(b_2, y_1, \frac{\lambda_2(1 - \gamma)}{\lambda_2(1 - \gamma) + (1 - \lambda_{2})(1 - \nu)}, s_2\right) \\
- \gamma w\left(b_2, y_1, \frac{\lambda_2(1 - \gamma)}{\lambda_2(1 - \gamma) + (1 - \lambda_{2})\nu}, s_2\right) \\
-(1 - \gamma)w\left(b_2, y_1, \frac{\lambda_2\gamma}{\lambda_2\gamma + (1 - \lambda_{2})\nu}, s_2\right) \geq 0 \]

A key requirement to show the continuity of \(q\) is to assume randomization when the government is indifferent between default and repayment decisions. It is know from general equilibrium theory that nonexistence of an equilibrium can be dealt with assuming no tie-breaking rule. A strategy to show this is to work with correspondences rather than decision rules and develop a fixed point argument in correspondences.

The lenders’ strategy is a function \(\psi : \mathbb{B} \times \mathcal{Y} \times \Lambda \times \mathcal{M} \to [0, \frac{1}{1 + r}]\)
Proof of proposition 3: Given any \( q(b', y_-, \lambda, m) \geq 0 \), there exists a bounded function \( v(b, y_-, \lambda, s) \) continuous in \( \lambda \) that solves the equation 2.3. Furthermore, \( v^{nd}(b, y_-, \lambda, s) \) is strictly increasing in \( b, \lambda \) and \( s \); and \( v^d(y_-, \lambda, s) \) is strictly increasing and continuous in \( s \) where repayment is feasible.

Proof - Let \( V \) be the set of all vector-valued continuous functions on \( \mathbb{B} \times \mathcal{Y} \times \Lambda \times \mathcal{S} \) whose values are in the interval \( [\frac{u(q(1-\epsilon)\lambda)}{1-\beta}, \frac{u(\eta\lambda)}{1-\beta}] \). \( (V, \|\|) \) is a complete metric space when \( V \) is equipped with sup norm \( \|\|_{\infty} \).

For \( v \in V \), let \( v^{d}(y_-, \lambda, s; v) \) be the solution to 2.4. It is continuous since \( c \) is continuous and \( u \) is continuous in \( c \), and the solution exists because 2.4 establishes a contraction mapping in \( v^{d} \) with modulus \( \beta \eta \). With a similar argument, \( v^{nd}(b, y_-, \lambda, s; v) \) is the solution to 2.5.

Next, define the operator that gives the maximum life-time utility for the state \( y_-, \lambda, s \). Specifically for \( v \in V \) and \( q \in \mathcal{Q} \), the operator

\[
T(v)(b, y_-, \lambda, s, q) = \max \left\{ \max_{m \in M, b' \in B} \left\{ E \left( u(y - q(b', y_-, \lambda, m)b' + b + w) \right) \right. \right. \\
\left. \left. + \beta E_{(y', s'|y_-, s)} v(b', y, \lambda', s') \right\}, v^{d}(y_-, \lambda, s) \right\} 
\]

(A.1)

Proof of proposition 4: If defaulting is optimal for debt level of \( b^1 \) for some values of output \( y \) and reputation \( \lambda \), then it would be optimal to default as well for a debt level of \( b^2 \) for the same output \( y \) and reputation \( \lambda \) for all \( b^2 < b^1 \), that is; if \( b^2 < b^1 \), \( D(b^2, \lambda) \geq D(b^1, \lambda) \).

Proof - To get a contradiction, for some pair \( y, \lambda \) suppose the following holds:

\( D(b^2, \lambda) < D(b^1, \lambda) \). Then \( D(b^2, \lambda) = 0 \) and \( D(b^1, \lambda) = 1 \). The former implies \( v^{nd}(b^2, y_-, \lambda, s) \geq v^{d}(\lambda, s) \) and the latter implies \( v^{d}(y_-, \lambda, s) > v^{nd}(b^1, y_-, \lambda, s) \). These two inequality imply \( v^{nd}(b^2, y_-, \lambda, s) > v^{nd}(b^1, y_-, \lambda, s) \) which is a contradiction since value functions are monotonic in \( b \), showed in an earlier proposition.

Proof of proposition 5: If it is optimal for the higher reputation government \( \bar{\lambda} \) to default for given level of debt \( b \), and state \( y \), then it is also optimal for the lower reputation government \( \lambda \) to default too for the same level of debt holdings \( b \), and state \( y \), that is, \( D(b, \bar{\lambda}) \subseteq D(b, \lambda) \).

Proof - For all \( \{y\} \in D(b, \bar{\lambda}) \),

\[
u(y) + \beta E \left( \eta v(0, y, \lambda', s') + (1 - \eta)v^{d}(y, \lambda, s') \right) > \\
\left\{ E \left( U(y - q(b', y_-, \bar{\lambda}, m)b' + b + w) \right) + \beta E v(b', y, \lambda', s') \right\} \]
Since
\[ y - q(b', y_-, \lambda, m)b' + b + w) > y - q(b', y_-, \lambda, m)b' + b + w), \]
\[ u(y - q(b', y_-, \lambda, m)b' + b + w) + \beta E v(b', y, \lambda', s') > \]
\[ u(y - q(b', y_-, \lambda, m)b' + b + w) + \beta E v(b', y, \lambda', s') \}
Hence;
\[ u(y) + \beta E \left[ \eta v(0, y, \lambda') + (1 - \eta)v^d(y, \lambda, s') \right] > \]
\[ \left\{ E(U(y - q(b', y_-, \lambda, m)b' + b + w)) + \beta E v(b', y, \lambda, s') \right\}, \]
that is, \( \{y\} \in D(b, \lambda) \)

\[ \square \]

**Proof of proposition 6:** A stationary Markov perfect Bayesian equilibrium exists.

**proof** - Intuitively, the proof will be established as follows. Consider that some states of the world \((b^*, y^*, \lambda^*)\) occurs with a very low probability \(\alpha\). Suppose a strategy profile in which both governments always babbles unless \((b^*, y^*, \lambda^*)\) is drawn. I will establish that when \((b^*, y^*, \lambda^*)\) is drawn, the competent government will tell the truth and the non-competent government will mix and their strategies will be best responses to each other.

I demonstrate the existence of at least one equilibria using Kakutani’s Fixed Point Theorem. I develop the correspondence and establish that this correspondence is compact and convex-valued.

Denote \(v^d_{nd}\) as the value function for the non-competent government from babbling given that it does not default and \(v^d_{nb}\) is the value function for the non-competent government from mixing.

Consider the following government strategy:

\[ \sigma_c(s|\lambda, b, y_-) = \begin{cases} 
\frac{1}{2} & \text{if } v^d_{nd}(b, y_-, \lambda, s = m) \leq v^d_{nd}(b, y_-, \lambda, s \neq m), \\
s & \text{if } v^d_{nd}(b, y_-, \lambda, s = m) > v^d_{nd}(b, y_-, \lambda, s \neq m).
\end{cases} \]

and

\[ \sigma_{nc}(s|\lambda, b, y_-) = \begin{cases} 
\frac{1}{2} & \text{if } v^d_{b} \leq v^d_{nb}, \\
v & \text{if } v^d_{b} > v^d_{nb}.
\end{cases} \]

The best response for the lenders is:

\[ \sigma_{lender}(m|b', \lambda, y_-) = \begin{cases} 
\tilde{q}(b', y_-, \lambda, m = \frac{1}{2}) & \text{if } v^d_{nd}(b, y_-, \lambda, s = m) \leq v^d_{nd}(b, y_-, \lambda, s \neq m), \\
\tilde{q}(b', y_-, \lambda, m = \pi) & \text{if } v^d_{nd}(b, y_-, \lambda, s = m) > v^d_{nd}(b, y_-, \lambda, s \neq m).
\end{cases} \]
The value function for the competent and non-competent government must satisfy \( v_c = T[v_c] \) and \( v_{nc} = T[v_{nc}] \) where

\[
T_c[v_c] = (1 - \alpha)\left[ \frac{1}{2} \hat{u}_c\left(\frac{1}{2}, 1\right) + \frac{1}{2} \hat{u}_c\left(\frac{1}{2}, 1\right) + \beta v_c \right] + \alpha \left\{ \frac{1}{2} \hat{u}_c(\pi(1), 1) + \frac{1}{2} \hat{u}_c(\pi(0), 1) \right. \\
\left. + \beta^2 \left[ \frac{1}{2} v_c\left(\frac{\lambda \gamma}{\lambda \gamma + (1 - \lambda)\nu} \right) + \frac{1}{2} (1 - \gamma) v_c\left(\frac{\lambda(1 - \gamma)}{\lambda(1 - \gamma) + (1 - \lambda)(1 - \nu)} \right) \right. \\
\left. + \frac{1}{2} \gamma v_c\left(\frac{\lambda \gamma}{\lambda \gamma + (1 - \lambda)\nu} \right) + \frac{1}{2} (1 - \gamma) v_c\left(\frac{\lambda(1 - \gamma)}{\lambda(1 - \gamma) + (1 - \lambda)\nu} \right) \right] \right\} \\
\]

\[
T_{nc}[v_{nc}] = (1 - \alpha)\left[ \frac{1}{2} \hat{u}_{nc}\left(\frac{1}{2}, 1\right) + \frac{1}{2} \hat{u}_{nc}\left(\frac{1}{2}, 1\right) + \beta v_{nc} \right] + \alpha \left\{ \frac{1}{2} \hat{u}_{nc}(\pi(1), 1) + \frac{1}{2} \hat{u}_{nc}(\pi(0), 1) \right. \\
\left. + \beta \left[ \frac{1}{2} v_{nc}\left(\frac{\lambda \gamma}{\lambda \gamma + (1 - \lambda)\nu} \right) + \frac{1}{2} v_{nc}\left(\frac{\lambda(1 - \gamma)}{\lambda(1 - \gamma) + (1 - \lambda)(1 - \nu)} \right) \right. \\
\left. + \frac{1}{2} v_{nc}\left(\frac{\lambda \gamma}{\lambda \gamma + (1 - \lambda)\nu} \right) + \frac{1}{2} v_{nc}\left(\frac{\lambda(1 - \gamma)}{\lambda(1 - \gamma) + (1 - \lambda)\nu} \right) \right] \right\} \\
\]

Both \( T_c \) and \( T_{nv} \) maps the set of strictly non-decreasing functions on \( \mathcal{V} \) onto itself. By construction \( T(v + k) \leq T(v) + \xi k \) where \( \xi = \max \left\{ \frac{\beta \eta}{(1 - \beta) + \beta \eta}, \beta \right\} < 1 \).

So \( T \) is a contraction mapping with modulus \( \xi \), there exists a unique fixed point.

**Proof of proposition 7:** (Characterization of Equilibrium Prices) In any MPBE: (i) \( q^*(b', y, \lambda, m) \) is increasing in \( b' \), and increasing in \( \lambda \); (ii) \( q^*(b', y, \lambda, m = H) \) \( \geq \) \( q^*(b', y, \lambda, m = L) \); (iii) if the grid for debt \( b \) is sufficiently fine, \( q^*(b^2, y, \bar{\lambda}, m) \) \( \geq \) \( q^*(b^1, y, \bar{\lambda}, m) \) for some \( b^1 > b^2 \).

Proof - For any given \( q^n \in Q(\mathbb{B} \times \mathcal{Y} \times \Lambda \times \mathcal{M}) \), the operator \( T^n \) is defined as follows. For given \( q^n \), use the operator \( T(v) \) until the convergence to \( (v^{nd})^n \)

\[
\psi^n(b, y, \lambda, s) = \begin{cases} 
1 & \text{if } v^d > (v^{nd})^n, \\
0 & \text{if } v^d > (v^{nd})^n \leq 0.
\end{cases}
\]

32
From that I can now establish the default probability:

$$ \delta^n(b', y_-, \lambda, m) = \sum_{D(b', \lambda')} \psi(b, y, \lambda, s) \pi(y, m, y_-, m_-) \quad (A.2) $$

and the set of bond prices when the government borrows can be obtained as follows:

$$ q^n(b', y_-, \lambda, m) = \frac{1 - \delta(b', y_-, \lambda, m)}{1 + rf} $$

Now we can define the sequence \( \{q^n\}_{n=0}^{\infty} \) using the operator \( T\) iteratively beginning with an initial guess of \( q^0(b', y_-, \lambda, m) = \frac{1}{1+rf} \). We can now show it is monotone and bounded sequence in \( Q(\mathbb{B} \times \mathcal{Y} \times \Lambda \times \mathcal{M}) \). To see that it is monotone, observe that \( q^1 \leq q^0 \) when debt increases.(it is going to be proved in the next proposition). As in [Benjamin and Wright, 2008], the fixed points of the operator \( T(v) \) are ordered, and thus we obtain an ordered sequence of \( \delta^n(b', y_-, \lambda, m) \) which leads a monotonically decreasing sequence of \( q^n \). It is clear that is bounded below by zero; so \( q^n \) converges to \( \mathcal{Q} \). (i) Proof - Let \( q \in Q(\mathbb{B} \times \mathcal{Y} \times \Lambda \times \mathcal{M}) \) and \( (v^{nd}, v^d) \in J(\mathbb{B} \times \mathcal{Y} \times \Lambda \times \mathcal{S}) \). Let’s establish the mapping, \( \mathcal{H}(v^{nd}, v^d, q) \) as follows. Define the operator \( T(v) \) by

$$ T(v)(b, y_-, \lambda, s, q) = \max \left\{ \max_{m \in M, b' \in B} \left\{ E(u(y - q(b', y_-, \lambda, m)b' + b + w) + \beta E(y_s | y_-, s)v(b', y, \lambda', s') \right\}, v^d(y_-, \lambda, s) \right\} \quad (A.3) $$

The finiteness of \( \mathbb{B} \) and \( \Lambda \) ensures that a solution to the government’s borrowing problem exists and bounded. Via the \( T(v) \) implies that \( v \) is continuous. Then the mapping \( \mathcal{H}(v^{nd}, v^d, q) \) is a continuous, compact and convex correspondence. Now I can construct the product correspondence

$$ \mathcal{H}(v^{nd}, v^d, q) = \prod_{(b, y, \lambda, m) \in \mathbb{B} \times \mathcal{Y} \times \Lambda \times \{0, 1\}} \mathcal{H}(v^{nd}, v^d, q)(b, y, \lambda, m) $$

Let \( \bar{q} = \frac{1}{1+rf} \) is the present discounted value of a bond it follows from the definition of zero-profit condition of \( \varphi(q) \). So the price vector is bounded above by \( \bar{q} \) and non-negativity is obvious. (i) By proposition 4, \( D(b', \lambda) \) is increasing in \( b' \), thus \( q(b', y_-, \lambda, m) \) is increasing in \( b' \) (ii) By proposition 5, \( D(b', \lambda) \) is increasing in \( \lambda \), thus \( q(b', y_-, \lambda, m) \) is increasing in \( \lambda \).

(ii) Proof - It is sufficient to show that default probabilities are increasing when a message is \( L \) for a given level of debt \( b \) and reputation \( \lambda \), that is \( \delta(b', y_-, \lambda, m = L) \geq \delta(b', y_-, \lambda, m = H) \).

From the equation 2.13, default probabilities are defined as:

$$ \delta(b', y_-, \lambda, m) = \sum_{D(b', \lambda')} \psi(b, y, \lambda, s) \pi(y, m, y_-, m_-) $$
Using the definition of state inference function, $\pi$ from equation 2.6, we can show that when $m = L$, the probability of the actual state being $L$ increases which in turn increases the likelihood of government falling into default sets, so $D(b, \lambda)$ goes up.

(iii) Proof - It suffices to show that $q(b^2, y_-, \bar{\lambda}, m) = q(b^1, y_-, \bar{\lambda}, m)$ for some $b^1 > b^2$. It was showed that countries with lower reputation find it optimal to default for some debt $b$, whereas higher reputation countries do not, that is, there exists $\lambda$ such that $D(b, \bar{\lambda}) = 0$ and $D(b, \underline{\lambda}) = 1$ for some $b$.

for the same states of () I can have a default correspondence such that $D(b + \epsilon, \bar{\lambda}) = 0$

B Appendix B

Figure B.1: 10-year Greek Bond Yields, Bloomberg. The above figure shows how cheap talk may affect the bond yields. European leaders and Greek Prime Minister George Papandreou agreed on a 50 percent debt haircut; however Papandreou put the deal at risk by announcing that he will take it to the referendum. Bond yields jumped right after the announcement until the passed. This can be translated into that the international lenders lost their confidence on Mr. Papandreou after his announcement.
<table>
<thead>
<tr>
<th>Emerging Markets</th>
<th>External Debt/GDP</th>
<th>Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>48.1</td>
<td>4.05</td>
</tr>
<tr>
<td>Brazil</td>
<td>66.1</td>
<td>31.12</td>
</tr>
<tr>
<td>Chile</td>
<td>9.19</td>
<td>3</td>
</tr>
<tr>
<td>Colombia</td>
<td>36</td>
<td>5.72</td>
</tr>
<tr>
<td>Hungary</td>
<td>80.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Indonesia</td>
<td>77.4</td>
<td>6.2</td>
</tr>
<tr>
<td>Mexico</td>
<td>42.9</td>
<td>4.1</td>
</tr>
<tr>
<td>Pakistan</td>
<td>56.2</td>
<td>5.9</td>
</tr>
<tr>
<td>Peru</td>
<td>24.5</td>
<td>17.4</td>
</tr>
<tr>
<td>Philippines</td>
<td>44.7</td>
<td>4.5</td>
</tr>
<tr>
<td>Russia</td>
<td>11.7</td>
<td>4.8</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>42.0</strong></td>
<td><strong>7.0</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advanced Economies</th>
<th>External Debt/GDP</th>
<th>Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>20.9</td>
<td>2.17</td>
</tr>
<tr>
<td>Canada</td>
<td>84</td>
<td>-0.23</td>
</tr>
<tr>
<td>Denmark</td>
<td>43.7</td>
<td>-0.38</td>
</tr>
<tr>
<td>France</td>
<td>82.4</td>
<td>-0.03</td>
</tr>
<tr>
<td>Germany</td>
<td>83.2</td>
<td>-0.42</td>
</tr>
<tr>
<td>Greece</td>
<td>143</td>
<td>9.22</td>
</tr>
<tr>
<td>Italy</td>
<td>119</td>
<td>1.43</td>
</tr>
<tr>
<td>Japan</td>
<td>220</td>
<td>-2.23</td>
</tr>
<tr>
<td>Netherlands</td>
<td>344</td>
<td>-0.24</td>
</tr>
<tr>
<td>New Zealand</td>
<td>134</td>
<td>2.56</td>
</tr>
<tr>
<td>Portugal</td>
<td>217</td>
<td>3.46</td>
</tr>
<tr>
<td>Spain</td>
<td>154</td>
<td>2.07</td>
</tr>
<tr>
<td>US</td>
<td>93.5</td>
<td>0</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>81.4</strong></td>
<td><strong>1.1</strong></td>
</tr>
</tbody>
</table>

Table B.1: (Gross External Debt/GDP, spreads (2010)) Source: World Bank, Financial Times, Bloomberg. The list continues, please ask the author for the complete list. Some countries are cut to fit it in one page.
<table>
<thead>
<tr>
<th>Emerging Markets</th>
<th>FDI to GDP ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>2.31</td>
</tr>
<tr>
<td>Brazil</td>
<td>2.87</td>
</tr>
<tr>
<td>Chile</td>
<td>6.03</td>
</tr>
<tr>
<td>Colombia</td>
<td>3.38</td>
</tr>
<tr>
<td>Hungary</td>
<td>12.64</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.23</td>
</tr>
<tr>
<td>Mexico</td>
<td>3.18</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1.64</td>
</tr>
<tr>
<td>Peru</td>
<td>3.00</td>
</tr>
<tr>
<td>Philippines</td>
<td>1.55</td>
</tr>
<tr>
<td>Russia</td>
<td>2.04</td>
</tr>
<tr>
<td>Turkey</td>
<td>1.64</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>3.37</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Advanced Economies</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>7.11</td>
</tr>
<tr>
<td>Belgium</td>
<td>12.53</td>
</tr>
<tr>
<td>Canada</td>
<td>4.00</td>
</tr>
<tr>
<td>Denmark</td>
<td>4.68</td>
</tr>
<tr>
<td>Finland</td>
<td>3.95</td>
</tr>
<tr>
<td>France</td>
<td>3.17</td>
</tr>
<tr>
<td>Germany</td>
<td>2.77</td>
</tr>
<tr>
<td>Greece</td>
<td>0.84</td>
</tr>
<tr>
<td>Iceland</td>
<td>11.24</td>
</tr>
<tr>
<td>Italy</td>
<td>1.36</td>
</tr>
<tr>
<td>Japan</td>
<td>0.16</td>
</tr>
<tr>
<td>Netherlands</td>
<td>8.01</td>
</tr>
<tr>
<td>New Zealand</td>
<td>2.74</td>
</tr>
<tr>
<td>Portugal</td>
<td>3.30</td>
</tr>
<tr>
<td>Spain</td>
<td>3.97</td>
</tr>
<tr>
<td>Sweden</td>
<td>5.11</td>
</tr>
<tr>
<td>Switzerland</td>
<td>4.87</td>
</tr>
<tr>
<td>UK</td>
<td>4.86</td>
</tr>
<tr>
<td>US</td>
<td>1.47</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td><strong>4.44</strong></td>
</tr>
</tbody>
</table>

Table B.2: (FDI-GDP ratio) Source: World Bank. The list continues, please ask the author for the complete list. Some countries are cut to fit it in one page.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>6</td>
<td>7</td>
<td>84</td>
</tr>
<tr>
<td>France</td>
<td>8</td>
<td>0</td>
<td>107</td>
</tr>
<tr>
<td>Austria</td>
<td>1</td>
<td>6</td>
<td>132</td>
</tr>
<tr>
<td>Germany</td>
<td>4</td>
<td>3</td>
<td>99</td>
</tr>
<tr>
<td>Greece</td>
<td>na</td>
<td>5</td>
<td>85</td>
</tr>
<tr>
<td>Portugal</td>
<td>na</td>
<td>6</td>
<td>128</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1</td>
<td>1</td>
<td>185</td>
</tr>
<tr>
<td>Italy</td>
<td>na</td>
<td>1</td>
<td>79</td>
</tr>
<tr>
<td>Japan</td>
<td>na</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>UK</td>
<td>na</td>
<td>1</td>
<td>252</td>
</tr>
</tbody>
</table>

Table B.3: This table shows that some of the advanced economies once serial defaulters. Source: [Reinhart et al., 2010]

Figure B.2: This graph shows the selected countries’ external debt-to-GDP ratios for some period. Advanced economies like the United States and Germany used to have low levels of debt at least for 30 years and after some time they begin increasing their debt holdings. Australia is another advanced economy and had high levels of debt, but Australia managed to take its debt levels down to 20 percent and kept it low for a long time. I also provided the graph for Chile as well, simply because [Reinhart and Rogoff, 2009] talk about its graduation process. In fact, it is also in line with my argument. Governments need to hold low-levels of debt in order to convey their information truthfully and thus build up reputation. Remember that lenders would not anticipate the government’s report if the government’s level of debt is above the threshold level. Source: IMF