

Sudden Stops and Sovereign Defaults.

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Abstract

Recent debt crises in Europe have highlighted the role of asymmetric information about fiscal shocks in accounting for sudden hikes in country risk. We develop a model where such asymmetry of information combined with the persistence of tax shocks can produce a sudden inward shift in the supply of loanable funds to a sovereign. Unlike previous models, such a sudden stop (SS) shows up in bond prices but not in borrowing flows until outright default materializes. The key trigger is an unexpected and large external financing tapping by the sovereign: under asymmetric information, even if the tapping is successful and net borrowing goes up, this signals a persistent negative shock to tax revenues and hence to debt repayment capacity, which raises spreads and in turn lowers the cost of a subsequent default. Under various parametrizations, the model generates a separating equilibrium where the SS precedes both the default and the eventual drop in net inflows, as well as a pooling equilibrium in which spreads stay put and the SS will not precede a sovereign default. We provide evidence that such a parcimonious model captures rather well the main stylized facts surrounding several recent and past episodes of sudden stops and sovereign defaults.

Keywords: Sudden Stops, Sovereign Default, Asymmetric Information.

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1 Introduction

Countries not so long ago heralded as growth success stories of the advanced world such as Ireland and Spain have witnessed, over the past year and a half, skyrocketing spreads on their sovereign bonds, plummeting confidence in the state of their public finances, and large output drops. Such a sudden turnaround in market assessment of country risk has been no less dramatic in Greece and Portugal and much of central Europe – once again countries deemed mostly advanced and which have been long declared as graduated from “debt intolerance” (Reinhart, Savastano, and Rogoff, 2004).

Three main features of these recent debt crises stand out. One is the seemingly pervasive uncertainty on the part of investors about the state of national public finances. This is clearly underscored by a spate of major revisions in national budget figures (typically in downward direction), often announced by the respective authorities with substantial lags, all of which have been accompanied by large swings in sovereign spreads.¹ Prima facie, this is suggestive of successful real time obfuscation of the true state of economic fundamentals, since if fully information on the latter were promptly available to investors, it would be immediately arbitrated away, obviating any sharp correction in bond prices upon its public announcement. These facts seem quite indicative of non-trivial information asymmetries between government, investors and the general public.

The second main feature of recent crises is that countries have been able to tap markets for the most part throughout the turmoil, albeit at a much higher spread.² Even in the Greek case, where fiscal fundamentals are believed to be far weaker than in other EU peers, the government’s need for fresh cash were met not only by bond purchases from the European Central Bank and fresh multilateral lending (by the EU and the IMF), but also by concomitant tapping from private capital markets. In contrast with other major debt crisis episodes, like in the 1930s, access to private capital markets was never lost. Indeed, as became apparent that the underlying economic contraction and shortfall in public revenues was persistent enough, tapping from private capital markets by affected countries (and regions

¹For instance, at the early stages of the crisis on April 22, 2009, the European Union statistical service (EUROSTAT) announced that Greece’s budget deficit in 2008 was revised up by nearly 1% of GDP from the previous official figure of 12.9% which was itself revised up from a string of previous estimates of under 10% in the course of 2009. Spreads went by some 60 basis points upon the announcement.

²For example, as the crisis continued exacerbate, the Financial Times reported on November 9, 2010 that: “The next test to Athens comes next month as the country needs to refinance EU 480 millions of debt maturing on December 24 (while) Greek 10-year bond spreads have risen to 11.30 percent from 8.77 percent since October 13”. In the event, in that very same month, and amidst such a sharp rise in spreads, Athens sold EU390m worth of fresh debt.

therein) often intensified.³ Even in the Greek case, where fiscal fundamentals are believed to be far weaker than in other EU peers, the governments need for fresh cash were met not only by bond purchases from the European Central Bank and fresh multilateral lending (by the EU and the IMF), but also by concomitant tapping from private capital markets. In contrast with other major debt crisis episodes, like in the 1930s, access to private capital markets was never lost. Indeed, as became apparent that the underlying economic contraction and shortfall in public revenues was persistent enough, tapping from private capital markets by affected countries (and regions therein) often intensified.⁴

A third noteworthy feature of the recent debt crises is that, unlike many emerging market crisis of the past, the countries involved were mostly advanced, with ample market access, including for debt denominated in their own currency and issued within national borders - even if much of it was purchased by foreign investors. In other words, there was no “original sin”: debt for the most part was issued in domestic currency and in the form of long-term bonds, at least through the onset of the crisis.⁵ This underscores the point that other factors, such asymmetric information and the nature of the shock, are likely to be more central to plausible explanations for these developments.

The aim of this paper is to develop a model that can account for these stylized facts. In particular, we study an economy where asymmetric information about fiscal shocks and the high persistence thereof can bring about sudden and large shifts in country risk amidst continuing market access, and where default is a possible – but not necessarily inevitable – equilibrium outcome of large fiscal shocks. The postulated mechanism is as follows. A sizeable tax revenue shock, which is unobservable

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⁴Once again, illustrations of this point abound in the press. As recent as 31 January 2011, it was reported, for instance, that: Catalonia, one of the richest parts of Spain, needs to raise 10bn-11bn in debt this year to cover deficits and repay earlier loans Andreu Mas-Colell, finance minister in the newly elected Catalan nationalist government, conceded in an interview with the Financial Times that it was not a negligible amount, as he added up the numbers and explained how he had inherited unfunded deficits from the previous, Socialist-led regional government. Were not yet guilty of anything, he said, in an echo of the outraged complaints of Greek ministers in 2009 when they inherited a deficit from their predecessors in power that was much worse than previously announced. The fact that the magnitude of the unfunded deficit is suddenly and massively revised and the problem was seemingly successfully hidden by the previous administration (since a shortfall of such a large magnitude does not originate overnight) further corroborates of how pervasive the asymmetry of information can be it can strike even the incoming administration of a rich and institutionally mature country/region.

⁵As discussed below, both in reality and in the model, debt maturity is shortened only once the crisis is underway. This is consistent with evidence from previous crises documented in Broner, Lorenzoni, and Schmukler (2010).

to investors but observable to the sovereign government and known to be (likely) very persistent, strikes the country that has a non-trivial net debt to GDP ratio to begin with. To the extent that spending cuts are sufficiently costly, this forces the sovereign to demand fresh cash ahead of the “normal” debt roll-over once the previously contracted (long-term) debt matures. Under asymmetric information, the incipient market tapping signals to investors that the sovereign has been hit by a large and likely persistent revenue shock. So, even if the tapping is successful and net borrowing goes up, this indicates that debt repayment capacity has been compromised relative to the no-shock baseline. Hence the future expected ratio of debt to revenue ratio goes up, raising country risk. In response, risk neutral investors raise spreads. By increasing the cost of future repayment and hence lowering the cost of a subsequent default, this increase in spread increases default risk. Default may in fact materialize if the country is hit by a subsequent round of adverse revenue shocks.

In this setting, we show that there are two possible equilibria. One in which the sovereign, when faced with the unexpected revenue shortfall, reveals itself by going to the market (separating equilibrium). This is more likely the higher cost of cutting government spending in response to the revenue shortfall. The other equilibrium is that where she “fakes”: despite being hit by a bad shock, there is no middle-of-the-way market tapping (pooling equilibrium). Instead, the sovereign just adjusts by cutting spending. However, to the extent that such spending cuts subsequently depress output and hence tax revenues, they will undermine future repayment capacity and thus also raise default risk.

There are important attractive features of this setting that make it capable to account not only for key stylized features of recent debt crises but also, as we discuss later, many previous episodes of sovereign defaults as well. One is that the model can account for both sudden stops and sovereign defaults, as two faces of the same coin (country risk). This is important since it unifies in a single and reasonably parsimonious model the two phenomena, which have been examined by two distinct theoretical literatures, as if having distinct etiologies.

Another attractive feature of our model is that it can account for distinct relationships between sudden stops and sovereign defaults are glossed over by previous contributions to both literatures. This becomes clearer once one defines - as arguably should - a “sudden stop” as an abrupt inward shift in the lending supply schedule faced by any given country. In this case, the “sudden stop” can materialize in terms of either prices (spread shifts), quantities (variations in gross and/or net borrowing), or a combination of both. As such, in a separating equilibrium, sudden stops typically precede sovereign defaults: once the sovereign is hit by a bad fiscal shock leading to higher demand for borrowing, a sudden stop materializes through prices only; spreads go up but there is actually an increase in fresh borrowing and net debt. So, the quantity flow alone will be a very misleading indicator of a SS.

At the same time, the model contemplates another possible equilibrium. For

some parametrizations, the country will find optimal to “fake”, i.e., to forego market tapping as if not hit a bad shock when she in fact was. In this case, there won’t be a negative revision of country risk by investors, and so no bond repricing and no SS. Yet, because reality eventually bites, the probability of default following the adverse shock will be higher due to shock persistence, and again as is well-known, large fiscal shocks tend to be very persistent, as we also illustrate with ample historical data below. In this “faking” or “pooling” equilibrium case, a rise in underlying country risk and possible eventual default will not be preceded by a SS. In short, the model encompasses cases in which a SD is preceded or not by a SS. In fact, in a pooling equilibrium, the SS would take place at the same time as the SD.

In nesting possible equilibria where a SS and a SD both take place, this paper relates to two main strands of the literature. One major strand is the work on sudden stops in capital flows pioneered by Calvo (1998) and further developed, both theoretically and empirically, by Caballero and Krishnamurty (2001), Calvo, Izquierdo and Mejia (2004), Calvo, Izquierdo and Talvi (2006), Kehoe et al (2005), Mendoza (2006, 2009). Much like in Calvo (1998), there is an association between output drops and SSs in our model. In Calvo (1998), the SSs arises from an un-anticipated shock to relative prices that drives the unhedged domestic producer with a short foreign currency position insolvent. As this makes her unable to borrow and produce further, an output drop immediately follows. In contrast, in our model there is no relative price shock and unhedged currency positions (due for instance externalities that lead to the underpricing of risk as in Caballero and Krishnamurty) leading to the SS and the subsequent output collapse. In fact, in the separating equilibrium case, the causality is as suggested by Kehoe et al (2005): a bad shock leads to the SS. But since there is also a pooling equilibrium, this will not be necessarily so in all cases as mentioned above. More broadly, information asymmetries are not present in these previous contributions and SSs are gauged as quantity shocks. In contrast, the SS in our model often manifest first and foremost through price adjustments (shifts in spreads). Once SSs are defined as inward shifts in the investors’ loan supply curve, whether price or output effects dominate will depend on what happens to sovereign demand and ancillary model parameters. Finally, it is important to notice that the mechanism we focus on is not incompatible with financial friction models of SSs, but rather complementary. In our model, output and tax revenue volatility are exogenously given, as is their persistences, and these may result from the combination of financial frictions and the menu of shocks (such as to the world interest rate) analyzed in previous models (e.g. Perri and Neumeyer, 2005; Mendoza, 2009). In neither of these models, however, is there default in equilibrium.

In allowing for default as a possible equilibrium outcome, our model is also closely related to a rich literature on sovereign risk. As in Aguiar and Gopinath (2006), Arelano (2008), our model builds on the volatility and persistence of output shocks (in our case translating into tax revenue shocks) as drivers of fluctuations in country risk. Aguiar and Gopinath (2006) find that greater output persistence tends to raise

sovereign default risk in a model with complete symmetry of information between borrowers and lenders, where default is punished by market exclusion, with exogenous re-entry probability rather than an endogenous effect through prices. A key prediction of their model is that countries with higher underlying persistence of output shocks are more prone to default. In a model also featuring symmetric information and full market exclusion as punishment device, Arellano (2008) shows that higher output volatility raises sovereign spreads. Yet, by virtue of the symmetric information assumption, none of these models can explain sharp hikes in spreads upon fiscal news announcements, nor why country risk can fluctuate as sharply under continuous market access. Allowing for the presence of information asymmetries between borrowers and lenders buys us precisely the capacity to explain these phenomena in a way that is consistent with the stylized facts mentioned above. In this regard, our setting is more closely related to Eaton (1996), Alfaro and Kanuzck (2005), Sandlieris (2008), and Catao, Fostel, and Kapur (2009) in that information asymmetries associated with investors's uncertainty about either the country's type or the persistence of output shocks are a key determinant of fluctuations in sovereign spreads. In these papers, as well as ours, investors learn from the country's action, updating their beliefs about future fundamentals along the way which are then reflected in the repricing of sovereign bonds. The main departure of our setting relative to these latter contributions is to highlight the role of fiscal shocks and market tapping mechanism as a signaling device. Also unlike these previous studies, our model thus allows for the possibility of a pooling equilibria where the country successfully "fakes" the true state of fiscal fundamentals: investors either never learn about them or only do so much later, when outright default materializes.

Finally, and also relative to both literatures, one extra contribution of this paper is to review the main stylized facts surrounding SSs and debt crises using a very long cross-country dataset. While most salient features of historical patterns of borrowing and defaulting have been nicely summarized in Reinhart and Rogoff (2009), we zoom in on the dynamics around sovereign defaults and debt crisis events more broadly, focusing in particular on the timing of price and quantity responses and the dynamics of critical fiscal variables, notably tax revenues. Two main novelties in this exercise are the use of newly revised and updated estimates of countries' external debt positions pioneered in the work of Milesi-Ferretti and Lane (2007) as well as the construction of a long database on general government revenues and expenditures spanning over 60 countries over a 40 year period. While an extensive empirical test of alternative theories is beyond the scope of this paper, we use this newly constructed database to show that the proposed model does a very good job in accounting for the main stylized facts not only of the recent debt crises but several past episodes as well.

The plan of the paper is as follows. Section II below reviews the empirical evidence on debt crises, highlighting some key similarities between the recent (2008-09) ones and past episodes, which corroborate as well as offer some further insights into the

stylized facts about debt crises discussed above. Section III lays out the model and its predictions on the relationships between SSs and SDs under the distinct equilibria - pooling and separating. Section IV presents the respective simulations results. Section VI concludes. Specifics of the proofs and the data are provided in Appendices 1 and 2 respectively.

2 Stylized Facts

As a illustration of whether and how far our model can rationale the main stylized facts surrounding SSs and SDs (or sovereign debt crises more broadly defined), we look at a very broad sample of sovereign crisis events, both across countries and over time. Since the main crisis mechanism highlighted in the model are largely motivated by recent episodes, we separate between defaults and near-default events over the past couple of years (largely but not exclusively the European debt crises) and events (largely confined to emerging markets) over 1970-2006. One advantage of separating the two periods is that of highlighting the robustness of the main stylized facts to period breakdowns. The other is that pre-2007 events allow us to study both the pre-crisis dynamics as well as the post-crisis one, as data is available for both pre- and post-crisis period. This is not possible for the 2008-09 events since our sample finishes in 2009.

We define a debt crisis as episodes of either an outright default or a near-default, where the latter is defined as a combination of a major drop in bond prices (larger than 2 standard deviations) and a large multilateral financial support. In the case of IMF support (such as during the Argentine and Mexican crises of 1995, the Asian crises of 1997-98), the definition of “large” support is that of at least twice as large as the respective country’s quota in the IMF, when all net disbursements are computed from program’s inception to end. The definition of outright default is that of Calomiris and Beim (2001) updated with information from the Standard & Poor reports compiled in Borensztein and Panizza (2008) and widely used in the literature on sovereign defaults. Because the causal mechanisms we are concerned in this paper require some reasonable degree of country integration with international capital markets, our sample comprises emerging markets and advance countries, excluding countries where most borrowing through the sample period has been on concessional/multilateral basis. The resulting sample of events by country/year is reported in Appendix 2. We report below the cross-country means of these various country/year events centered within a eight-year window for each of the variables of interest.⁶

Figure 1 depicts the cross-country mean of net foreign borrowing (adding both

⁶The only variable which has substantial gaps in our sample is spreads. Even though we were able to compile some spread data for a few countries from the late 1970s, the overwhelming majority of spread data covers the 1992-2009 period.

debt and equity instruments) in countries that experienced a debt crisis where, as standard, net foreign borrowing is scaled by the respective countries' GDP.

As Figure 1 shows, there is not SS in net borrowing prior to the default (or near default) event at $t=0$. Debt crises are typically associated with a major rise of borrowing all the way through default. Thus, there is not SS in quantities. That, if anything, takes place only after the default. Note that two sets of crises - pre-2007 and post-2007 - display very similar pre-default dynamics, a sharp rise, and not a drop, in net borrowing in the run-up to the default.

Figure 2 portrays a similar story focusing only on debt liabilities (which is the centerpiece of our model).

Figure 3 then focus on the equity component of foreign borrowing (equity+debt=total net foreign liabilities). It is clearly relatively uneventful, i.e., net equity borrowing increases prior to default but not by much: in comparison with debt liabilities, it is relatively stable. This clearly justifies the focus on the sovereign risk literature on debt contracts, rather than on equity-type contracts.

Figure 4 turns to output which is the main driver of countries' tax bases. (Evidence on tax revenues further below). Clearly a negative output preceeds both the default and the SS in quantities. If anything, an adverse output and tax shock is, if anything, a trigger of subsequent developments in country risk and net debt inflows.

As the overwhelming majority of external debt crises (the Asian crisis being an exception) have typically associated with government financing problems, it is not surprising that much of the increase in country's net foreign liabilities in the run-up to the crisis have been associated with rising public sector indebtedness. This is shown in Figure 4 which depicts general government debt.

Crucial to the mechanism we focus in the paper, much of this rise in gross and net borrowing in the run-up to the crisis is typically associated with a fiscal deterioration. As before, this has been true of both previous and recent crises, as shown in Figure 5. The revenue to spending gap, and hence the size of the budget balance, begins to shrink prior to the crisis, sometimes as long as 2 years before the default or near-default outbreak.

The counterpart of this widening of the financing gap is the rise in market tapping and soaring indebtedness by the sovereign. Further, and also central in the model developed below, adverse shocks to the tax base appear to be a key driver. This can be seen by what happens to real income in Figure 6: real GDP begins to slow down in earnest one to two years prior to the crisis.

To the extent that declining GDP growth translates into a drop of the tax base and hence to lower revenues, this clearly a key driver of the widening financing gap.

While the adverse shock to output and hence to the tax base could in principle be offset by rising tax rates, this is not what typically happens: Figure 7 shows that, if anything, government revenues to GDP ratio fall too in the run-up to the crisis. This implies that the decline in overall tax revenues arise from a combination of declining output growth and a reduction in tax collection relative to GDP. As government spending keeps its growing momentum while revenues decelerate, the financing gap widens, as depicted above.

Figure 8 shows, however, that while gross and net borrowing increases *pari passu* with the deterioration of fiscal fundamentals, what happens to bond prices is very different from what happens to quantities. Bond prices sharply fall, and hence country spreads rise. Thus, as discussed in the introduction, the early manifestation of the SS shows up in prices rather quantities and the turnaround is rather abrupt, with spreads more than doubling in a two to three years window around the average crisis event.

3 Model

3.1 Sovereign Borrower

3.1.1 Fiscal shocks and debt.

A government issues bonds in international capital markets to finance investment in a long-term project which can be related to physical infrastructure and/or human capital development (e.g. education and health). We develop our argument in the simplest setting, which involves three periods, $t = 0, 1$, and 2 . The project's investment requirement, I_0 in period 0 (which we consider exogenous) generates fiscal revenues τ_0, τ_1 and τ_2 in periods $0, 1$ and 2 respectively.

To finance this requirement, the sovereign issues long-term debt to be paid in period 2 . It issues $D_0 = \tau_0$ at time $t = 0$, it pays interest $r_0\tau_0$ in $t = 1$ and it promises $(1 + r_0)\tau_0$ in $t = 2$.

In period $t = 1$ government's fiscal revenue is subject to shocks $\tilde{\epsilon}_1$ which assumes two values: $\epsilon_1^H = \alpha\tau_1$ and $\epsilon_1^L = -\alpha\tau_1$, with probability p and $1 - p$ respectively, where $\alpha < 1$. The key assumption is that the shock in period 1 is persistent.

Upon receiving the shock in the middle period, the borrower has two options:

1. "Renegotiate" (R).

The borrower can buy back its debt paying $(1 + r_0)\tau_0$ at $t = 1$ and re-issue the same debt $D_1 = \tau_0$ at $t = 1$ promising $(1 + r_1^R)\tau_0$ at $t = 2$. Notice that total debt at the end of the middle period is τ_0 , so after renegotiation there is no fresh debt issuance, i.e total outstanding debt at $t = 1$ is the same as in $t = 0$.

2. “New Fresh Issuance” (I).

The borrower can issue new fresh debt D_1 to be paid at $t = 2$, to cover fiscal downfalls. In this case $D_1 = \alpha\tau_1$ and promise to pay $(1 + r_1^I)\alpha\tau_1$ at $t = 2$. Notice that in this case, total outstanding debt at the end of the middle period is $\alpha\tau_1 + \tau_0$

At the final period, the government receives another fiscal shock $\tilde{\epsilon}_2$ which can assume two values, ϵ_2^H or ϵ_2^L with probability q and $1 - q$ respectively. After the realization of the shock, the government decides whether to pay or default in all outstanding debt.

Default only happens at the end, there is no default on interest payments in the middle period.

3.1.2 Government objective.

The government maximizes social welfare. Without getting into the details of a particular social welfare function, we will assume that the government is risk neutral, have a discount factor of β and maximizes expenditure G . The payoffs are described as follows:

In period $t = 0$:

$$G_0 = \tau_0 \tag{1}$$

In period $t = 1$ there are two possibilities. The borrower re-negotiates (R), in which case we have

$$G_1 = \tau_1 + \tilde{\epsilon}_1 - (1 + r_0)\tau_0 + \tau_0 \tag{2}$$

expenditures equals fiscal revenues $F_1 = \tau_1 + \tilde{\epsilon}_1$ minus debt buy back plus new debt issuance.

In case the borrower issues new fresh debt (I)

$$G_1 = \tau_1 + \tilde{\epsilon}_1 - r_0\tau_0 + \alpha\tau_1 \tag{3}$$

expenditures equals fiscal revenues $F_1 = \tau_1 + \tilde{\epsilon}_1$ minus interest payments plus new debt issuance.

In the last period there are four possibilities. After renegotiation (R) the sovereign could repay or default. If it repays

$$G_2 = \tau_2 + \rho\epsilon_1 + \tilde{\epsilon}_2 - (1 + r_1^R)\tau_0 \quad (4)$$

expenditure equals fiscal revenues $F_2 = \tau_2 + \rho\epsilon_1 + \tilde{\epsilon}_2$ minus debt re-payments.
If it defaults

$$G_2 = \tau_2 + \rho\epsilon_1 + \tilde{\epsilon}_2 - c(1 + r_1^R)\tau_0 - \eta_1(\tau_2 + \rho\epsilon_1 + \tilde{\epsilon}_2) \quad (5)$$

expenditure equals fiscal revenues $F_2 = \tau_2 + \rho\epsilon_1 + \tilde{\epsilon}_2$ minus debt haircuts minus fiscal confiscation losses: a proportion η_1 of fiscal revenues is confiscated by $t = 1$ creditors.

On the other hand, after new debt issuance (I), the sovereign could again either repay or default. If it repays

$$G_2 = \tau_2 + \rho\epsilon_1 + \tilde{\epsilon}_2 - (1 + r_0)\tau_0 - (1 + r_1^I)\alpha\tau_1 \quad (6)$$

expenditure equals fiscal revenues $F_2 = \tau_2 + \rho\epsilon_1 + \tilde{\epsilon}_2$ minus debt re-payments of debt issued at $t = 0$ and $t = 1$.

If it defaults

$$G_2 = \tau_2 + \rho\epsilon_1 + \tilde{\epsilon}_2 - c(1 + r_0)\tau_0 - c(1 + r_1^I)\alpha\tau_1 - \eta(\tau_2 + \rho\epsilon_1 + \tilde{\epsilon}_2) \quad (7)$$

expenditure equals fiscal revenues minus debt haircuts of all outstanding debt, minus fiscal confiscation losses, where $\eta = \eta_0 + \eta_1$ is the total proportion of fiscal confiscation, that goes to $t = 0$ and $t = 1$ creditors.

3.2 Lenders

The bond market is competitive, with risk-neutral lenders who are willing to subscribe to bonds at any price that, given their beliefs, allow them to break-even. For modeling simplicity we treat the mass of lenders at every period as a single lender. The riskless interest rate in the model, r_f , is taken as exogenous.

There are two debt markets, at $t = 0$ and at $t = 1$. We assume that there is no seniority of debt at $t = 2$ and when the borrower defaults, it defaults on all its outstanding debt at the same time.

In the case of default creditors receive a haircut c . Moreover, in any finite-horizon framework, in the absence of other penalties, in period 2 the borrower will default with probability one. To avoid the trivialities associated with this case, we assume that default in the final period is punished with sanctions that cause the sovereign to lose a fraction η of its current fiscal revenues. These losses are divided between creditors, so that $\eta = \eta_0 + \eta_1$, where η_0 is the proportion captured by $t = 0$ creditors and η_1 is the proportion captured by $t = 1$ creditors.

Figure 1 shows the cash flow associated to lending at $t = 0$. With probability p the debt gets buy back in period 1 and re-invested in the risk-free technology. With probability $(1 - p)$, the lender receives interest payment in period 1, which are re-invested in the risk free technology. In period 2, with probability π the creditor faces sovereign default and with probability $1 - \pi$ the creditor is paid back interest plus principal.

Figure 2 shows the cash flow associated to lending at $t = 1$. In period 2, with probability π the creditor faces sovereign default and with probability $1 - \pi$ the creditor is paid back interest plus principal.

3.3 Asymmetric Information and Sudden Stops

We assume that there is asymmetric information between the sovereign borrower and investors. While the borrower can perfectly observe the realization of the middle period shock $\tilde{\epsilon}_1$, lenders cannot.

The only way lenders can infer some information about the realization of the shock is through the borrower's action in the middle period: to issue new debt (I) or to re-negotiate (R).

Lenders at $t = 1$, after observing the borrower action (issue or re-negotiate) update their beliefs of future default and re price debt accordingly. In the next section we show that there are situations in which the interest rate charged in the middle period is sensitive to the borrower's action. So $r_1^I \neq r_1^R$, this is, borrowers' action alter credit market conditions.

We define a sudden stop (SS) as the shift in the supply curve of funds. Since for simplicity we are not modeling the quantity choice in the model (issuance is taken exogenous), the supply shift is completely characterized by the difference in rates charged by lenders in period 1: $r_1^I - r_1^R$.

3.4 Sudden Stops and Sovereign Defaults

We model the borrower and lender interaction as a game. The borrower's strategy is to issue (I) or re-negotiate (R) in period 1 and to pay or not in period 2. The lender's strategy is to set a break-even price. Lender's will have beliefs about borrower's type (shock). A Perfect Bayesian equilibrium (PBE) is one in which everybody's response is optimal given everybody's else response and beliefs, and beliefs are consistent with strategies and updates using Bayes' (whenever possible).

There are potentially to types of equilibria: Separating and Pooling.⁷ In a separating equilibrium actions following each shock will be different (say issuing only

⁷In pure strategies. We are not considering mixed strategies in the model.

when a bad shock) and hence completely revealing. In a pooling equilibrium actions following different shock realizations are the same (say country never issues).

A Sudden Stop, as defined before, will arise in the model only in a separating equilibrium in which R follows a good shock and I follows a bad shock in the middle period. The main result of the paper is the following.

Proposition 1: *There exists a separating perfect bayesian equilibrium in this economy in which Sudden Stop associated with hiking spreads but positive net borrowing precedes a Sovereign Default.*

Proof: See Appendix.

4 Numerical Simulations

The objective of the numerical simulation is to assess which sets of parameters lead to which types of equilibria. In particular, we look at whether there is a separating equilibrium characterized by a sudden stop and the resulting size of the sudden stop that is the spread in the interest rate between agents who refinance and agents who re-issue debt.

The model is calibrated as follows. The discount factor is set at $\beta = 0.96$ which implies a risk-free interest rate equal to $r = 1/\beta - 1 = 4.17\%$.

In the first set of simulation, the default cost parameters c, η_0, η_1 are fixed: $c = 0.7; \eta_0 = \eta_1 = 0.25$. We let vary the size of the shock, α , between 10% and 90% of the fiscal revenues τ . The first period shock and the second period *i.i.d* shock are set to the same value. The persistence parameter ρ varies between 0.1 and 0.9. Each equilibrium of the model is indexed by a number from 1 to 6 corresponding to the six cases discussed in the appendix. 0 indexes the lack of equilibrium. 1 is a pooling equilibrium which does not feature a sudden stop while equilibria 2 to 6 feature a sudden stop for a bad realization of first period shock.

Figure 11 plots the equilibria for different values of the size and persistence of shock. For an equilibrium to exist, the shock need to be either persistence enough or large enough. However if shocks are both very persistent and very large, they are no equilibrium. Equilibria are all separating equilibria.

Figure 12 plots the size of the sudden stop, that is the difference in interest rate pricing between a country reinvesting and a country refinancing. The more persistent and the larger are the shocks, the more severe is the sudden stop.

Figure 13 illustrates the interest gains form refinancing for a country experiencing a good realization of first period shock. Refinancing gains are larger if the shock is

larger but are decreasing in the persistence of the shock. In all figures, values equal to zeros correspond to zone of parameters without equilibria.

In the second set of simulation, the size of the shock is fixed at $\alpha = 0.5$ and the persistence at $\rho = 0.6$. We now let the parameters controlling the default costs vary. The fiscal confiscation parameter η_1 varies between 0.05 and 0.5 and the recovery rate c between 0.3 and 0.6.

Figure 14 shows the set of the parameters for which a separating equilibrium exists. This set is larger for intermediate values of both parameters.

Figure 15 shows that the size of sudden stop is decreasing in the recovery rate but non monotone in fiscal consolidation.

Figure 16 that refinancing gains decrease with the recovery rate and the size of fiscal confiscation.

5 Conclusion

This paper has examined how sharp fluctuations in sovereign spreads amidst continuous market access cum net borrowing can arise in an environment characterized by substantive information asymmetries about fiscal fundamentals and where tax revenue shocks can be large and persistent. In this setting, we show that there two types of equilibria. In a separating equilibrium, unexpected market tapping by the sovereign signals to investors that it has been hit by a large and likely persistent revenue shock. So, even if the tapping is successful in the sense that net borrowing goes up, this signals to investors that debt repayment capacity has been compromised relative to baseline. Hence the future expected ratio of debt to revenue ratio goes up, raising repayment risk. In response, risk neutral investors hike up spreads which, in turn, increases the cost of future repayment and thus lowers the cost of a subsequent default. In this separating equilibrium, the SS (defined as an inward shift in lenders' supply schedule) preceeds the sovereign default or debt crisis broadly speaking. The novelty of this equilibrium relative to previous SS models is that the drop in net capital flows may take place only long after a large drop in output and tax revenues; capital inflows (both gross and net) only dry up later - and potentially much later - once default materializes.

Yet, we also establish the existence of another equilibrium in which the country “fakes”: despite being hit by a bad fiscal shock, there is no middle-of-the-way market tapping. In this pooling equilibrium, the sovereign instead adjusts by cutting spending, not revealing to investors the “bad news”. Hence spreads stay put and there is no SS, measure either in price or quantity (flow) terms. However, to the extent that the deterioration is persistent and insofar as public spending cuts further depress

output and hence tax revenues, future repayment capacity is undermined. Thus default risk will rise nevertheless. We illustrate circumstances in which each equilibria will occur under various model calibrations. In the case of separating equilibrium, we also illustrate using a comprehensive cross-country database that the model predictions regarding tight and roughly contemporary correlation between spreads, output and tax revenues, as well as lags in capital inflow adjustment, have been remarkably consistent with main stylized facts of recent and also several past debt crises.

It is important to note that the postulated crisis mechanism and attendant equilibria are potentially complementary, rather than substitutes, to those featuring in many previous models of SSs and SDs. By developing our argument in a simple one-good setting, where unhedged currency positions are not present, complicated coordination issues between junior and senior investors are schewed away, and the persistence of output and tax shocks is taken as given rather than modeled from the supply-side of the economy, our aim has been to isolate the role of asymmetric information on bond pricing in an environment where fiscal can be large and highly persistent. Insofar as this simple setting can rationalize salient correlations and lags observed in real world data, as we argue to be the case, we regard this as a non-trivial plus in favor of our model. A more comprehensive model of SSs and SDs would of course need to incorporate the supply side of these economies, as well as the role of financial frictions such as leverage constraints on the private sector, given evidence of its importance in shock amplification and persistence, along the lines of a recent DSGE literature (see, e.g., Gertler and Kiyotaki, 2009; Mendoza, 2010; and various reference therein). Once again, however, given the seemingly central importance of fiscal shocks and asymmetric information about them in the anatomy of the recent debt crises, these seem important to incorporate in the menu of frictions purporting to explain such events.

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7 Appendix

7.1 Appendix 1

Proof of Proposition 1:

The proof establishes that the strategies are optimal given beliefs and other player's strategies and beliefs are consistent with observed choices. Step 1 begins by assuming that the borrowers renegotiates after a good shock and issues new debt after a bad shock and establishes the optimality of all other choices and beliefs. Step 2 confirms the optimality of the period -1 borrowers strategy assumed before.

Step 1:

We assume that the borrower after receiving $\epsilon_1^H = \alpha\tau_1$ decides to follow strategy (R) and after receiving $\epsilon_1^L = -\alpha\tau_1$ decides to follow strategy (I). We also assume without loss of generality that $\tau_0 = \tau_1 = \tau_2 = \tau$.

1. Lender's beliefs at $t = 1$

Clearly, lender's beliefs are given by $\mu(H/R) = 1$ and $\mu(L/I) = 1$.

2. Borrower's strategy at $t = 2$

Let us consider first the borrower that received a good shock in the middle period, from now on called H -type. His revenue after repayment is $\tau_2 + \rho\epsilon_1^H + \tilde{\epsilon}_2 - (1 + r_1^R)\tau_0 = \tau(1 + \rho\alpha - (1 + r_1^R)) + \tilde{\epsilon}_2$. On the other hand, if he defaults his revenue is $\tau_2 + \rho\epsilon_1^H + \tilde{\epsilon}_2 - c(1 + r_1^R)\tau_0 - \eta_1(\tau_2 + \rho\epsilon_1^H + \tilde{\epsilon}_2) = \tau((1 + \rho\alpha)(1 - \eta_1) - c(1 + r_1^R)) + (1 - \eta_1)\tilde{\epsilon}_2$. Hence an H borrower repays at the end if and only if

$$\tilde{\epsilon}_2 \geq (\tau/\eta_1)(-(1 + \rho\alpha)\eta_1 + (1 - c)(1 + r_1^R)) = H_2 \quad (8)$$

Now, let us consider an L type borrower. His revenue after repayment is $\tau_2 + \rho\epsilon_1^L + \tilde{\epsilon}_2 - (1 + r_0)\tau_0 - (1 + r_1^I)\alpha\tau_1 = \tau(1 - \rho\alpha - (1 + r_0) - (1 + r_1^I)\alpha) + \tilde{\epsilon}_2$. On the other hand, if he defaults his revenue is $\tau_2 + \rho\epsilon_1^L + \tilde{\epsilon}_2 - c(1 + r_0)\tau_0 - c(1 + r_1^I)\alpha\tau_1 - \eta(\tau_2 + \rho\epsilon_1^L + \tilde{\epsilon}_2) = \tau((1 - \rho\alpha)(1 - \eta) - c(1 + r_0) - c(1 + r_1^I)\alpha) + (1 - \eta)\tilde{\epsilon}_2$. Hence an L borrower repays at the end if and only if

$$\tilde{\epsilon}_2 \geq (\tau/\eta)(-(1 - \rho\alpha)\eta + (1 - c)((1 + r_0) + (1 + r_1^I)\alpha)) = L_2 \quad (9)$$

Note that in a genuine separating equilibrium $H_2 < L_2$. We confirm this in section 4 with the numerical simulations. Before moving on to determine the pricing, notice that there are six cases from the lender's perspective:

- Case 1: $H_2 < L_2 < \epsilon_2^L < \epsilon_2^H$. Nobody defaults.
- Case 2: $H_2 < \epsilon_2^L < L_2 < \epsilon_2^H$. H never defaults, L only for a bad shock.
- Case 3: $\epsilon_2^L < H_2 < L_2 < \epsilon_2^H$. Both default for a bad shock.
- Case 4: $H_2 < \epsilon_2^L < \epsilon_2^H < L_2$. H never defaults, L always defaults.
- Case 5: $\epsilon_2^L < H_2 < \epsilon_2^H < L_2$. L always defaults, H only for a bad shock.
- Case 6: $\epsilon_2^L < \epsilon_2^H < H_2 < L_2$. Both always default.

3. Lender's pricing at $t = 1$

We need to consider each case separately.

- Case 1: $H_2 < L_2 < \epsilon_2^L < \epsilon_2^H$. In this case

$$r_1^R = r_1^I = r_f \quad (10)$$

- Case 2: $H_2 < \epsilon_2^L < L_2 < \epsilon_2^H$. In this case r_1^R is given by equation (10). Break-even condition implies that $q(1 + r_1^I)\alpha\tau + (1 - q)(c(1 + r_1^I)\alpha\tau + \eta_1 F_2^{LL}) = (1 + r_f)\alpha\tau$, where $F_2^{LL} = \tau - \rho\alpha\tau + \epsilon_2^L$. This gives

$$(1 + r_1^I) = \frac{1 + r_f}{q + (1 - q)c} - \frac{(1 - q)\eta_1 F_2^{LL}}{(q + (1 - q)c)\alpha\tau} \quad (11)$$

- Case 3: $\epsilon_2^L < H_2 < L_2 < \epsilon_2^H$. In this case r_1^I is given by equation (11). And by the same break-even logic we have that

$$(1 + r_1^R) = \frac{1 + r_f}{q + (1 - q)c} - \frac{(1 - q)\eta_1 F_2^{HL}}{(q + (1 - q)c)\tau} \quad (12)$$

where $F_2^{HL} = \tau + \rho\alpha\tau + \epsilon_2^L$

- Case 4: $H_2 < \epsilon_2^L < \epsilon_2^H < L_2$. In this case r_1^R is given by equation (12), and r_1^I is given by

$$(1 + r_1^I) = \frac{1 + r_f}{c} - \frac{\eta_1 E F_2^L}{c\alpha\tau} \quad (13)$$

where $E F_2^L = q F_2^{LH} + (1 - q) F_2^{LL}$, and $F_2^{LH} = \tau - \rho\alpha\tau + \epsilon_2^H$.

- Case 5: $\epsilon_2^L < H_2 < \epsilon_2^H < L_2$. In this case r_1^R is given by equation (12) and r_1^I by equation (13).
- Case 6: $\epsilon_2^L < \epsilon_2^H < H_2 < L_2$. In this case r_1^I is given by equation (13) and r_1^R by

$$(1 + r_1^R) = \frac{1 + r_f}{c} - \frac{\eta_1 E F_2^H}{c\tau} \quad (14)$$

where $E F_2^H = q F_2^{HH} + (1 - q) F_2^{HL}$ and $F_2^{HH} = \tau + \rho\alpha\tau + \epsilon_2^H$.

4. Lender's pricing at $t = 0$

- Case 1: $H_2 < L_2 < \epsilon_2^L < \epsilon_2^H$. Break-even condition implies that $p((1+r_0)(1+r_f)\tau) + (1-p)((1+r_f)r_0\tau + q(1+r_0)\tau + (1-q)(1+r_0)\tau) = (1+r_f)^2\tau$. Which gives

$$r_0 = \frac{(1+r_f)^2\tau - (1+r_f)\tau p - (1-p)\tau}{(1+r_f)\tau + (1-p)\tau} \quad (15)$$

As shown in the numerical simulations in this case $r_0 = r_f$.

- Case 2: $H_2 < \epsilon_2^L < L_2 < \epsilon_2^H$. By the same break-even logic we have that

$$r_0 = \frac{(1+r_f)^2\tau - (1+r_f)\tau p - (1-p)(q\tau + (1-q)c\tau + (1-q)\eta_0 F_2^{LL})}{(1+r_f)\tau + (1-p)(q\tau + (1-q)c\tau)} \quad (16)$$

- Case 3: $\epsilon_2^L < H_2 < L_2 < \epsilon_2^H$. In this case, r_0 is given by equation (16).
- Case 4: $H_2 < \epsilon_2^L < \epsilon_2^H < L_2$. In this case, by the same logic we have that

$$r_0 = \frac{(1+r_f)^2\tau - (1+r_f)\tau p - (1-p)(c\tau + \eta_0 E F_2^L)}{(1+r_f)\tau + (1-p)c\tau} \quad (17)$$

- Case 5: $\epsilon_2^L < H_2 < \epsilon_2^H < L_2$. In this case r_0 is given by equation (17).
- Case 6: $\epsilon_2^L < \epsilon_2^H < H_2 < L_2$. In this case r_0 is given by equation (17).

Step 2:

We first describe the payoffs of each type. Let us start with the L-type. His payoffs under no deviations, i.e. when playing the strategy assumed, I , are given by, first, in the case in which the borrower always repays:

$$\tau(1-r_0) + \beta(\tau(1-\rho\alpha - (1+r_0) - (1+r_1^I)\alpha) + E\tilde{\epsilon}_2) \quad (18)$$

when it repays only for a good shock:

$$\tau(1-r_0) + \beta(q(\tau - \tau\rho\alpha + \epsilon_2^H - (1+r_0)\tau - (1+r_1^I)\alpha\tau) + (1-q)(\tau - \tau\rho\alpha + \epsilon_2^L - c(1+r_0)\tau - c(1+r_1^I)\alpha\tau - \eta F_2^{LL})) \quad (19)$$

and finally, when he always defaults

$$\tau(1-r_0) + \beta(\tau - \tau\rho\alpha - c(1+r_0)\tau - c(1+r_1^I)\alpha\tau + E\tilde{\epsilon}_2 - \eta E F_2^L) \quad (20)$$

There are two things that change when an L-type decides to deviate and play the R strategy after receiving a bad shock in the middle period: the second period repayment threshold and his payoffs. Let us first describe the deviation threshold. After deviation his payoff after repayment at the end is given by $\tau(1-\rho\alpha - (1+r_1^R)) + \tilde{\epsilon}_2$. After default is given by $\tau - \rho\alpha\tau + \tilde{\epsilon}_2 - c(1+r_1^R)\tau - \eta_1(\tau - \rho\alpha\tau + \tilde{\epsilon}_2)$.

Hence, he repays if and only if

$$\tilde{\epsilon}_2 \geq (\tau/\eta_1)(-(1 - \rho\alpha)\eta_1 + (1 - c)(1 + r_1^R)) = L_2^d \quad (21)$$

From equations (8), (9) and (21) it follows that $H_2 < L_2^d < L_2$.

His payoffs under deviations, i.e. when playing R , are given by, first, in the case in which the borrower always repays:

$$\tau(2 - \alpha - (1 + r_0)) + \beta(\tau(1 - \rho\alpha - (1 + r_1^R)) + E\tilde{\epsilon}_2) \quad (22)$$

when it repays only for a good shock:

$$\tau(2 - \alpha - (1 + r_0)) + \beta(q(\tau - \tau\rho\alpha + \epsilon_2^H - (1 + r_1^R)\tau) + (1 - q)(\tau - \tau\rho\alpha + \epsilon_2^L - c(1 + r_1^R)\tau - \eta_1 F_2^{LL})) \quad (23)$$

and finally, when he always defaults

$$\tau(2 - \alpha - (1 + r_0)) + \beta(\tau - \tau\rho\alpha - c(1 + r_1^R)\tau + E\tilde{\epsilon}_2 - \eta_1 E F_2^L). \quad (24)$$

Next we describe the payoffs of the H-type. His payoffs under no deviations, i.e. when playing the strategy assumed, R , are given by, first, in the case in which the borrower always repays:

$$\tau(2 + \alpha - (1 + r_0)) + \beta(\tau(1 + \rho\alpha - (1 + r_1^R)) + E\tilde{\epsilon}_2) \quad (25)$$

when it repays only for a good shock:

$$\tau(2 + \alpha - (1 + r_0)) + \beta(q(\tau + \tau\rho\alpha + \epsilon_2^H - (1 + r_1^R)\tau) + (1 - q)(\tau + \tau\rho\alpha + \epsilon_2^L - c(1 + r_1^R)\tau - \eta_1 F_2^{HL})) \quad (26)$$

and finally, when he always defaults

$$\tau(2 + \alpha - (1 + r_0)) + \beta(\tau + \tau\rho\alpha - c(1 + r_1^R)\tau + E\tilde{\epsilon}_2 - \eta_1 E F_2^H). \quad (27)$$

There are two things that change when an H-type decides to deviate and play the I strategy after receiving a bad shock in the middle period: the second period repayment threshold and his payoffs. Let us first describe the deviation threshold. After deviation his payoff after repayment at the end is given by $\tau(1 + \rho\alpha - (1 + r_0) - (1 + r_1^I)\alpha) + \tilde{\epsilon}_2$. After default is given by $\tau + \rho\alpha\tau + \tilde{\epsilon}_2 - c(1 + r_0)\tau - c(1 + r_1^I)\alpha\tau - \eta(\tau + \rho\alpha\tau + \tilde{\epsilon}_2)$. Hence, he repays if and only if

$$\tilde{\epsilon}_2 \geq (\tau/\eta)(-(1 + \rho\alpha)\eta + (1 - c)((1 + r_0) + (1 + r_1^I)\alpha)) = H_2^d \quad (28)$$

From equations (8), (9) and (28) it follows that $H_2 < H_2^d < L_2$.

His payoffs under no deviations, i.e. when playing the strategy assumed, I , are

given by, first, in the case in which the borrower always repays:

$$\tau(1 + 2\alpha - r_0) + \beta(\tau(1 + \rho\alpha - (1 + r_0) - (1 + r_1^I)\alpha) + E\tilde{\epsilon}_2) \quad (29)$$

when it repays only for a good shock:

$$\tau(1+2\alpha-r_0)+\beta(q(\tau+\tau\rho\alpha+\epsilon_2^H-(1+r_0)\tau-(1+r_1^I)\alpha\tau)+(1-q)(\tau+\tau\rho\alpha+\epsilon_2^L-c(1+r_0)\tau-c(1+r_1^I)\alpha\tau-\eta F_2^{HL})) \quad (30)$$

and finally, when he always defaults

$$\tau(1 + 2\alpha - r_0) + \beta(\tau + \tau\rho\alpha - c(1 + r_0)\tau - c(1 + r_1^I)\alpha\tau + E\tilde{\epsilon}_2 - \eta EF_2^H)) \quad (31)$$

Finally, in order to check for the existence of a separating equilibrium, we need to check for possible deviations for each type. We have two cases: I) $H_2 < H_2^d < L_2^d < L_2$ and II) $H_2 < L_2^d < H_2^d < L_2$. Note that for pricing we still just need to consider the 6 original cases since investors cannot observe deviations. However, in order to check for deviations some of these cases may get subdivided in sub-cases. Table 1 and 2 show all the possible cases that we need to check. For example, in case 4.1) in table 1 in order to check for deviation we need to show that equation (25) is bigger than equation (29) for the H type and that equation (20) is bigger than equation (22) for the L-type using pricing according to case 4 discussed in step 1. Clearly, there will be parameter values that can sustain a separating equilibrium. This is ultimately a numerical question, which we discuss extensively in section 4.

7.2 Appendix 2

Table at the end describes in detailed data used in the Stylized Facts section.

Figure 1: Net Foreign Liabilities Around External Debt Crises
(cross-country mean as percent of GDP)

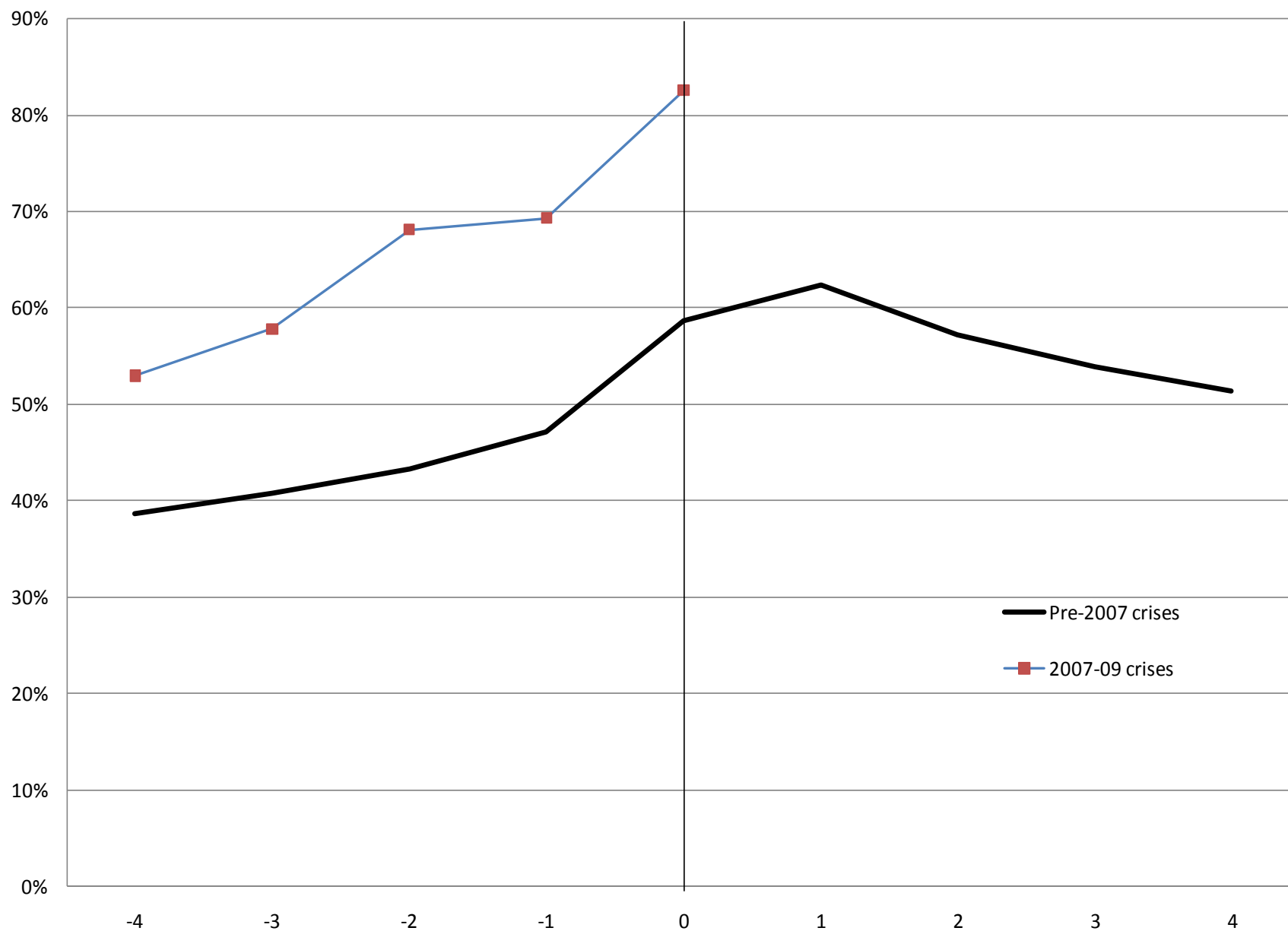


Figure 2: Net External Debt Around External Debt Crises
(cross-country mean as percent of GDP)

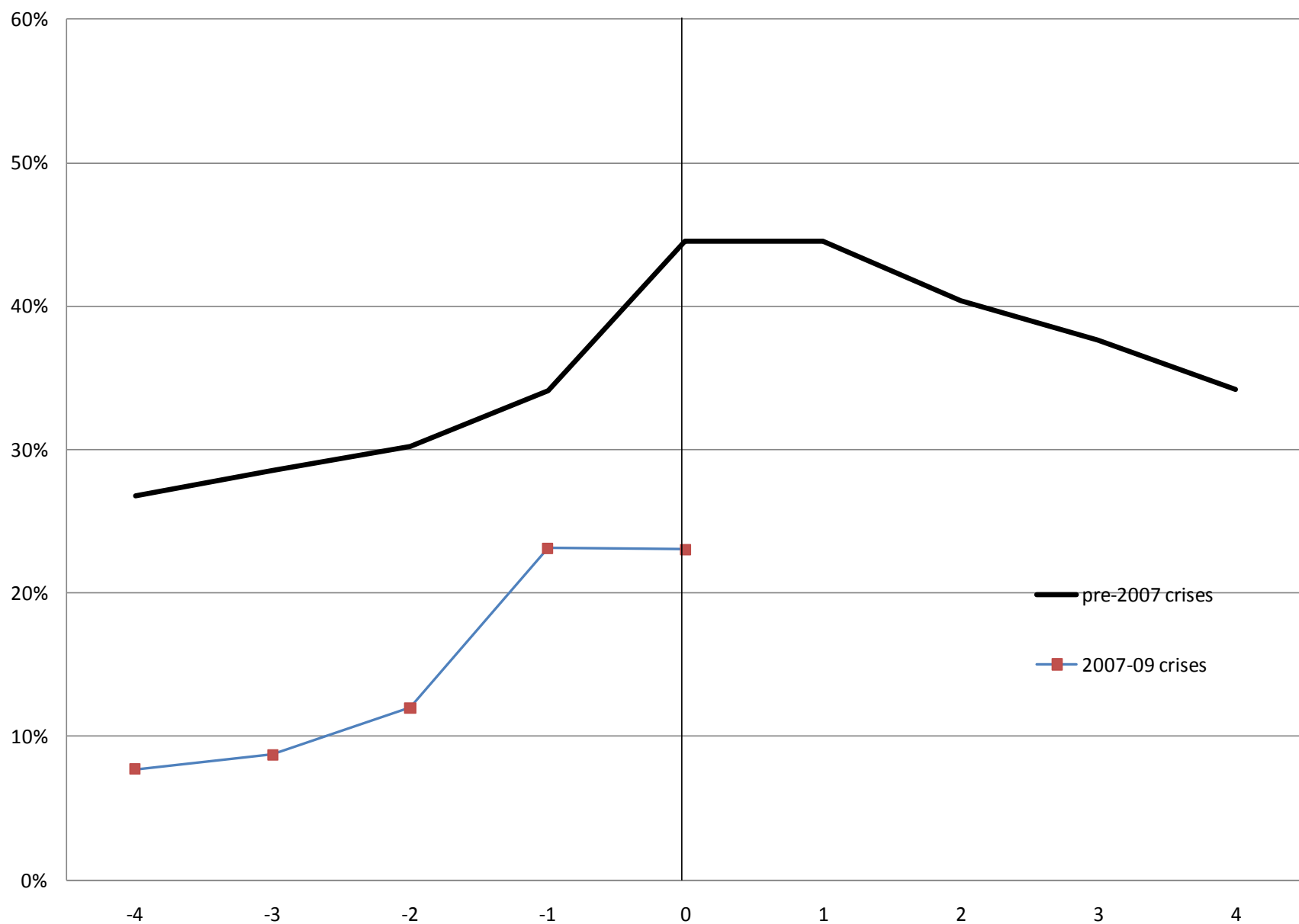


Figure 3: Net External Equity Liabilities Around External Debt Crises
(cross-country mean as percent of GDP)

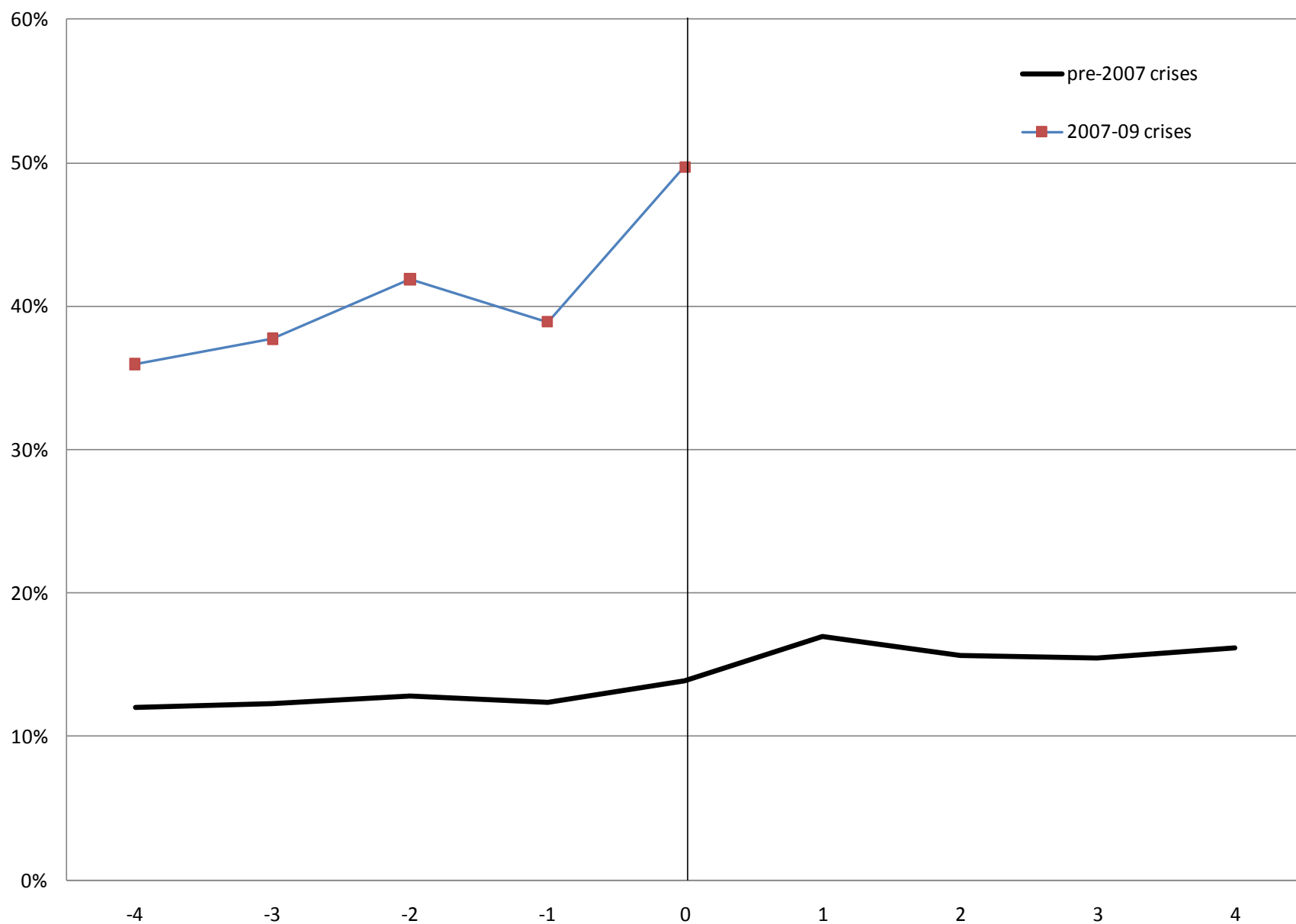
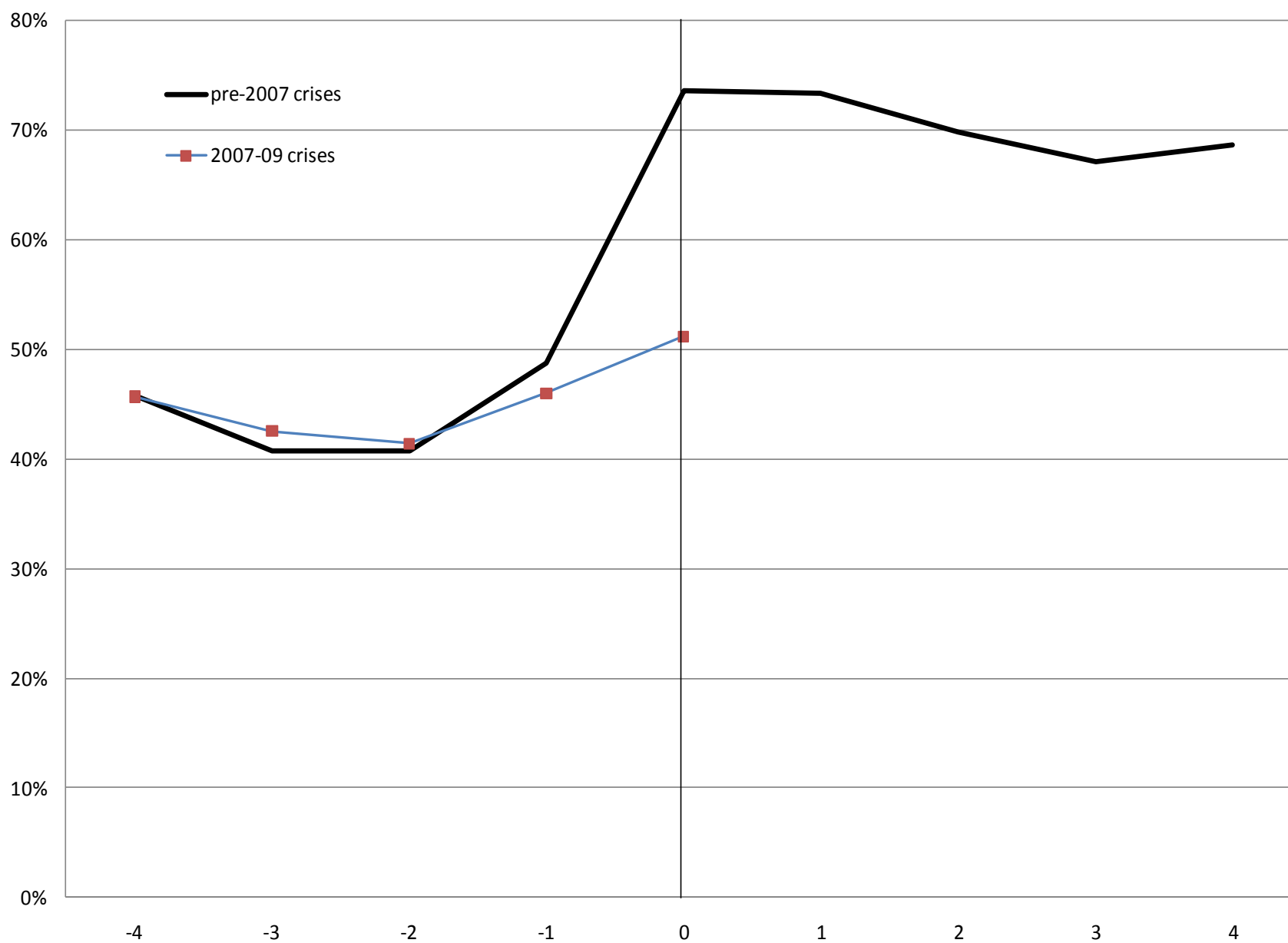


Figure 4: Gross Total Public Debt Around External Debt Crises
(ratio to GDP)



**Figure 5. Fiscal Balances in the run-Up to External Debt Crises
(ratio to GDP)**

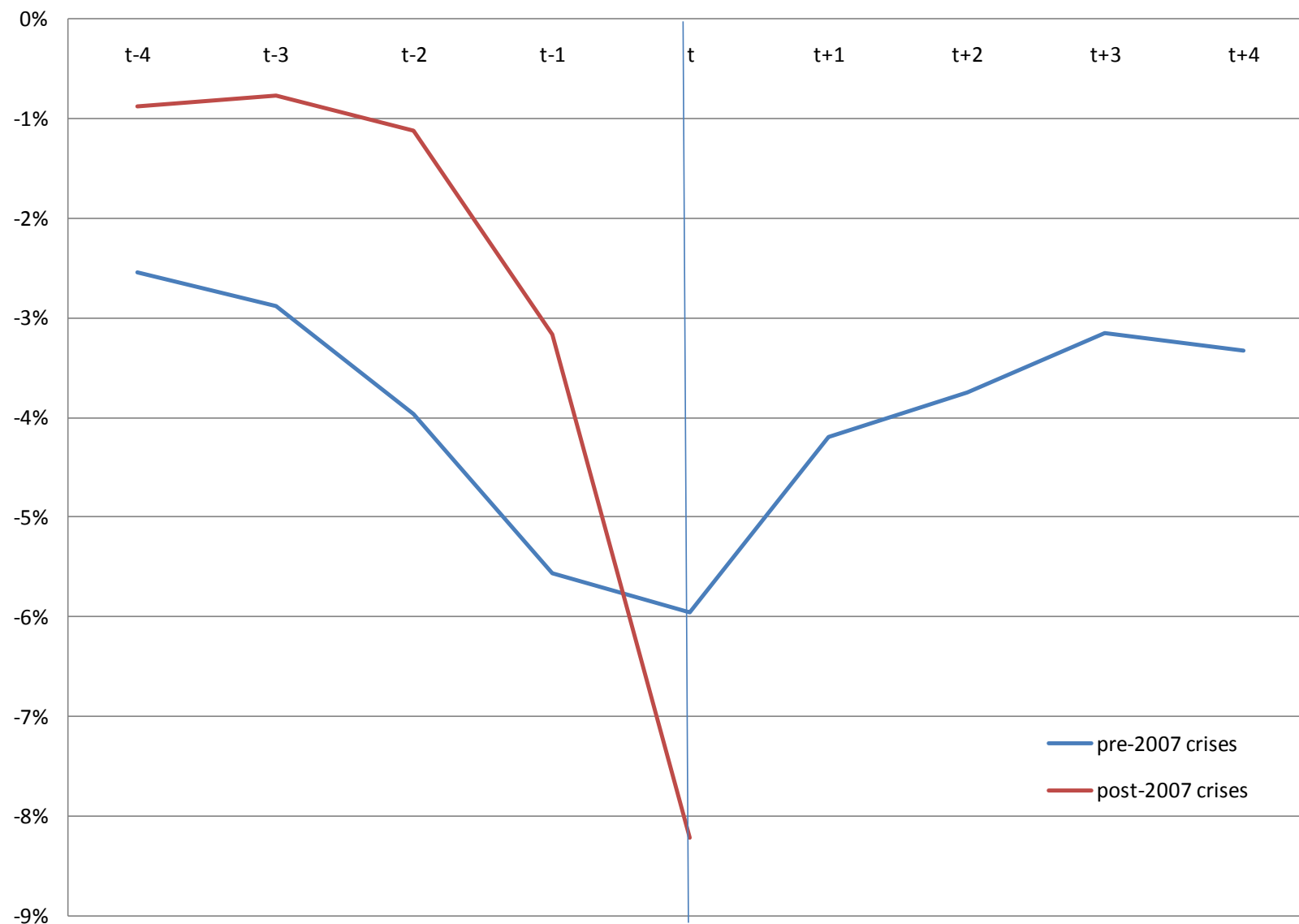
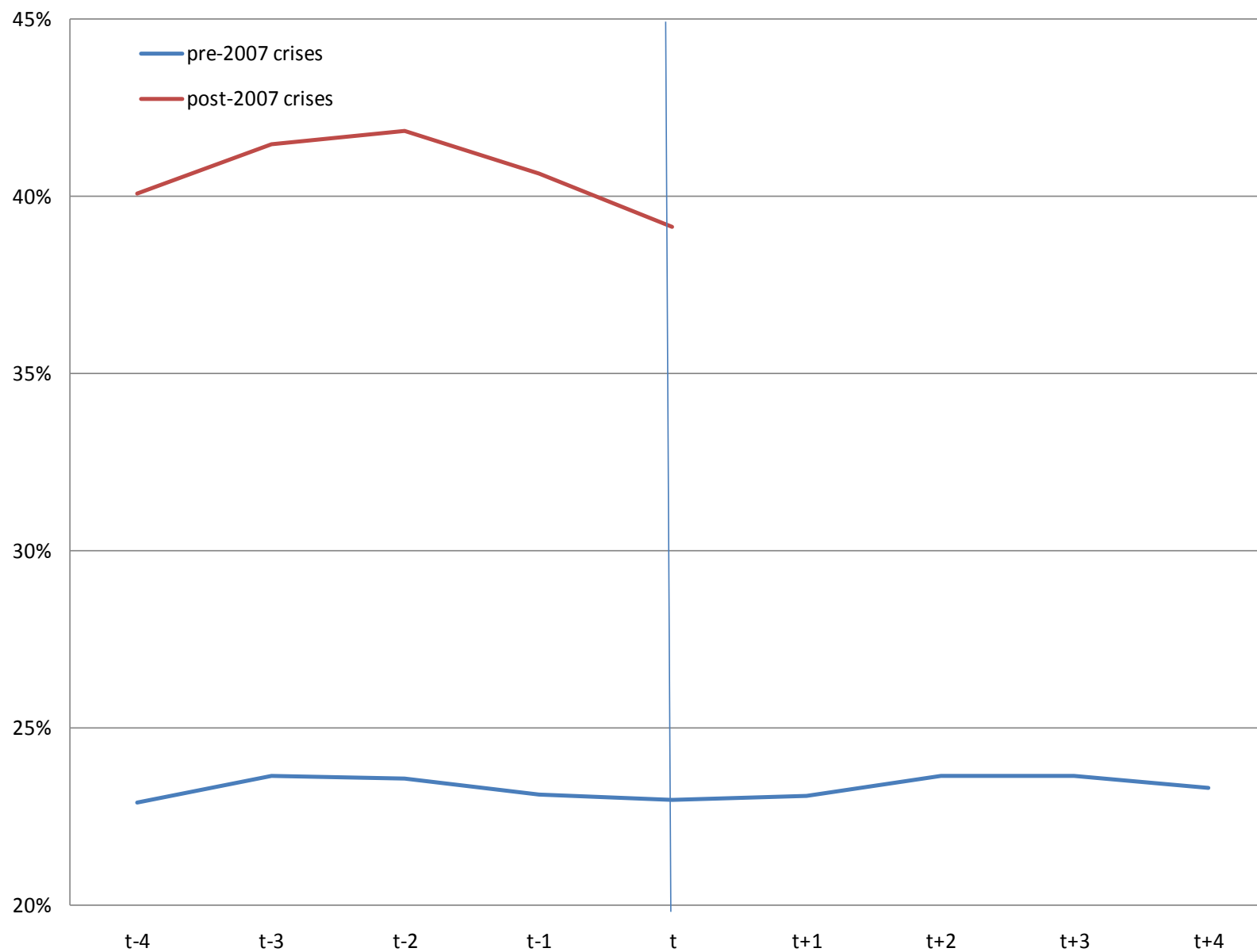


Figure 6: Real GDP Around External Debt Crises
(in deviations from a HP-filtered trend)



**Figure 7. Fiscal Revenues in the run-Up to External Debt Crises
(ratio to GDP)**



**Figure 8. Sovereign Spreads in the run-Up to External Debt Crises
(percent)**



Figure 9

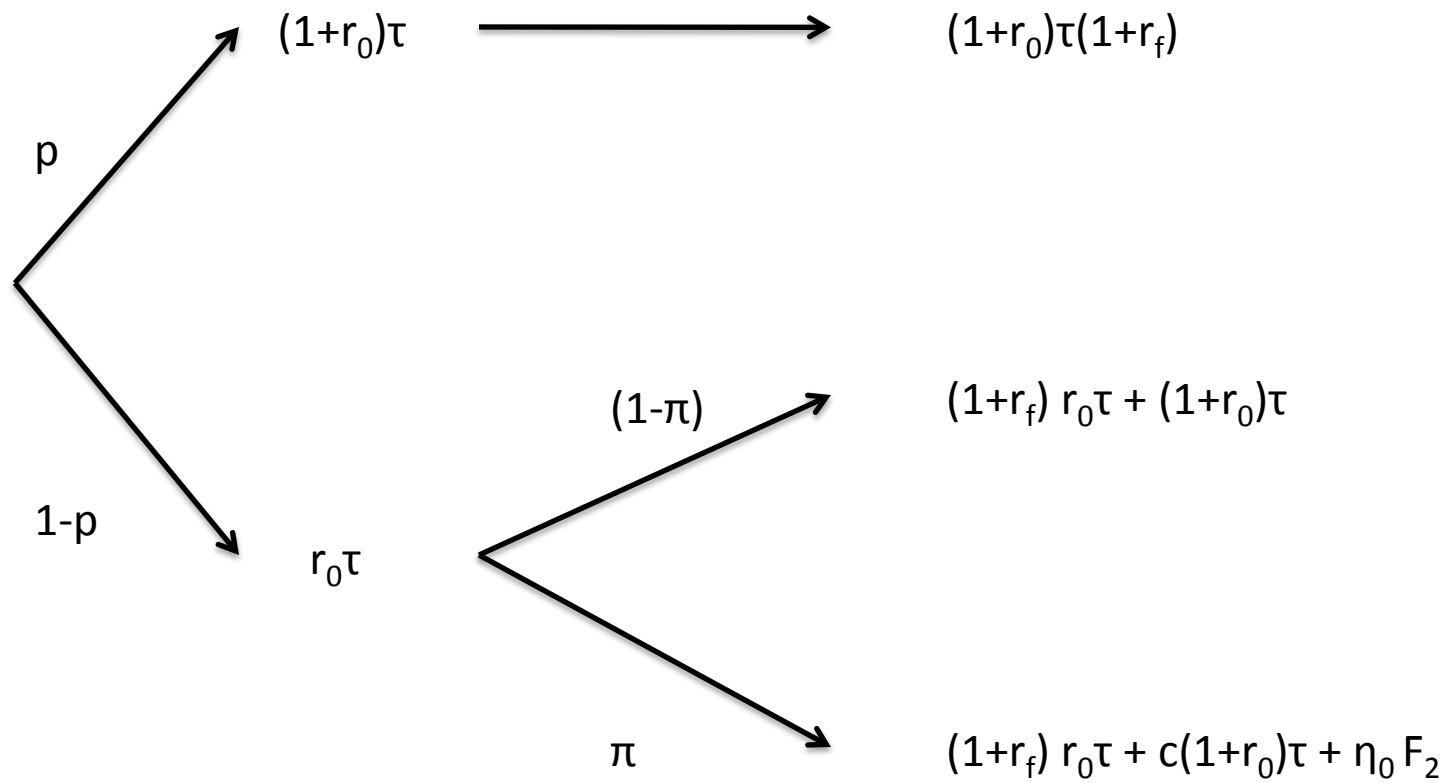


Figure 10

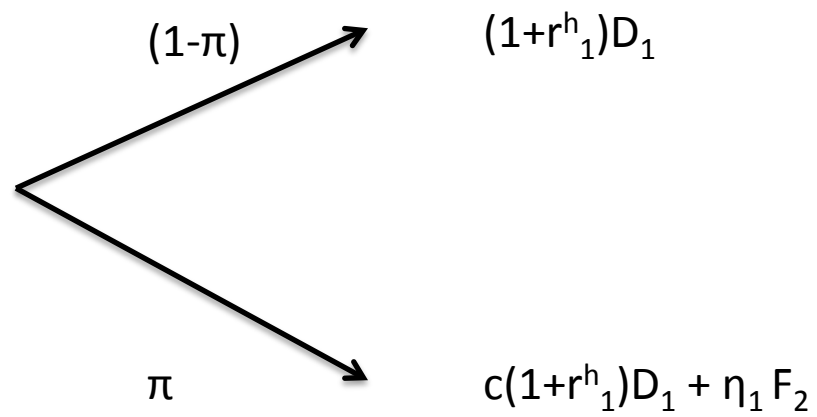
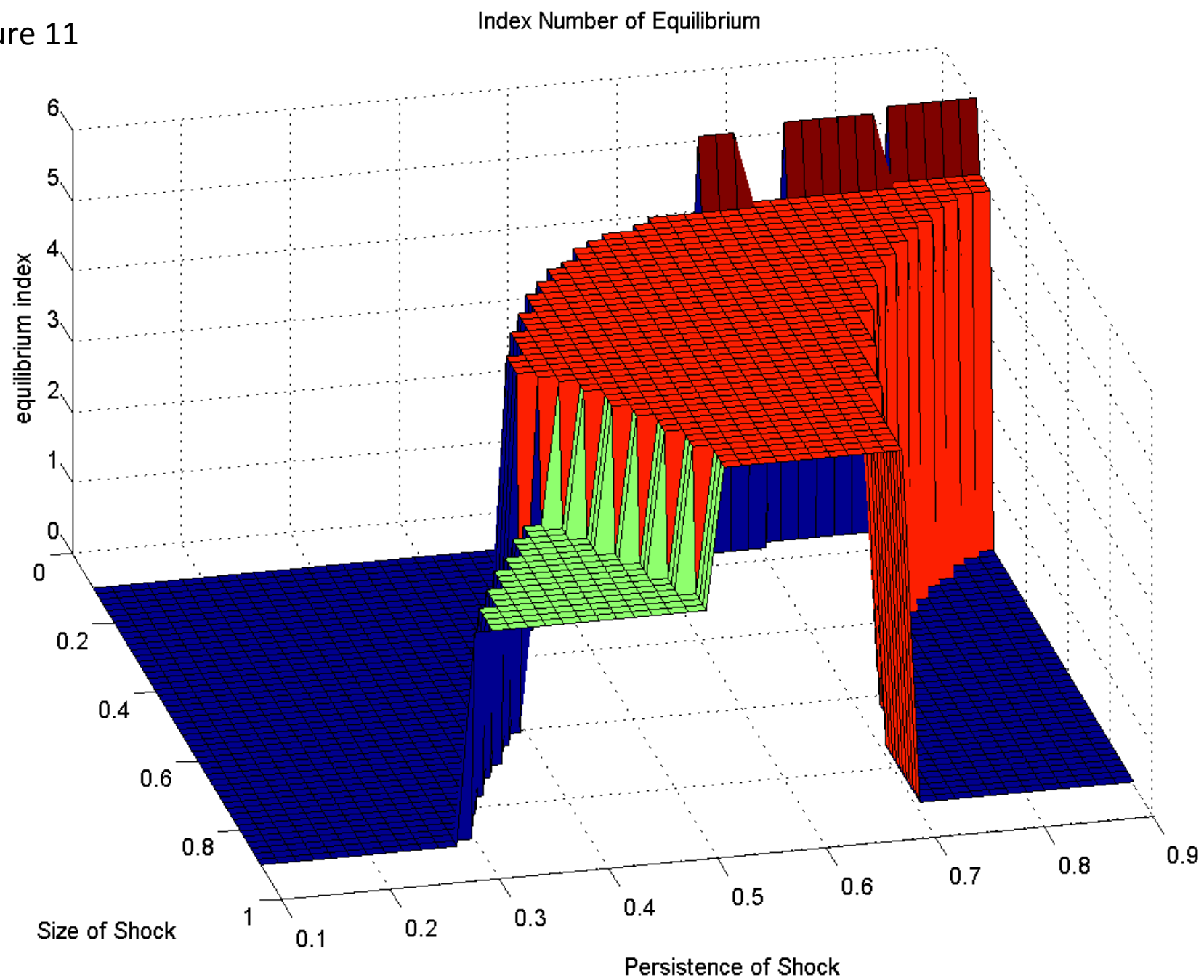


Figure 11



Size of Sudden Stop / Reinvest-Refinance Interest Rate

Figure 12

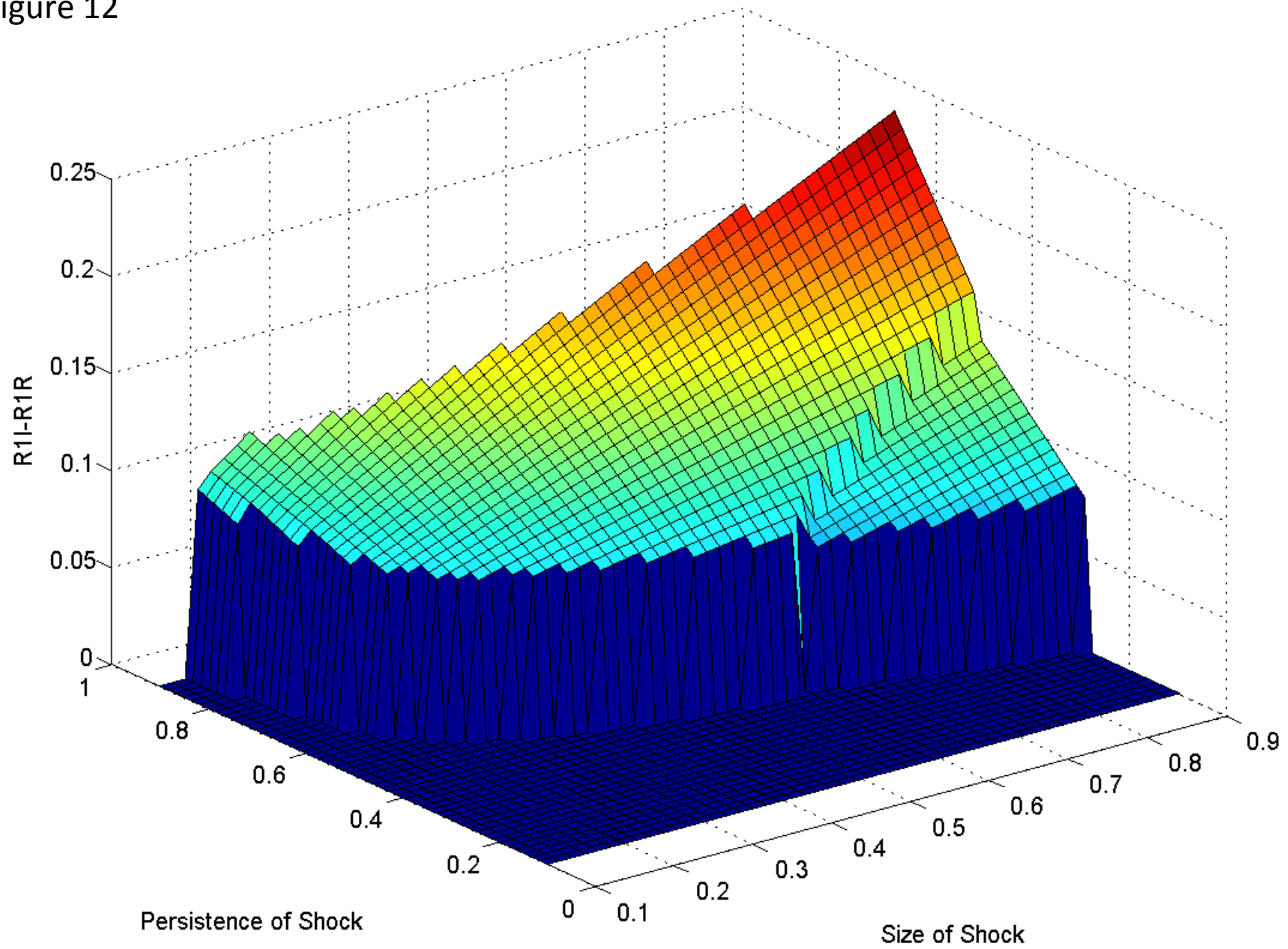


Figure 13

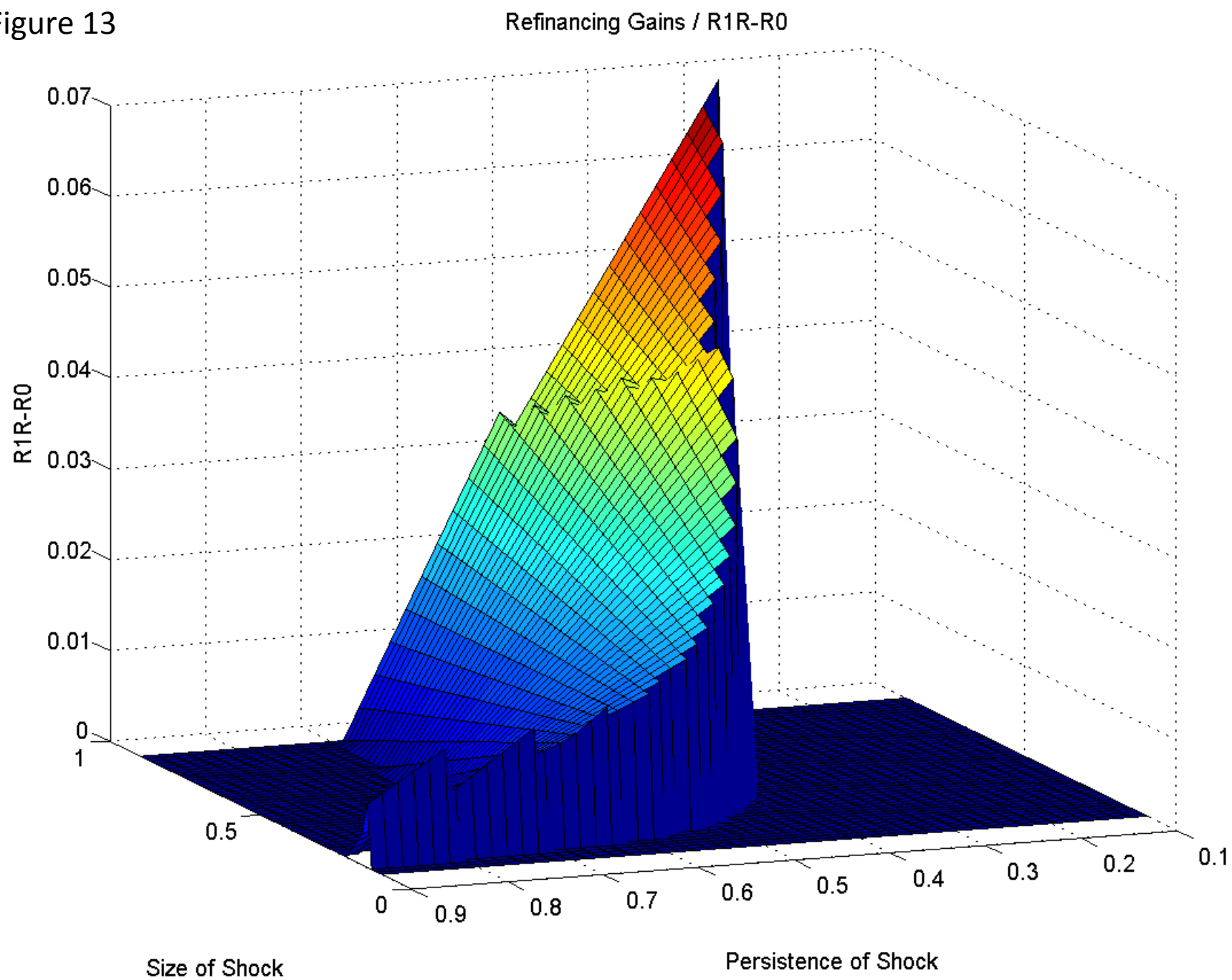


Figure 14

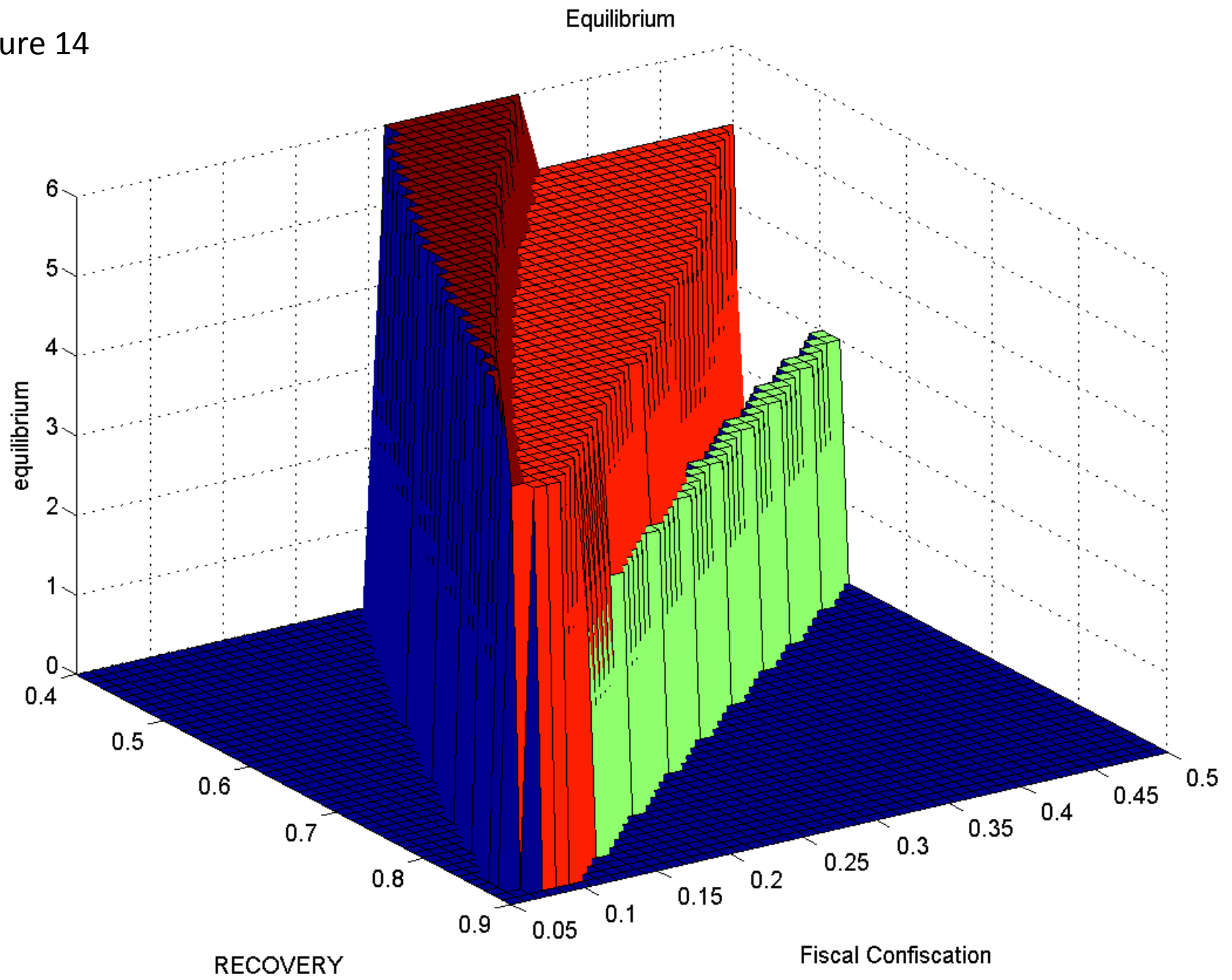


Figure 15

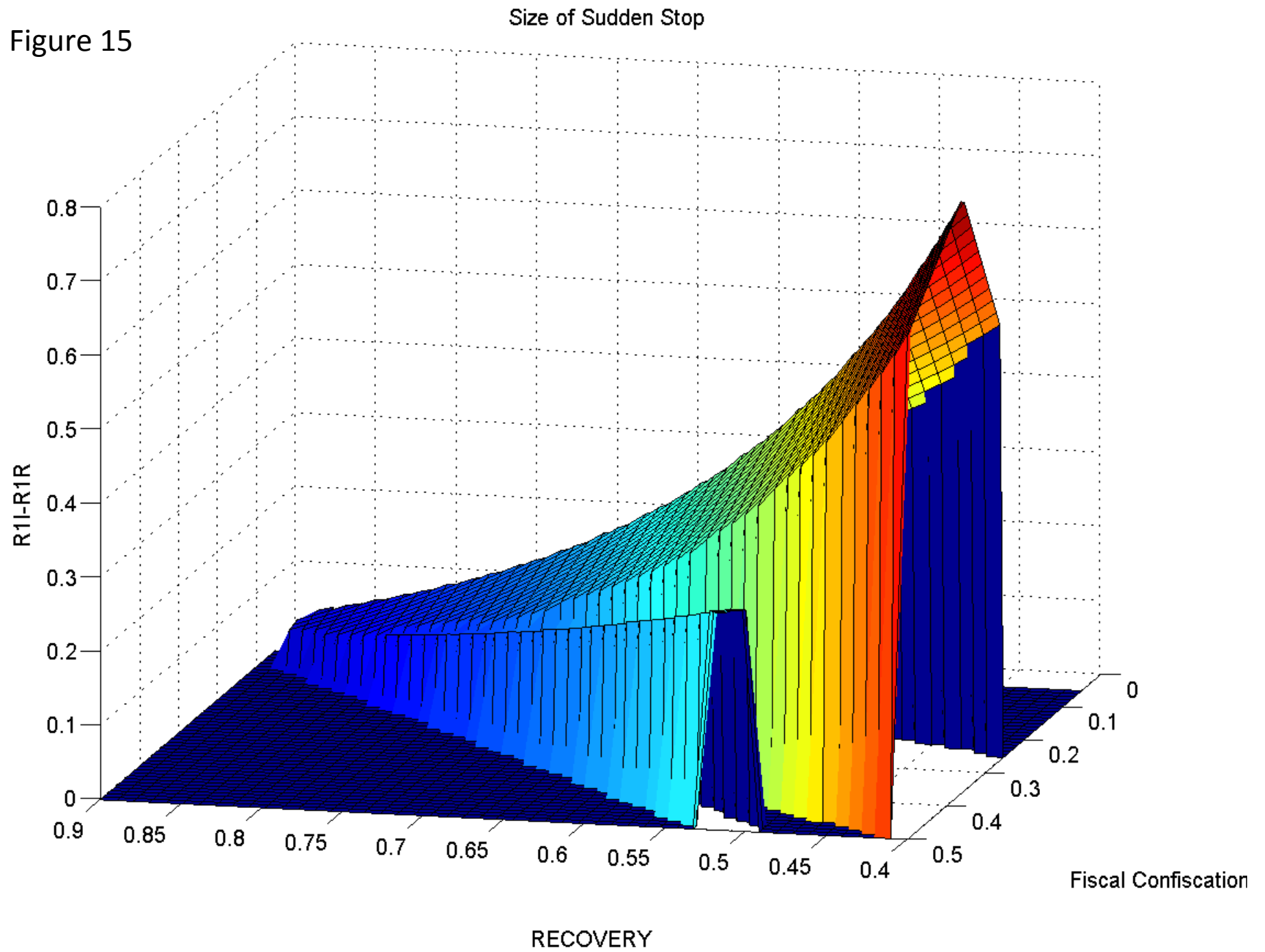
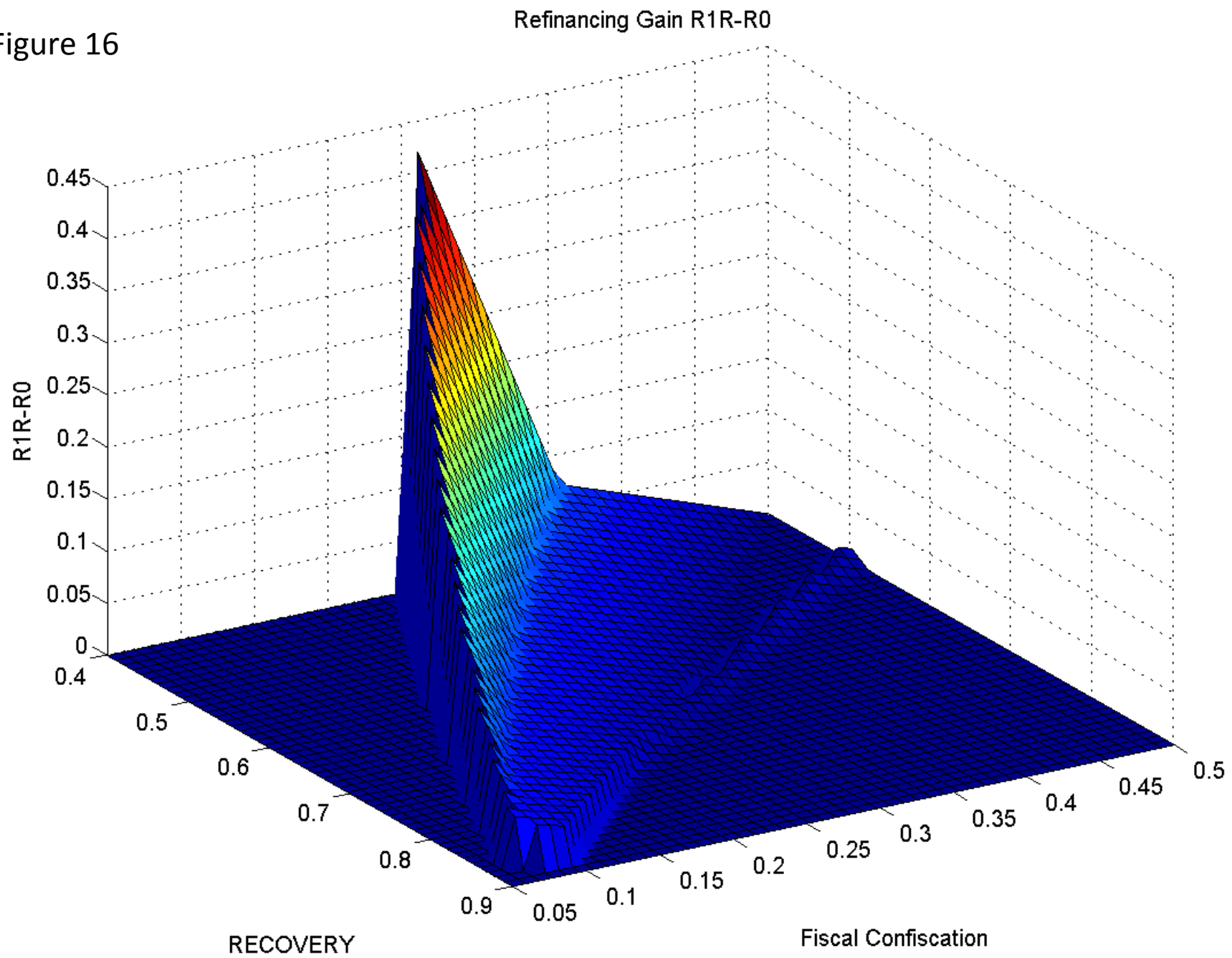


Figure 16



A. Country List From Which Crisis Events were Sampled				B. Debt Crisis		
				Events		
Argentina	Hong Kong	Pakistan	1982	Argentina	2002	Moldova
Australia	Hungary	Panama	1995	Argentina	1983	Morocco
Austria	Iceland	Peru	2001	Argentina	1983	Nigeria
Belgium	India	Philippines	1983	Brazil	2002	Nigeria
Brazil	Indonesia	Poland	1999	Brazil	1998	Pakistan
Bulgaria	Ireland	Portugal	2009	Bulgaria	1984	Peru
Canada	Israel	Romania	1983	Chile	1983	Philippines
Chile	Italy	Russia	1981	Costa Rica	1997	Philippines
China	Japan	Serbia	1982	Dominican	1981	Poland
				Republic		
Colombia	Jordan	Singapore	2003	Dominican	2009	Portugal
Costa Rica	Kenya	Slovak Republic	1983	Republic		Romania
Croatia	Korea	Slovenia	1999	Ecuador	1982	Romania
Cyprus	Latvia	South Africa	1999	Ecuador	2009	Romania
Czech Republic	Lithuania	Spain	2008	Ecuador	1998	Russia
Denmark	Luxembourg	Sweden	1984	Egypt	1992	Serbia
Dominican Republic	Macedonia	Switzerland	2009	Greece	2009	Serbia
				Hungary		South
Ecuador	Malaysia	Taiwan	2008	Iceland	1985	Africa
Egypt	Malta	Thailand	2009	Indonesia	2009	Spain
El Salvador	Mexico	Turkey	1998	Ireland	1997	Thailand
Estonia	Moldova	Ukraine	2009	Jordan	1978	Turkey
Finland	Morocco	United Kingdom	1989	Kenya	1999	Turkey
France	Netherlands	United States	1994	Korea	1998	Ukraine
Germany	New Zealand	Uruguay	1982	Korea	2009	Ukraine
Greece	Nigeria	Venezuela	1998	Latvia	1983	Uruguay
Guatemala	Norway		2008	Malaysia	2003	Uruguay
			1998	Mexico	1983	Venezuela
			1982	Mexico		
			1995	Mexico		