Are Government Bonds Bad for Banks? Evidence from a Rare Fiscal Shock

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Abstract

We identify the effect of government debt exposure on financial sector performance. We use confidential balance-sheet and portfolio data for the universe of banks in Turkey between 1986–2012. The identification relies on a natural experiment. Government hit by a major fiscal shock as a result of the 1999 Marmara Earthquake that led to public insolvency. Using a differences-in-differences methodology, we compare the performance of banks with high exposure to government debt against the banks with low exposure before and after the earthquake. Banks who hold a significant amount of government securities on their balance sheets got hurt relatively more than banks with less exposure. Results are not driven by the extensive margin, i.e., the banks that were taken over by the government during 2001 crisis. We rule out alternative stories on selection and customer demand in Marmara region. Falsification exercises show that government bonds are bad for banks only when government debt unexpectedly becomes unsustainable.

JEL: E32, F15, F36, O16

Keywords: banking crisis, sovereign crisis, earthquake, public debt, investment

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I Introduction

The connection between a stressed banking sector and a troubled sovereign is at the heart of the recent European financial crises. This has been a common and a reoccurring phenomena in the emerging markets during the last 30 years, where banking and sovereign crises go hand-in-hand, not only because of high levels of external debt but also often hidden domestic debt.[1] Public sector intervenes after a banking crisis, assuming private debts, which in turn reduces sustainability of its own debt, as recently happened in Iceland and Ireland. It is also common that fiscal troubles of the sovereign can lead to the demise of the banking system, as in Greece. Such linkages between sovereigns and banks can be catastrophic especially in a currency union, where banks in healthy members are exposed in large quantities to the sovereign debt of the troubled members.

Identifying the effect of banking crises on sovereign defaults and/or the effect of sovereigns' fiscal unsustainability on banking failures requires to address the two way nature of this relationship given the fact that causality runs both ways.[2] In addition, many other factors such as domestic credit expansion and external debt accumulation drive both of the phenomena. Yet, it is important to know the magnitude of each effect from a policy perspective. It is not a surprise that government default can endanger domestic bank stability but it is impossible to identify such an effect at the time of default. At such a moment, or before in expectation, banks can be induced to buy more government debt to satisfy regulation or take more risks in the expectation of a bail out, or try to get rid of the bonds since the value of government debt might collapse with the bail out (Acharya, Drechsler, and Schnabl (2013)).

Such selection issues will cloud identification. We want to know the economic impact

[1] Reinhart and Rogoff (2008).

[2] The empirical literature in general only focuses on one side of this two-way relation. Two exceptions are Panizza and Borenstein (2008) and Reinhart and Rogoff (2010). The first paper finds that probability of a banking crisis conditional on a sovereign default is much higher then the unconditional probability, whereas probability of default conditional on banking crisis is only slightly higher. The second paper finds the opposite result that banking crises are the most significant predictors of defaults.

of the debt overhang on the financial sector when the safe government debt becomes risky in an unanticipated fashion, i.e., if government debt stops being safe unexpectedly without allowing banks to respond in advance?

We provide a well-identified estimate of such an effect, namely, direct evidence on how a fiscally unsustainable sovereign brings down the domestic banking sector. We do so using a natural experiment and utilizing data on confidential monthly regulatory balance-sheet and portfolio reporting of the universe of Turkish banks between 1986–2012. Our natural experiment is a large exogenous fiscal shock, which helps us to identify the link from fiscal stress to banking crises. The natural disaster that generates the fiscal shock, i.e. the 1999 Marmara Earthquake, is clearly an exogenous event.

Our identification strategy relies on the size of the fiscal shock and existence of variation in government debt holdings. We use a differences-in-differences strategy, where our estimates will be identified from the *relative* difference between banks with low and high exposures to government debt, before and after the earthquake. Keeping the exposures fixed (predetermined) or letting them change over time does not matter in our context since the treatment (earthquake) is a completely unexpected event. It is unlikely that banks accumulate or run down government debt in expectation of the earthquake. To be a threat to our identification, it has to be such that banks who hold more government securities on their balance sheets must be affected from earthquake more, which is not the case given the extent and nature of the region affected by the earthquake, where each of our banks has a presence.

In terms of the size of the fiscal shock, this earthquake is very significant. On August 17, 1999 and November 12, 1999 , two big earthquakes (at a Richter Scale of 7.6 and 7.2, respectively) hit industrial heartland of Turkey, composed of cities such as Kocaeli, Sakarya, Duzce, Bolu, Yalova, Eskisehir, Bursa and Istanbul. The region's population share in country total is 25 percent and GDP share is 50 percent. Total cost of the disaster is estimated to be 20 billion USD, which makes of 11 percent of GDP as of 2000. To put this event in context, the ratio of damaged buildings (including key industrial/chemical factories) is 4 times higher

than 1995 Kobe earthquake and 12 times higher than 1994 Northridge earthquake. The Marmara Earthquake is listed in top ten in the U.S. Department of Commerce Significant Earthquakes database on all earthquakes recorded in history.

To compare banks' performance with different exposures to government debt before and after the earthquake, there needs to be enough variation in debt holdings across banks and over time. This is the key variation for our identification. Why do banks differ in terms of such holdings? There is a growing literature on the causes of such holdings in the light of the European crisis. In any country, banks tend to be heavily exposed to debt of their own countries and also hold debt of foreign country sovereigns (Blundell-Wignall and Slovik (2010)). Theory provides several answers on the reasons of such holdings. First, government debt is held because it is deemed as a risk free asset that provides liquidity services to banks (Holmstrom and Tirole (1998), Bolton and Jeanne (2011)). According to this view, during normal times government bonds are needed for healthy operation of banks but they can be toxic during the default. In fact holding your own sovereign's debt is part of normal business and cannot be deemed risky given the moral hazard and/or home bias issues.

Second, banks hold government debt in order to chase returns/take risk in anticipation of a debt crises (Acharya and Steffen (2013)). This is relevant especially when banks have a portfolio of different sovereigns debt and re-balance constantly as part of their portfolio optimization. And, third, government induces banks to hold its' bonds either through regulation or moral suasion/financial repression (Broner et al (2013)). It is not straightforward to separate home bias from moral suasion unless there is an exogenous shock that helps to differentiate between the two. According to return chasing and moral suasion views detrimental effects of holding government bonds during crisis times can surpass beneficial effects of such holdings during normal times. Using an extensive worldwide bank-level data set from Bankscope, Gennaioli, Martin, and Rossi (2012) find that liquidity view dominates, while Acharya and Steffen (2013) show support for the risk taking view (a carry trade of different sovereigns) in the European context using data on listed banks. Buch, Koetter and Ohls (2013), does not find support for the risk taking view in Europe and show substantial

heterogeneity in the sovereign bond holdings of German banks that can be explained by fixed bank characteristics such as being large and/or poorly capitalized.

The case of Turkish banks is somewhere between. In the absence of shocks banks clearly hold these bonds for liquidity purposes but in the light of bank and government specific shocks they might take more risk thorough such holdings and also coerced by government to hold more. A series of events in 1990s, such as Asian and Russian crises, led to an increase in public sector borrowing requirement and forced the government to coerce banks via means of higher interest rates to increase their exposure to government debt. Banks dramatically change the composition of their portfolio from private sector lending to lending to government during the course of these events. At the same time, banks also increased their risk exposure to other sectors feeling safe based on their government paper dominated portfolio. Government bonds are the highest value collateral in Turkey. Notice that this is an alternative channel of risk-taking by banks compared to the one emphasized in the advance country context, that is the low interest rate environment. Thus, the extensive variation in government bond holdings in Turkey is explained as part of the risk-return decision of banks, where large banks operate in capital intensive sectors may need more government paper as collateral or take more risks than others and such needs will vary over time.

We find that banks with higher exposures to government debt pre-earthquake have witnessed declining capital and equity values and profits after the earthquake. These effects are very significant economically and have a direct impact on investment and real economy through hindered domestic credit expansion: A typical bank whose government securities share in total assets is 13 percent, which corresponds to the median of the distribution as of July 1999, witnesses 2.9 percentage point decline in profits to assets ratio and 2.1 percentage point decline in ratio of bank capital (shareowner's equity) to total bank assets. These effects are sizeable since they correspond to a decline of 81 percent in profits and 11.4 percent in capital relative to the pre-earthquake mean respectively. Such a bank also faces a 1.4 percentage point increase in probability of being taken over by Savings Deposit Insurance Fund (SDIF) relative to pre-earthquake mean. These estimates are the upper bounds since they

include both extensive margin (due to exiting banks after being taken over by SDIF) and intensive margin. When we use our most conservative sample (i.e., the banks who were never taken over by SDIF throughout the post earthquake and the financial crises period), our estimates are still large: approximately 1 percentage point erosion in bank capital to assets ratio and 1.2 percentage point erosion in bank profits, where both represent approximately a 25 percent decline in these outcome variables.

Overall, our paper has two key contributions. First, it provides direct causal evidence on the link between sovereigns and banks where causality runs from sovereign's insolvency to bank performance. Second, our paper offers evidence on public debt overhang, highlighting a specific mechanism. The traditional channel works via the effect of higher long-run real interest rates and distortionary taxation on crowding out private investment (Barro (1979), Krugman (1988)). However, the empirical evidence on such a channel is lacking. As shown by Reinhart, Reinhart, and Rogoff (2012) and others, the relation between public debt, investment and growth can be non linear, where public debt can affect long-run growth negatively both for low or high real interest rate environments, especially if there is financial repression. These findings suggest an alternative mechanism might be at play. Gennaioli, Martin, and Rossi (2012) develop a model where sovereign defaults weaken banks' balance sheets because domestic banks hold the sovereign bonds, yielding a complementarity between domestic credit and public debt. Our results provide direct evidence on such a channel, where these type of effects can be realized even without an outright default once the fiscal situation of government is deemed unsustainable. In our case, this is triggered by the unanticipated exogenous fiscal shock, the earthquake. In this vein, our results have important implications for the current European crisis since due to weakened banks the "lending-channel" cannot operate and private sector investment can be sluggish even in a

low interest rate environment.[3]

In relation to the sovereign debt literature our paper sits at the juncture between domestic debt and external debt. Gertler and Rogoff (1990) show that a country's financial institutions shape its external borrowing by affecting the share of output that can be pledged as collateral to foreigners. Gennaioli, Martin, and Rossi (2012) and Broner, Martin, and Ventura (2010) show that this external collateral constraint can be internalized if domestic banks hold the public debt and/or if foreigners can sell the sovereign debt in the secondary market to domestic agents. In the case of Turkey, most of the public debt was held by the domestic banking sector. As argued by Reinhart and Rogoff (2011), this is a common emerging market phenomena that explains sovereign crisis and defaults at very low levels of external debt.

We proceed as follows. Section 2 discusses the background in Turkey. Section 3 lays out the identification methodology. Section 4 presents the data. Section 5 undertakes the empirical analysis and Section 6 concludes.

II Background: Turkish Case

Turkey liberalized the foreign trade and launched an export-led growth program in 1980. Initially, this policy has lead to a substantial increase in the growth performance. However, starting from the second half of 1980s, the fiscal performance deteriorated, resulting in an increase in public sector borrowing requirement, which led to the liberalization of the capital account in 1989. This step allowed the government to finance its borrowing requirement using the capital inflows intermediated by the banking sector, thanks to the managed floating exchange rate regime as well as the explicit guarantees to the banks' deposit liabilities. In particular, as typical in many emerging markets those days, the exchange rate policy was

[3]To clarify: we are not saying the Turkish case constitutes a low interest rate environment since it was not during the period we study. Our point is simply that we provide direct evidence on the channel of fiscally unsustainable governments affecting the financial sector negatively that will hinder investment; a channel relevant for the advanced countries currently.

geared towards trying to keep depreciation of the Turkish lira against foreign currencies below the difference between the return on government debt and the world interest rate. However, this implied a rapid surge in short-term foreign debt as well as loss in the external competitiveness by late 1993, which later brought about the massive economic crises in 1994. Concerns about the government debt dynamics were high and hence a sharp devaluation and an increase in inflation were the situation in the aftermath of 1994 crisis. This "financial repression" helped partly inflating away the government debt. The 1994 crisis also resulted in the take-over of 3 private banks by the Savings Deposit Insurance Fund. As a result of these takeovers, government extended the existing guarantee on the deposits banks in a way to cover the entire deposit liabilities.

The public sector borrowing requirement continued to be an important issue for the Turkish economy in the post-1994 period. As can be seen in Figures 1a and 1b, the sustainability of the government debt remained a key issue in the second half of 1990s, thanks to the domestic factors such as the political instability and the series of foreign shocks such as the Asian crises of 1997 and the Russian Crises in August 1998. Figure 1a plots the public sector borrowing requirement which is akin to consolidated budget deficit. In the light of growing interest liabilities, primary budget records a surplus as an attempt to keep fiscal situation sustainable. As shown in Figure 1b, domestic debt was the culprit for high debt/GDP ratio during this period, while external debt was more manageable.

While Asian Crisis in 1997Q3 constituted the first shock to Turkish banks that borrow internationally, the major shock was observed in 1998Q3 when Russia devalued its currency and defaulted on its debt. This resulted in a large decline in exports, as Russia was second largest exports market for Turkey, a massive capital outflow of 7.2 billion USD - constituting one third of the FX Reserves of Central Bank of the Republic of Turkey, CBRT and a discrete jump in nominal interest rates on government securities from 77 percent to 137 percent within a 1.5 months (see Figure 2).

During this period, the banking sector's portfolios gradually shifted towards the domestic

government debt). The changes in the government's financing needs and the increase in the return on holding government debt made the domestic government debt instruments attractive for the banking sector. As a result, Turkish banking sector's government bond and bill holdings as a ratio of total credit extended to non-financial sector doubled within two years, as shown in Figure 3, that plots this ratio for the average bank. Figure 4 plots the share of government securities in bank's total assets for the average bank and shows an increase of approximately 6 percentage points between 1997 and 1999. It is worth noticing that there is a lot of time series variation in this ratio, which indicates that the decision to hold government paper is part of the portfolio optimization problem of banks instead of fixed bank characteristics.[4] Figure 5 presents a similar picture using flow-of-funds type aggregate data, plotting credits to non-financial sector as a ratio to total assets, where this ratio falls slightly below 30 percent from approximately 42 percent.

The tipping point for the sustainability of the Turkish government's debt has occurred in August 1999, when the Turkey was hit by one of the largest earthquakes in world history in terms of the number of causalities and as well as the economic cost. This was followed by the second earthquake in November 1999, which made an economic program directed towards maintaining the debt sustainability inevitable. On December 9, 1999, the Government and the CBRT announced the program aiming at reducing inflation and restoring the fiscal balance, which involved a 36-month Stand-By agreement with the IMF.[5] On the monetary policy side, this program entailed a pre-announced exchange rate path for Turkish lira against the currency basket composed of US dollar and Euro, determined in line with the year end inflation targets. Following a 18-month crawling peg period, the program envisioned a gradual exit to floating exchange rate regime via gradually widening crawling band regime planned to be implemented in July 2001–December 2002 period. Another aspect of the monetary policy implemented in the context of the Stand-By program was a tight band

[4]In Appendix we plot this same ratio by bank type over time.

[5]See Özatay and Sak (2002) for an account of the 2000 Stand-By program and 2000–2001 Financial Crises in Turkey.

around the daily values of the net domestic assets of the central bank. This would imply that there would be limited policy space for using open market operations for liquidity provision to the money market or for sterilization of capital flows. As a result, the changes in net foreign assets of CBRT became the main source of the changes in the monetary base. The program also involved explicit austerity measures on government expenditures, an extensive privatization plan and the explicit government primary surplus targets as performance criteria.

Relative to pre-program period, the Stand-By brought about a rapid decline in inflation and interest rates, and a significant improvement in the primary fiscal surplus, leading to a lower ratio of debt to GDP and public sector borrowing requirement. On the other hand, the weaknesses in the banking system and the political uncertainties undermining the credibility of the structural reform agenda brought about concerns on the sustainability of the program in 2000Q4. In November 2000, one of the major banks was taken over by the SDIF, further raising concerns about the Stand-By, which led to the start of capital outflows. However, the official collapse of the Stand-By, triggered by a political crises, took place in February 2001, resulting in the free-float of Turkish lira after a sharp devaluation as well as a rapid surge in the inflation rates, nominal interest rates on government debt and one of the largest contraction episodes in the economic activity in Turkey. This also resulted in a substantial financial crises associated with a collapse of a number of private banks.

In May 2001, Turkey announced a new Stand-By program, aiming at maintaining the discipline in fiscal and monetary policy and restructuring the banking sector. The implementation of the comprehensive reform agenda in the period afterwards resulted in a substantial improvement in the economic fundamentals in the post-2001 period, including bringing the inflation to around 5-6 percent from 68 percent in 2001 and government debt to GDP ratio to 35-40 percent from 100 percent.

III Identification

We are interested in how a sovereign's fiscal problems can cause a banking crisis. We ask whether the higher level of exposure of a bank to government debt market has resulted in a lower performance and higher failure risk, when government debt becomes unsustainable as a result of an unanticipated fiscal shock. We consider changes in bank performance both at the extensive and intensive margins at the time of the exogenous fiscal shock. At the extensive margin, since we know the banks that are taken over by the SDIF, we ask whether the probability of being taken over increases with high level of exposure to government debt. At the intensive margin, we test whether banks' performance, measured by profit and equity, deteriorate with higher levels of government debt on their balance-sheets.

Denoting the outcome of interest by y_{it}, we can make use of Equation 1 for presenting the intuition behind our identification strategy:

$$y_{it} = \gamma_1 Earthquake_t + \beta_1 GovDebtExp_{it} + \beta_2 Earthquake_t \times GovDebtExp_{it} + \epsilon_{it} \qquad (1)$$

The key idea we are exploiting in this exercise is that a sizable exogenous fiscal shock that can not be anticipated can lead to a higher loss for the banks who devote a higher share of their total assets to the government debt. As mentioned above, this particular shock in our exercise is the 1999 Marmara and Duzce Earthquakes, represented by binary variable $Earthquake_t$ equal to one for every month between August 1999 and December 1999, and zero otherwise. Let us assume for simplicity that $GovDebtExp_{it}$ is a binary variable equal to 1 for the banks that are exposed and zero otherwise. Ideally, β_1 gives the effect of bank i's government debt exposure on the outcome at time t. However, since the banks adjust their government bond exposure considering the outcome variable in the case of anticipated changes in y_{it}, we can not rely on β_1 as the effect of the government debt exposure on the banks' performance (same logic can be applied for the effect of government default). Therefore, we need to compare how the performance difference between the exposed and non-exposed banks change with an unanticipated and totally exogenous change in governments' capacity to meet its debt obligations. β_2 in Equation 1 is a typical difference-in-differences estimator, showing how

the difference between the performance of the exposed and non-exposed banks differ before and after the totally unanticipated fiscal shock due to the sizable earthquake.

In practice, we run the following regression:

$$\begin{aligned} y_{it} &= \alpha_i + \lambda_t + \beta_1 Gov\ Debt\ Exp_{it} + \beta_2 Earthquake_t \times GovDebtExp_{it} \\ &+ \beta_3 Private\ Credit_{it} + \beta_4 Earthquake_t \times Private\ Credit_{it} \\ &+ \beta_6 Interbank_{it} + \beta_7 Earthquake_t \times Interbank_{it} \\ &+ \beta_6 CentBankExp_{it} + \beta_7 Earthquake_t \times CentBankExp_{it} \\ &+ \epsilon_{it} \end{aligned} \tag{2}$$

where i is bank, t is month and α_i and λ_t stand for bank-fixed effects and month-fixed effects, which control for the time-invariant unobserved heterogeneity across banks and all common shocks to the banks (including direct effect of the earthquake), respectively. We measure the banks' performance, y_{it}, with three alternative measures: the profits from bank's operations as a ratio to their assets, the bank's shareowner equity as a ratio to their assets and the binary variable called SDIF status which takes the value of 1 if the bank is under the control of the Savings Deposit Insurance Fund at time t and 0 otherwise.

We measure the government debt exposure, $Gov\ Debt\ Exp_{it}$, by ratio of banks' government security holdings to total banks' assets. As explained above, β_2 in Equation gives us how the difference in the outcomes of banks with low and high exposure to government debt differ before and after the exogenous shock, which can be interpreted as the causal impact of the exogenous fiscal deterioration on the banks' performance. However, in order to assure that we do not capture the effects of other events that might have affected the sustainability of the government debt, we also control interactions of government debt with the other major events that happened before and after the 1999 Marmara Earthquake, such as Asia Crises, Russia Crisis, Stand-by agreement, and 2001 crises. The direct effects of these events are absorbed by the month fixed effects.[6]

[6]We define the crises and other dummies as follows. Asian Crises is a binary variable equal to 1 between

Another possible channel that may contaminate our identification of impact of an exogenous fiscal shock would be the effect of earthquake on bank balance sheets via their other banking activities. For example, if the earthquake affects the costumer base of a bank as well as the return on the loans extended to the private sector by triggering a decline in economic activity, we may observe a deterioration in banks' performance regardless of whether the earthquake triggers a fiscal shock or not. To control for that channel, we also include the shares of credits to non-financial firms in total assets, $Private\ Credit_{it}$, the net balances with the interbank money market as a ratio to total assets, $Interbank_{it}$, and net balances with the central bank market as a ratio to total assets, $CentBankExp_{it}$, and the interactions of all these variables with the earthquake and the other 4 major events in our sample. These variables control for net positions and other hedges. Finally, we also control bank specific quarterly and yearly shocks through quarter-bank and year-bank fixed effects.

For the intensive margin, we also consider the subsample of banks who were not taken over by the SDIF. This exercise may be useful especially if there are concerns about the unobserved confounding features of the banks taken over by the SDIF, which would affect these banks' performance even in the absence of a fiscal shock. Although most of these factors will be taken care for by a bank fixed effect, we still run our regressions in a sample of surviving banks throughout the sample period in order not to bias our result if the banks were being taken over at the time of earthquake by chance were weak banks all along. Another possibility is that these inherently bad banks change their government debt exposure at the time of earthquake by coincidence.[7] In order to address these concerns, we test if the banks who could manage to survive would still face a profit and equity loss in the case of a fiscal shock. Notice that this exercise is expected to provide smaller estimates since by focusing on a subsample of surviving banks although we address the claim that bad performers were

July 1997–December 1997. Russian Crises is a binary variable equal to 1 between August 1998–December 1998. Earthquake is a binary variable equal to 1 between August 1999–December 1999. Stand-By is a binary variable equal to 1 between January 2000–June 2000 and finally 2001 Crises is a binary variable equal to 1 between December 2000–December 2002.

[7]Only 8 banks are taken over in 1999, so this is not likely to affect our results.

bad banks anyway and would have failed even without the fiscal shock, we also do not use valuable information on banks who may have become bad performers exactly because they kept government debt on their balance sheet, which deteriorated substantially the bank's profits and equity as a result of the exogenous fiscal shock. These banks are the ones who may perform reasonably in the absence of the fiscal shock.[8]

IV Data and Descriptive Statistics

We use confidential and regulatory monthly bank balance sheet data from Turkey for 1986–2011 period. This data is collected regularly as part of the *Monitoring Package,* which is the data collection and processing system for monitoring and regulation purposes. All the banks operating within Turkey are obliged with reporting their balance sheets as well as some extra items by the end of month to the regulatory and supervisory authorities, such as CBRT and the Banking Regulation and Supervision Agency (BRSA). Besides the data on the balance sheets, we also use the extra reporting of the banks, such as the decomposition of the banks' securities portfolio including the information on which particular securities are held by banks by the end of each month, net debtor positions against domestic and foreign creditors and the currency denomination of assets and liabilities through interbank operations, which are not publicly available.

The banks in our sample are all banks operating within Turkey, regardless of the ownership status or the classification with respect to the main activity -such as deposits banks or investment banks, except the so-called *Participation Banks*, which are not engaged in any interest-bearing operations in order to comply with Islamic rules. At the end, our sample covers more than 99 percent of the entire banking industry at any point in our sample period.

[8]Note that if the claim on bad banks will fail anyway is true and we fail to control for it then a diff-in-diff strategy should not give us any result since this strategy identifies off of the relative difference between bad and good banks at the time of the earthquake. We come back to this point when we do our placebo earthquake exercise.

In terms of the number of banks, the Turkish banking industry has experienced important variations over time as shown in Figure 6. While there were 49 banks (6 of which being state-owned deposit/savings banks) in 1986, the number of banks reached 81 (4 of which being state-owned deposit/savings banks) by the end of 1999. However, in 1999–2003 period, the number of banks has declined substantially due to the series of events including the financial crises in 2000–2001 period. In particular, if the regulatory agency observes a private bank to experience a decline in its capital adequacy ratio resulting from losses due its operations, then the bank is asked to add new capital and to improve the balance sheet quality. However, if the bank fails to take necessary actions and bank's capital adequacy ratio falls below the legal limit, then its control is taken over by SDIF to provide immunity to the depositors as well as to limit the risks to the banking system. In the aftermath of the 2001 crises, the weak capital structure of the Turkish banks resulted in a number of takeovers. As a result, in 2000–2004 period, a total of 25 banks were taken over by SDIF. Also, a number of mergers and acquisitions resulted in a decline in the number of private banks in Turkey in the post-crises period, resulting in a total of 45 banks operating in Turkey as of end of 2011.

Table 1 presents the key descriptive statistics of our analysis. We observe a significant cross-sectional heterogeneity with respect to holdings of government securities in banks' balance sheets. While the average share of such securities in banks' total assets have been around 13 percent, for some banks, it reached as high as 90 percent.[9] There is also extensive variation in ratios of credits to assets and other variables.

[9]For a world-wide sample of banks, the average is 12 percent and for German banks it is 15 percent. See Gennaioli, Martin, and Rossi (2012) and Buch, Koetter and Ohls (2013) respectively.

V Empirical Analysis

A Determinants of Banks' Holdings of Government Securities

Before moving to our main question of how the banks with high and low exposure to government debt are affected by the large fiscal shock, we want to look at the main bank characteristics correlated with the government bond holding behavior. We follow Gennaioli, Martin, and Rossi (2012) and decompose the overall government bond holdings into a time-varying and time-invariant part, by taking the fitted values from the regression of the government bond holdings as a ratio to total assets on the bank fixed effects. The time-varying part will be then equal to actual bond holdings minus the time-invariant component.

Table 2 shows the bank characteristics correlated with their government bond holding behavior. First and foremost the coefficients in column (1) are larger than column (2) suggesting that time-varying part is more important. We observe that banks with higher tendency to lend to non-financial firms and higher tendency to lend through the interbank money market are characterized with lower government bond holdings both over time and in the long-run. Banks who are more risk takers (defined as less cash) also hold more government paper both over time and in the long-run. As a fixed bank characteristic, in the long-run, large and state banks hold more government securities. Appendix figures A1 and A2 also show that there is extensive variation in government bond holdings of banks over time by type of banks. We show state banks and private banks and also domestic and foreign investment banks. In Figure A1, we plot the ratio of banks in several categories holding government securities as the average of a binary variable (hold or not hold) and hence we show the extensive margin. Many type banks always hold government paper, as shown in Figure A1, while some (investment banks) increase their exposure during the moral suasion period of higher interest rates. The share (intensive margin) increases for all types as shown in Figure A2, which plots for the same categories actual holdings, i.e., the share of

government securities in total assets.[10]

Overall, these findings suggest that banks adapt dynamically to changing risk and return conditions in the financial markets in Turkey, a typical emerging market.

B The Banks' Performance as a Function of their Government Debt Exposure

We identify how banks' performance is affected from government debt exposure by comparing the change in performance of banks with different degrees of exposure before and after the sizable and unanticipated fiscal shock experienced in Turkish economy. For the bank performance, we focus on three measures. First, we look at how the change in the period's profits from banks' operations compare between banks with low and high exposure before and after the earthquake. Second, we look at how changes in the ratio of equity to the total assets compare. Third, we look whether the changes in the probability that the banks' management would be taken over by Savings Deposit Insurance Fund (SDIF) differ by the degree of banks' exposure to government debt.[11] A particular case of the take-over by SDIF occurs if a bank makes sizable amount of losses from operations, which would melt down the equity.

We first analyze these three performance measures for the sample of all banks, as shown in Table 3. All the results in Table 3 are obtained by controlling for banks' government debt exposure, interbank exposure, central bank exposure and the loan market exposure and their interactions with the major events, i.e. Asian Crises of 1997, Russian Crises 1998, the Earthquakes in 1999, the Stand-By Program of 2000 and the financial crises, that started with a liquidity crises at the end of 2000 and was felt in overall economy in 2001 and 2002. We also control for bank fixed effects accounting for time-invariant heterogeneity across banks,

[10]The jump in holdings of state banks after 2001 is driven by the fact that treasury gave to these banks bonds to cover their losses due to crisis but these are non-marketable (hold & wait until the maturity).

[11]In Turkish, TMSF, which stands for Tasarruf Mevduati Sigorta Fonu.

time fixed effects accounting for the common shocks to all banks as well as bank-year fixed effects in the columns 1, 3 and 5 and bank-quarter fixed effects in columns 2, 4 and 6 which account for the time varying unobserved heterogeneity across banks.

We estimate the differential effect of earthquake on banks' profit and equity as negative and on the possibility of take-over by SDIF as positive, indicating that the banks with higher debt exposure performed worse following the negative fiscal shock. Using the specification with bank-year effects, we find the differential percentage point decline due to the earthquake in profits to assets and the equity to assets for the bank at the median of government securities to assets ratio was 1.5 percentage points and 1.25 percentage points respectively, compared to a banks that had no exposure to the government securities market.[12] Compared to a bank with no exposure to the government debt, the bank with median exposure faced 1.3 percentage point increase in the probability of being taken over by SDIF. Using the specification with bank-quarter fixed effects, we find that the corresponding differential declines for the profits to assets and equity to assets ratios are 2.9 and 2.1 percentage points, while the differential rise in the probability to be taken over by SDIF for the bank with median exposure is 1.4 percentage points. Finally, comparing the changes in the outcomes between the banks at the 90th percentile of the distribution of the government debt to asset ratio with no-exposure banks, the profits to assets ratio and equity to assets ratio fall by 8.1 and 5.7 percentage points and probability to be taken over by SDIF increases by an extra 3.9 percentage points.

Considering the fact that pre-earthquake mean values of the profits to assets ratio, equity to assets ratio and the probability of being taken over by SDIF is 3.6, 18.3 and 3.7 percent respectively, we conclude that the exposure to government debt has non-negligable negative impact on banks' performance. In particular, for the banks at the median of the government debt exposure distribution, the percentage change in the profits to assets ratio, equity to assets ratio and the SDIF take-over probability corresponds to 81 percent, 11.4 percent and

[12]Following Cameron et al (2011) and Thompson (2011), we adjust all the standard errors both for correlation across banks and correlation across time by clustering it for bank id and time.

38 percent of the pre-earthquake mean values of corresponding outcomes.

A particular concern for the results presented in Table 3 is that it includes the sample of both state-owned and private banks. The state-banks differ from the private ones in a number of aspects. First, the private and public banks may differ from each other in terms of the degree of profit orientation. The political influences on state banks may lead to different changes in the performance outcomes over the fiscal shocks.[13] Second, at least in practice, the state banks are not taken over by SDIF. Therefore, we repeat the regressions with our conservative specification, i.e. the one with bank-quarter fixed effects, also for the sample excluding the state-owned banks. As observed in Columns 1-3 of Table 4, the point estimates obtained with this sample is very similar to the one that we already showed, suggesting that non-peculiar aspects of the state-owned banks do not affect our conclusions.

In a similar fashion, it may be necessary to see how the results discussed above are affected by the existence of the foreign-owned banks in the sample. Some of the foreign banks in our sample are very small and subject to rapid and sizable movements in their balance sheets. Therefore, excluding foreign banks from the sample for the case of Turkey may correspond to focusing on the group of banks who would be more systematically engaged in the government bond transactions. The results presented in Columns 4-6 in Table 4. We find that excluding foreign owned banks show similar results to what we obtain for the entire sample or the sample of private banks. In particular, we observe that the banks at the median of the government debt exposure distribution face 2.3 and 4.3 extra decline in their equity to assets and profits to assets ratio and a 2.3 percent differential increase in the probability of being taken over by the SDIF compared to a bank with no government bond holding.

[13] As an example, in 1990s, some of the state-banks have been used as part of governments' populist redistribution and subsidy policies. In addition, banks also differ by their structural tasks stated for example during their establishment. For instance, Ziraat Bankasi (translated as Agriculture Bank), which is the largest state-owned bank and one of the largest banks in the Turkish banking system, has been assigned the task of supporting the development of agriculture.

C Robustness and Threats to Identification

C.1 Prior Trends in Outcomes

The main threat to identification is differential prior trends in our dependent variables. In particular, if the banks with high government debt already experience a relative slow down or decline in profits and shareowner equity, one may view this case as the differential negative effect of the negative fiscal shock. Figures 7a, 7b, 8a and 8b clearly indicate that the banks' profits from their operations and equity followed a very similar pattern before the earthquake. The main difference in these outcomes across banks with low and high government debt exposure occurred in the aftermath of the earthquake, as we conjecture and identify from.

C.2 The Specification with Lagged Control Variables and Intensive Margin

A particular aspect of the specification used in Tables 3 and 4 is that we use the contemporaneous values of outcome variable and the government debt exposure. The negative effect of government debt exposure on bank performance at the time of a large fiscal shock may be due to banks' portfolio adjustment in response to a shock to their own outcome which happens to be coinciding with the earthquake. For example, if a bank experiences a profit decline, they increase their government debt exposure in the time of need for government in order to compensate for the profit loss. While we think that such possibilities are not plausible, as we are looking at the relative change in banks' performance before and after a large unanticipated fiscal shock, we still want to address this issue by using the lagged values of government debt exposure, credits to non-financial firms, central bank exposure and the interbank exposure and their interaction with concurrent values of the major events in Turkish economy.

The results presented in Table 5. Using the lagged values of the control variables rather than the contemporaneous ones suggest that the banks with higher government debt holdings

before the earthquake would still experience a substantial decline in equity, profits as well as an increase in the probability to be taken over by SDIF. We reach similar findings when we exclude the state-owned banks or banks taken over from our sample (Columns 1-5 of Table 6). The last two columns use only the sample of banks who were never taken over by SDIF over 1986-2011 period. Arguably, these banks are stronger banks than those taken over by SDIF. Yet, we still observe that the banks with higher government debt exposure performed worse even in this sample.

*C.*3 Placebo Tests

We estimate our main specification counter-factually taking the earthquake period as March 1999-July 1999 instead of the actual earthquake period. The results presented in Table 7 show that there is no differentiation across banks with different government debt exposure for the outcomes of our interest before and after the counterfactual earthquake dates.

*C.*4 The Analysis with the Quarterly Data

Finally, we want to check if our results would still be valid if we extend our sample backwards as much as we can. The monthly data that we use is available for 1997 January and onwards, while the quarterly data goes back to January 1986. The results in Table 8 and 9 obtained with the quarterly data for 1986-2011 period also provide evidence that the banks with higher government debt exposure was affected more negatively in terms of the profits, equity and probability to be taken over by SDIF compared to the banks with lower exposure to the government debt market.

VI Conclusion

We identify the effect of exposure to government debt on various measures of banks' performance, using data on universe of banks in Turkey during 1986-2011. For identification we

use a rare disaster, the 1999 Marmara Earthquake—one of the largest earthquakes in world history, as a major fiscal shock. Using a differences-in-differences methodology, we investigate whether the differences in the degree of banks' exposure to the government debt matter for the effect of fiscal shock on outcomes, such as profitability, equity-to-assets ratio, which measure banks' performance at the intensive margin. We also investigate whether the banks with high exposure also faced a larger increase in the probability of ending their activity as a result of being taken over by the Savings Deposit Insurance Fund (SDIF) (extensive margin).

Our results indicate that the high government debt exposure resulted in a differential decline in the profit-to-asset and equity-to-asset ratios and a significant increase in the probability of being taken over by SDIF due to the large exogenous fiscal shock. We show that the effects observed on the profitability and the equity positions are not due to extensive margin changes in the status of the banks: the significant negative differential effect of earthquake on the profits and the equity-to-asset ratios are also observed for the banks who were not taken over the SDIF.

Our estimates for the bank at the median of the government bond holdings to assets ratio imply that the median bank faces an extra 2.1-4.1 percentage point decline in equity to assets ratio, and extra 1.7 to 4.8 percentage point decline in the profits to assets ratio and an extra 1.5 to 2.6 percentage point increase in the probability to be taken over by SDIF, compared to a bank with no exposure to the government debt.

Our results provide first time evidence on the link between fiscal and financial imbalances, where the causality goes from fiscal to financial stress. Using an exogenous rare event which triggered a fiscal shock, we identify that the fiscal imbalances has important causal implications for the performance of the financial sector. Although our identification is clear, valid and policy relevant, it works only for the link from the government to banks. The caveat is that we cannot say anything for the predictive power of banking crisis on sovereign defaults, which is equally important. Nevertheless, our results shed light on our understanding of the

connection between a stressed banking sector and the sovereign debt problems which is at the center of the current policy debate related to crises observed across Euro Area.

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Table 1: Bank-Level Descriptive Statistics
1997-2011 Sample

	Number of Obs.	Simple Averages	Averages Weighted by Banks' Total Assets	Standard Deviation	Variance	Minimum	Maximum
Ratio of Government Securities to Total Assets	9950	0.13	0.14	0.14	0.020	0.00	0.95
Ratio of Credit to Non-Financial Private Sector to Total Assets	9950	0.31	0.15	0.21	0.044	0.00	0.94
Ratio of Profits to Total Assets	9950	0.00	0.03	0.16	0.026	-4.09	0.53
Ratio of Shareowners' Equity to Total Assets	9950	0.20	0.08	0.34	0.116	-6.82	0.99
SDIF Take over Status (1 if under SDIF Control)	9950	0.04	0.09	0.21	0.044	0.00	1.00

Table 2: Determinants of Government Bond Holdings By Banks

Sample Period: 1997m1-2011m12		
Dependent Variable	**Ratio of Gov. Bonds to Total Assets**	**Ratio of Gov. Bonds to Total Assets Projected on Bank Fixed Effects**
	(1)	**(2)**
Size	-0.012	0.011**
	(0.008)	(0.003)
State Bank	-0.060***	0.078***
	(0.019)	(0.026)
Exposure to Central Bank	0.118	-0.054
	(0.112)	(0.074)
Interbank Balances	-0.217***	-0.056***
	(0.026)	(0.023)
Profitability	0.006	-0.023
	(0.031)	(0.020)
Leverage	0.019	-0.003
	(0.149)	(0.012)
Risk Taking	0.477***	0.143***
	(0.039)	(0.027)
Total Loans as a Share of Total Assets	-0.302***	-0.171***
	(0.030)	(0.032)
Bank Fixed Effects	Yes	-
Time Fixed Effects	Yes	Yes
Observations	9950	9950
R-squared	0.68	0.4

Notes: (1) The dependent variable in Column 1 is the bank's government bond holdings as a ratio to total assets. The dependent variable in Column 2 is obtained by projecting the Ratio of Government Securities to Total Assets on bank fixed effects. (2) The variable labeled as "Size" is the natural logarithm of total assets; "Risk Taking" is one minus cash holdings; "Leverage" is one minus book value of shareowner's equity divided by total assets; "Total Loans as a Share of Total Assets" is total loans outstanding divided by total assets; "Profitability" is profit from operations divided by total assets; "Exposure to Central Bank" is total exposure to central bank divided by total assets; "Interbank Balances" is interest-earning balances of the bank against the interbank money market as a ratio to its total assets; "State Bank" is a binary variable equal to 1 if bank is owned by state. (4) * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3: Banks' Performance Before and After the Earthquake

Sample Period: 1997m1-2011m12						
Specification With Contemporaneous Controls						
Sample	**All Banks**					
	'(1)	**'(2)**	**'(3)**	**'(4)**	**'(5)**	**'(6)**
Dependent Variable	**Equity to Asset Ratio**		**Profit to Asset Ratio**		**SDIF Status at time t**	
Earthquake x Gov Securites to Total Asset Ratio	-0.090**	-0.146***	-0.134***	-0.208***	0.092***	0.101***
	(0.045)	(0.049)	(0.042)	(0.054)	(0.028)	(0.027)
Gov Securites to Total Asset Ratio	0.177***	0.327***	0.005	0.078***	0.013	0.013
	(0.025)	(0.120)	(0.023)	(0.078)	(0.022)	(0.010)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Year Effects	Yes	No	Yes	No	Yes	No
Bank-Quarter Effects	No	Yes	No	Yes	No	Yes
Quantifying the effects						
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio the Corresponding Sample	0.138	0.138	0.138	0.138	0.138	0.138
Pre-Earthquake Median value of T-Bill/Assets at 90th Percentile of the Corresponding Sample	0.38	0.38	0.38	0.38	0.38	0.38
Pre-earthquake average value of the outcome	0.183	0.183	0.036	0.036	0.037	0.037
Differential percentage point change in the outcome for banks at median of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.013	-0.021	-0.015	-0.029	0.013	0.014
Differential percentage point change in the outcome for banks at 90th Percentile of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.034	-0.057	-0.041	-0.081	0.035	0.039
Observations	9950	9950	9950	9950	9950	9950
R-squared	0.871	0.954	0.512	0.822	0.928	0.987

Notes: (1) Dependent variables are the bank's shareowner's equity as a ratio to total assets in Columns 1 and 2, the bank's flow profit as a ratio to their total assets at time t in Columns 3 and 4 and the SDIF status, i.e. a binary variable showing whether the bank is under the control of Savings and Deposit Insurance Fund at time t, in Columns 5 and 6. (2) The "Earthquake" is a binary variable equal to 1 between August 1999 and December 1999 and "Gov Securites to Total Asset Ratio" refer to the bank's holdings of government securities as a ratio of their total assets. (3) All specifications control for aggregate demand effects on bank's balance sheets by controlling banks' credit to non-financial sector as a ratio of their total assets as of time t, and their interactions with Asian Crises, defined as a binary variable equal to 1 between July 1997-December 1997, "Russian Crises" defined as a binary variable equal to 1 between August 1998 and December 1998, "Earthquake" variable defined as above, "Stand-By" defined as a binary variable equal to 1 between January 2000 and June 2000 and "2001 Crises" defined as a binary variable equal to 1 between December 2000 and December 2002. Other controls include bank's holdings of government securities as a ratio of their total assets as of time t and its interaction with "Asian Crises", "Russian Crises", "Stand-by" period indicator and "2001 Crises" indicator. The specifications also control for bank's net exposure to Interbank Money Market as a ratio to total assets and net exposure to central bank funding as a ratio to bank's total assets. (4) Robust standard errors clustered for bank id and time are presented in parentheses. (5) * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4: Banks' Performance Before and After the Earthquake

Sample Period: 1997m1-2011m12

Specification With Contemporaneous Controls

Sample	**All Private Banks**			**All Domestic Banks**		
	'(1)	**'(2)**	**'(3)**	**'(4)**	**'(5)**	**'(6)**
Dependent Variable	**Equity to Asset Ratio**	**Profit to Asset Ratio**	**SDIF Status at time t**	**Equity to Asset Ratio**	**Profit to Asset Ratio**	**SDIF Status at time t**
Earthquake x Gov Securites to Total Asset Ratio	-0.159***	-0.220***	0.107***	-0.162**	-0.303***	0.158***
	(0.051)	(0.055)	(0.029)	(0.081)	(0.101)	(0.042)
Gov Securites to Total Asset Ratio	0.334***	0.0790***	0.0130	0.236***	0.102**	0.046**
	(0.121)	(0.078)	(0.010)	(0.0564)	(0.050)	(0.022)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes
Quantifying the effects						
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio for the Corresponding Sample	0.139	0.139	0.139	0.141	0.141	0.141
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio at the 90th Percentile of the Corresponding Sample	0.38	0.38	0.38	0.311	0.311	0.311
Pre-earthquake average value of the outcome	0.180	0.037	0.039	0.179	0.031	0.049
Differential percentage point change in the outcome for banks at median of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.023	-0.030	0.015	-0.023	-0.043	0.023
Differential percentage point change in the outcome for banks at 90th Percentile of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.062	-0.084	0.041	-0.049	-0.094	0.049
Observations	9401	9401	9401	7194	7194	7194
R-Squared	0.955	0.824	0.987	0.956	0.808	0.987

Notes: (1) The sample used for obtaining the results in Columns 1-3 includes all banks except for the state-owned banks. The sample used for obtaining the results in Columns 4-6 includes all banks except for the foreign-owned banks. Dependent variables are the bank's shareowner's equity as a ratio to total assets in Columns 1 and 4, the bank's flow profit as a ratio to their total assets at time t in Columns 2 and 5 and the SDIF status, i.e. SDIF Status, i.e. a binary variable showing whether the bank is under the control of Savings and Deposit Insurance Fund at time t, in Column 3 and 6. (2) The "Earthquake" is a binary variable equal to 1 between August 1999 and December 1999 and "Gov Securites to Total Asset Ratio" refer to the bank's holdings of government securities as a ratio of their total assets. (3) All specifications control for aggregate demand effects on bank's balance sheets by controlling Banks' credit to non-financial sector as a ratio of their total assets as of time t, and their interactions with Asian Crises, defined as a binary variable equal to 1 between July 1997-December 1997, "Russian Crises" defined as a binary variable equal to 1 between August 1998 and December 1998, "Earthquake" variable defined as above, "Stand-By" defined as a binary variable equal to 1 between January 2000 and June 2000 and "2001 Crises" defined as a binary variable equal to 1 between December 2000 and December 2002. Other controls include bank's holdings of government securities as a ratio of their total assets as of time t and its interaction with "Asian Crises", "Russian Crises", "Stand-by" period indicator and "2001 Crises" indicator. The specifications also control for bank's net exposure to Interbank Money Market as a ratio to total assets and net exposure to central bank funding as a ratio to bank's total assets. (4) Robust standard errors clustered for bank id and time are presented in parentheses. (5) * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5: Banks' Performance Before and After the Earthquake

Sample Period: 1997m1-2011m12

Specification With Lagged Controls

Sample	**All Banks**		
	'(1)	**'(2)**	**'(3)**
Dependent Variable	**Equity to Asset Ratio**	**Profit to Asset Ratio**	**SDIF Status at time t**
Earthquake x Gov Securites to Total Asset Ratio at time t-1	-0.156***	-0.125**	0.113***
	(0.037)	(0.053)	(0.042)
Controls	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
Bank-Quarter Effects	Yes	Yes	Yes
Quantifying the effects			
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio for the Corresponding Sample	0.138	0.138	0.138
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio at the 90th Percentile of the Corresponding Sample	0.38	0.38	0.38
Pre-earthquake average value of the outcome	0.183	0.036	0.037
Differential percentage point change in the outcome for banks at median of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.021	-0.017	0.015
Differential percentage point change in the outcome for banks at 90th Percentile of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.057	-0.045	0.043
Observations	9886	9886	9886
R-squared	0.939	0.788	0.987

Notes: (1) Dependent variables are the bank's shareowner's equity as a ratio to total assets in Column 1, the bank's flow profit as a ratio to their total assets at time t in Columns 2 and the SDIF status, i.e. a binary variable showing whether the bank is under the control of Savings and Deposit Insurance Fund at time t, in Column 3. (2) The "Earthquake" is a binary variable equal to 1 between August 1999 and December 1999 and "Gov Securites to Total Asset Ratio (t-1)" refer to the bank's holdings of government securities as a ratio of their total assets in the preceding month, i.e. time t-1. (3) All specifications control for aggregate demand effects on bank's balance sheets by controlling banks' credit to non-financial sector as a ratio of their total assets as of time t-1, and their interactions with Asian Crises, defined as a binary variable equal to 1 between July 1997-December 1997, "Russian Crises" defined as a binary variable equal to 1 between August 1998 and December 1998, "Earthquake" variable defined as above, "Stand-By" defined as a binary variable equal to 1 between January 2000 and June 2000 and "2001 Crises" defined as a binary variable equal to 1 between December 2000 and December 2002. Other controls include bank's holdings of government securities as a ratio of their total assets as of time t-1 and its interaction with "Asian Crises", "Russian Crises", "Stand-by" period indicator and "2001 Crises" indicator. The specifications also control for bank's net exposure to Interbank Money Market as a ratio to total assets and net exposure to central bank funding as a ratio to bank's total assets at t-1. (4) Robust standard errors clustered for bank id and time are presented in parentheses. (5) * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6: Banks' Performance Before and After the Earthquake

Sample Period: 1997m1-2011m12					
Specification With Lagged Controls					
Sample	**Excluding State Banks**			**Excluding Banks Ever Taken By SDIF**	
	'(1)	**'(2)**	**'(3)**	**-4**	**-5**
Dependent Variable	**Equity to Asset Ratio**	**Profit to Asset Ratio**	**SDIF Status at time t**	**Equity to Asset Ratio**	**Profit to Asset Ratio**
Earthquake x Gov Securites to Total Asset Ratio at time t-1	-0.167***	-0.130**	0.113***	-0.053***	-0.089***
	(0.035)	(0.054)	(0.042)	(0.016)	(0.030)
Controls	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Bank-Quarter Effects	Yes	Yes	Yes	Yes	Yes
Quantifying the effects					
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio for the Corresponding Sample	0.139	0.139	0.139	0.134	0.134
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio at the 90th Percentile of the Corresponding Sample	0.38	0.38	0.38	0.371	0.371
Pre-earthquake average value of the outcome	0.180	0.037	0.039	0.237	0.050
Differential percentage point change in the outcome for banks at median of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.023	-0.018	0.016	-0.007	-0.012
Differential percentage point change in the outcome for banks at 90th Percentile of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.064	-0.049	0.042	-0.019	-0.034
Observations	9335	9335	9335	8454	8454
R-squared	0.940	0.790	0.987	0.911	0.972

Notes: (1)Dependent variables are the bank's shareowner's equity as a ratio to total assets in Columns 1, 4 and 7, the bank's flow profit as a ratio to their total assets at time t in Columns 2, 5 and 8 and the SDIF status, i.e. a binary variable showing whether the bank is under the control of Savings and Deposit Insurance Fund at time t, in Column 3 and 6. (2) The "Earthquake" is a binary variable equal to 1 between August 1999 and December 1999 and "Gov Securites to Total Asset Ratio (t-1)" refer to the bank's holdings of government securities as a ratio of their total assets in the preceding month, i.e. time t-1. (3) All specifications control for aggregate demand effects on bank's balance sheets by controlling banks' credit to non-financial sector as a ratio of their total assets as of time t-1, and their interactions with Asian Crises, defined as a binary variable equal to 1 between July 1997-December 1997, "Russian Crises" defined as a binary variable equal to 1 between August 1998 and December 1998, "Earthquake" variable defined as above, "Stand-By" defined as a binary variable equal to 1 between January 2000 and June 2000 and "2001 Crises" defined as a binary variable equal to 1 between December 2000 and December 2002. Other controls include bank's holdings of government securities as a ratio of their total assets as of time t-1 and its interaction with "Asian Crises", "Russian Crises", "Stand-by" period indicator and "2001 Crises" indicator. The specifications also control for bank's net exposure to Interbank Money Market as a ratio to total assets and net exposure to central bank funding as a ratio to bank's total assets at t-1. (4) Robust standard errors clustered for bank id and time are presented in parentheses. (5) * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7: Placebo Earthquake

Sample Period: 1997m1-2011m12						
Specification With Contemporaneous Controls						
Sample	**All Banks**			**Excluding State Banks**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Dependent Variable	**Equity to Asset Ratio**	**Profit to Asset Ratio**	**SDIF Status at time t**	**Equity to Asset Ratio**	**Profit to Asset Ratio**	**SDIF Status at time t**
Placebo Earthquake x Gov Securites to Total Asset Ratio	0.000	0.010	-0.009	-0.003	0.004	-0.010
	(0.031)	(0.011)	(0.006)	(0.069)	(0.065)	(0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Year Effects	No	No	No	No	No	No
Bank-Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9950	9950	9950	9401	9401	9401
R-squared	0.954	0.822	0.987	0.955	0.824	0.987

Notes: (1) The sample includes all banks except for the state-owned banks. Dependent variables are the bank's shareowner's equity as a ratio to total assets in Columns 1 and 4, the bank's flow profit as a ratio to their total assets at time t in Columns 2 and 5 and the SDIF status, i.e. a binary variable showing whether the bank is under the control of Savings and Deposit Insurance Fund at time t, in Columns 3 and 6. (2) The "Placebo Earthquake" is a binary variable equal to 1 between March 1999 and July 1999 and "Gov Securites to Total Asset Ratio" refer to the bank's holdings of government securities as a ratio of their total assets. (3) All specifications control for aggregate demand effects on bank's balance sheets by controlling banks' credit to non-financial sector as a ratio of their total assets as of time t, and their interactions with Asian Crises, defined as a binary variable equal to 1 between July 1997-December 1997, "Russian Crises" defined as a binary variable equal to 1 between August 1998 and December 1998, "Placebo Earthquake" variable defined as above, "Stand-By" defined as a binary variable equal to 1 between January 2000 and June 2000 and "2001 Crises" defined as a binary variable equal to 1 between December 2000 and December 2002. Other controls include bank's holdings of government securities as a ratio of their total assets as of time t and its interaction with "Asian Crises", "Russian Crises", "Stand-by" period indicator and "2001 Crises" indicator. The specifications also control for bank's net exposure to Interbank Money Market as a ratio to total assets and net exposure to central bank funding as a ratio to bank's total assets. (4) Robust standard errors clustered for bank id and time are presented in parentheses. (5) * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: Banks' Performance Before and After the Earthquake

Sample Period: 1986q1-2011q4

Sample	**All Banks**		
	'(1)	**'(2)**	**'(3)**
Dependent Variable	**Equity to Asset Ratio**	**Profit to Asset Ratio**	**SDIF Status at time t**
Earthquake x Gov Securites to Total Asset Ratio	-0.309***	-0.367***	0.194***
	(0.101)	(0.105)	(0.049)
Controls	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
Bank-Quarter Effects	Yes	Yes	Yes
Quantifying the effects			
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio for the Corresponding Sample	0.132	0.132	0.132
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio at the 90th Percentile of the Corresponding Sample	0.373	0.373	0.373
Pre-earthquake average value of the outcome	0.171	0.031	0.038
Differential percentage point change in the outcome for banks at median of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.041	-0.048	0.026
Differential percentage point change in the outcome for banks at 90th Percentile of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.115	-0.137	0.072
Observations	5687	5687	5687
R-squared	0.83	0.53	0.91

Notes: (1) Dependent variables are the bank's shareowner's equity as a ratio to total assets in Column 1, the bank's flow profit as a ratio to their total assets at time t in Column 2 and the SDIF status, i.e. a binary variable showing whether the bank is under the control of Savings and Deposit Insurance Fund at time t, in Column 3. (2) The "Earthquake" is a binary variable equal to 1 for 3rd and 4th quarters of 1999 and "Gov Securites to Total Asset Ratio" refer to the bank's holdings of government securities as a ratio of their total assets by the end of concurrent quarter. (3) All specifications control for aggregate demand effects on bank's balance sheets by controlling Banks' credit to non-financial sector as a ratio of their total assets as of time t, and their interactions with 1994 Crises defined as a binary variable equal to 1 for 2nd, 3rd and 4th quarters of 1994, Asian Crises defined as a binary variable equal to 1 for the 3rd and 4rth quarter of 1997, "Russian Crises" defined as a binary variable equal to 1 for the 3rd and 4th quarter of 1998, the "Earthquake" variable defined as above, "Stand-By" defined as a binary variable equal to 1 for the 1st and 2nd quarter of 2000 and "2001 Crises" defined as a binary variable equal to 1 for 4th quarter of 2000 and all quarters of entire 2001-2002. Other controls include bank's holdings of government securities as a ratio of their total assets as of time t and its interaction with"1994 Crises", "Asian Crises", "Russian Crises", "Stand-by" period indicator and "2001 Crises" indicator. (4) Robust standard errors clustered for bank id and time are presented in parentheses. (5) * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 9: Banks' Performance Before and After the Earthquake

Sample Period: 1986q1-2011q4

Sample	**Excluding State Banks**			**Excluding Foreign Banks**			**Excluding Banks Ever Taken By SDIF**	
	'(1)	**'(2)**	**'(3)**	**'(4)**	**'(5)**	**'(6)**	**(7)**	**(8)**
Dependent Variable	**Equity to Asset Ratio**	**Profit to Asset Ratio**	**SDIF Status at time t**	**Equity to Asset Ratio**	**Profit to Asset Ratio**	**SDIF Status at time t**	**Equity to Asset Ratio**	**Profit to Asset Ratio**
Earthquake x Gov Securites to Total Asset Ratio	-0.329***	-0.387***	0.205***	-0.355***	-0.441***	0.277***	-0.023	-0.057**
	(0.110)	(0.115)	(0.053)	(0.144)	(0.151)	(0.071)	(0.051)	(0.025)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quantifying the effects								
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio the Corresponding Sample	0.14	0.14	0.14	0.134	0.134	0.134	0.136	0.136
Pre-Earthquake Median value of Gov. Sec. to Total Asset Ratio at the 90th Percentile of the Corresponding Sample	0.37	0.37	0.37	0.285	0.285	0.285	0.415	0.415
Pre-earthquake average value of the outcome	0.176	0.033	0.042	0.155	0.027	0.050	0.22	0.044
Differential percentage point change in the outcome for banks at median of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.046	-0.054	0.028	-0.047	-0.059	0.037	-0.003	-0.008
Differential percentage point change in the outcome for banks at 90th Percentile of the Gov. Bond distribution (Relative to Gov.Sec./Tot. Assets=0)	-0.122	-0.144	0.075	-0.101	-0.125	0.078	-0.010	-0.024
Observations	5040	5040	5040	4287	4287	4287	4588	4588
R-squared	0.83	0.53	0.92	0.84	0.56	0.92	0.94	0.76

Notes: (1) Dependent variables are the bank's shareowner's equity as a ratio to total assets in Columns 1, 4 and 7, the bank's flow profit as a ratio to their total assets at time t in Columns 2, 5 and 8 and a binary variable showing whether the bank is under the control of Savings and Deposit Insurance Fund at time t in Column 3 and 6. (2) The "Earthquake" is a binary variable equal to 1 for 3rd and 4th quarters of 1999 and "Gov Securites to Total Asset Ratio" refer to the bank's holdings of government securities as a ratio of their total assets by the end of concurrent quarter. (3) All specifications control for aggregate demand effects on bank's balance sheets by controlling banks' credit to non-financial sector as a ratio of their total assets as of time t, and their interactions with 1994 Crises defined as a binary variable equal to 1 for 2nd, 3rd and 4th quarters of 1994, Asian Crises defined as a binary variable equal to 1 for the 3rd and 4rth quarter of 1997, "Russian Crises" defined as a binary variable equal to 1 for the 3rd and 4th quarter of 1998, the "Earthquake" variable defined as above, "Stand-By" defined as a binary variable equal to 1 for the 1st and 2nd quarter of 2000 and "2001 Crises" defined as a binary variable equal to 1 for 4th quarter of 2000 and all quarters of entire 2001-2002. Other controls include bank's holdings of government securities as a ratio of their total assets as of time t and its interaction with"1994 Crises", "Asian Crises", "Russian Crises", "Stand-by" period indicator and "2001 Crises" indicator. (4) Robust standard errors clustered for bank id and time are presented in parentheses. (5) * significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 1a: Public Sector Borrowing Requirement (PSBR) as a Ratio to GDP (Annual, Year-End, Percent)

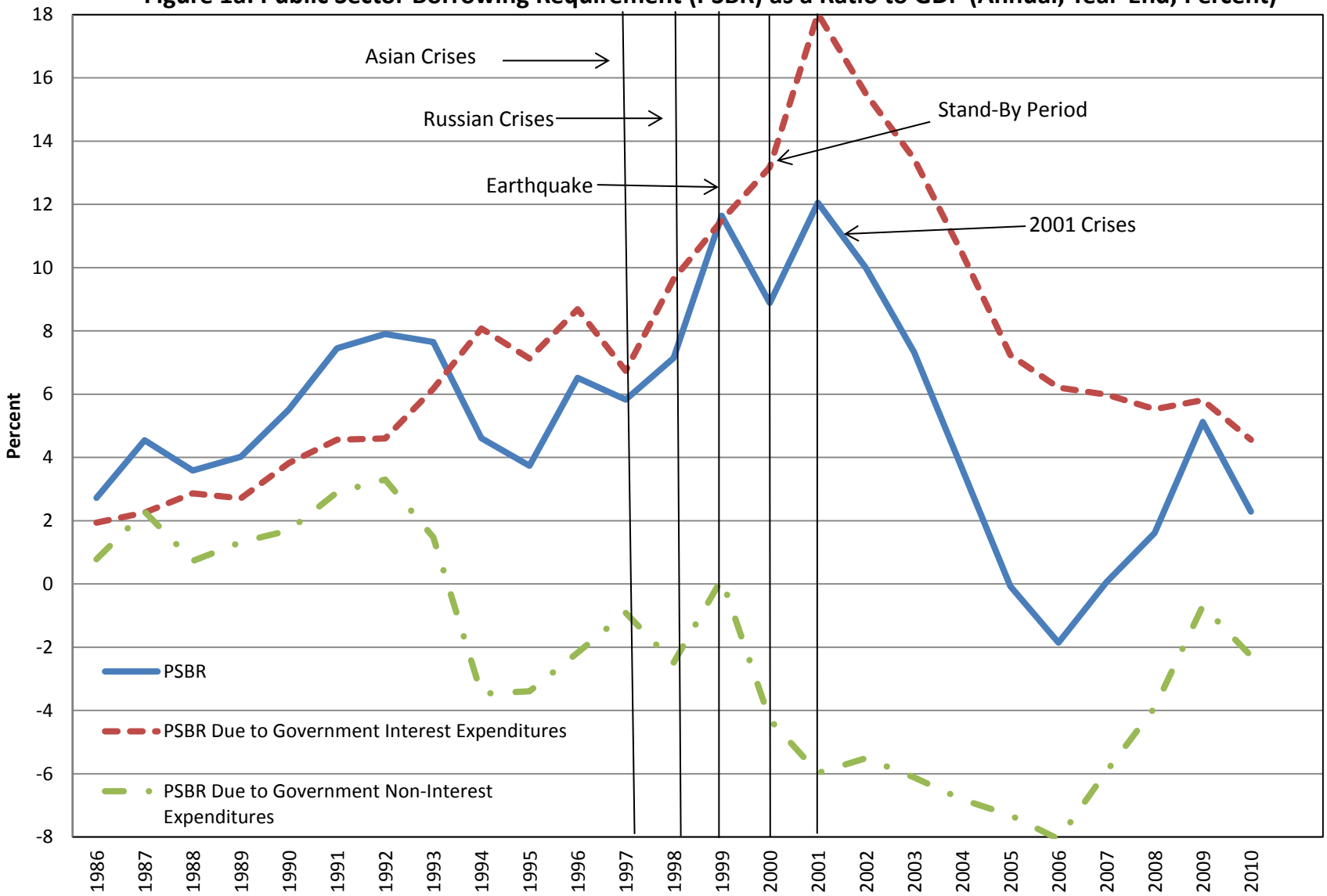

Figure 1b: Domestic and External Government Debt as a Ratio to GDP (Annual, Year-End, Percent)

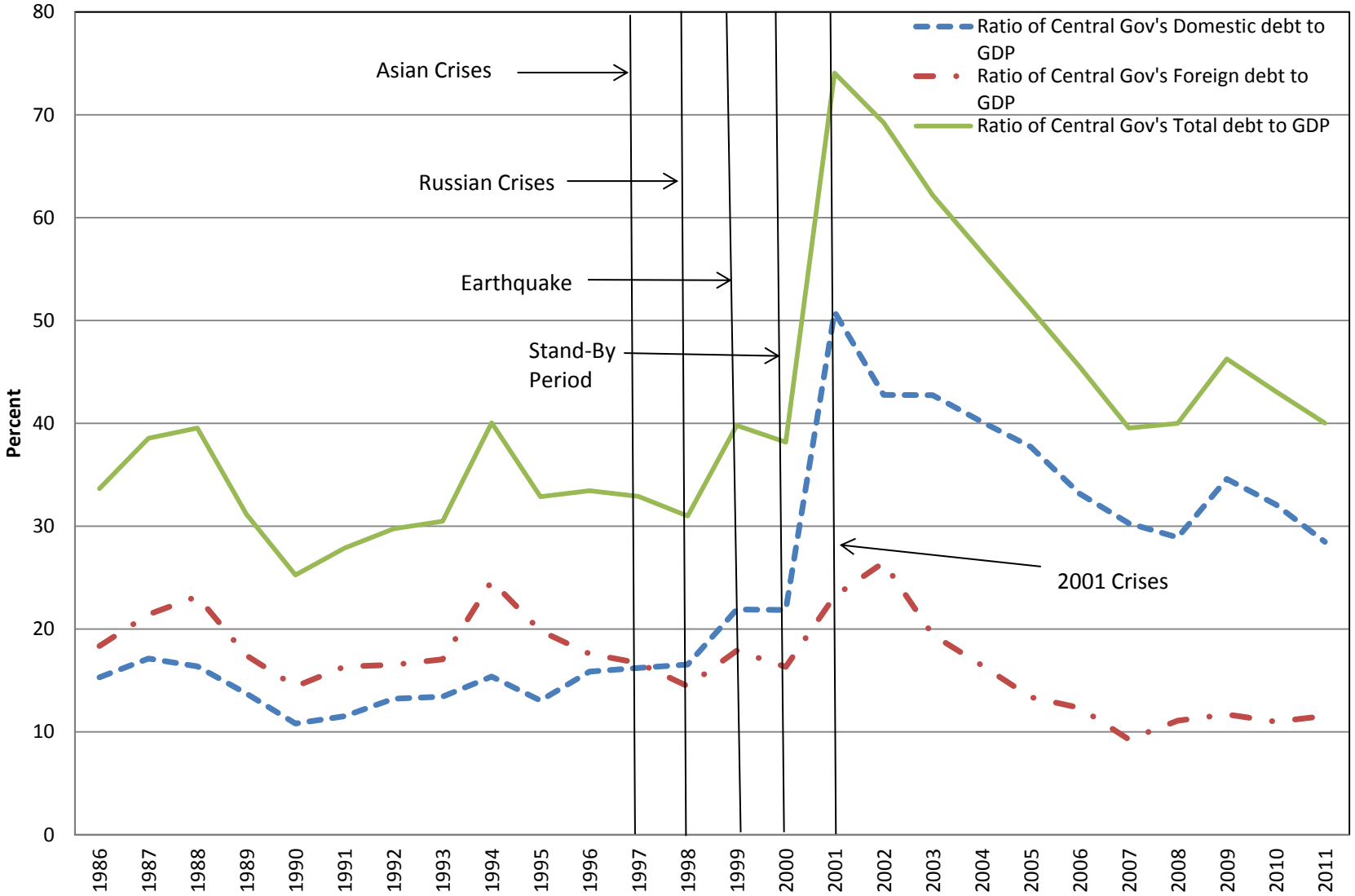

Figure 2: Nominal Interest Rates on Government Auctions and Annual CPI Rates (Percent)

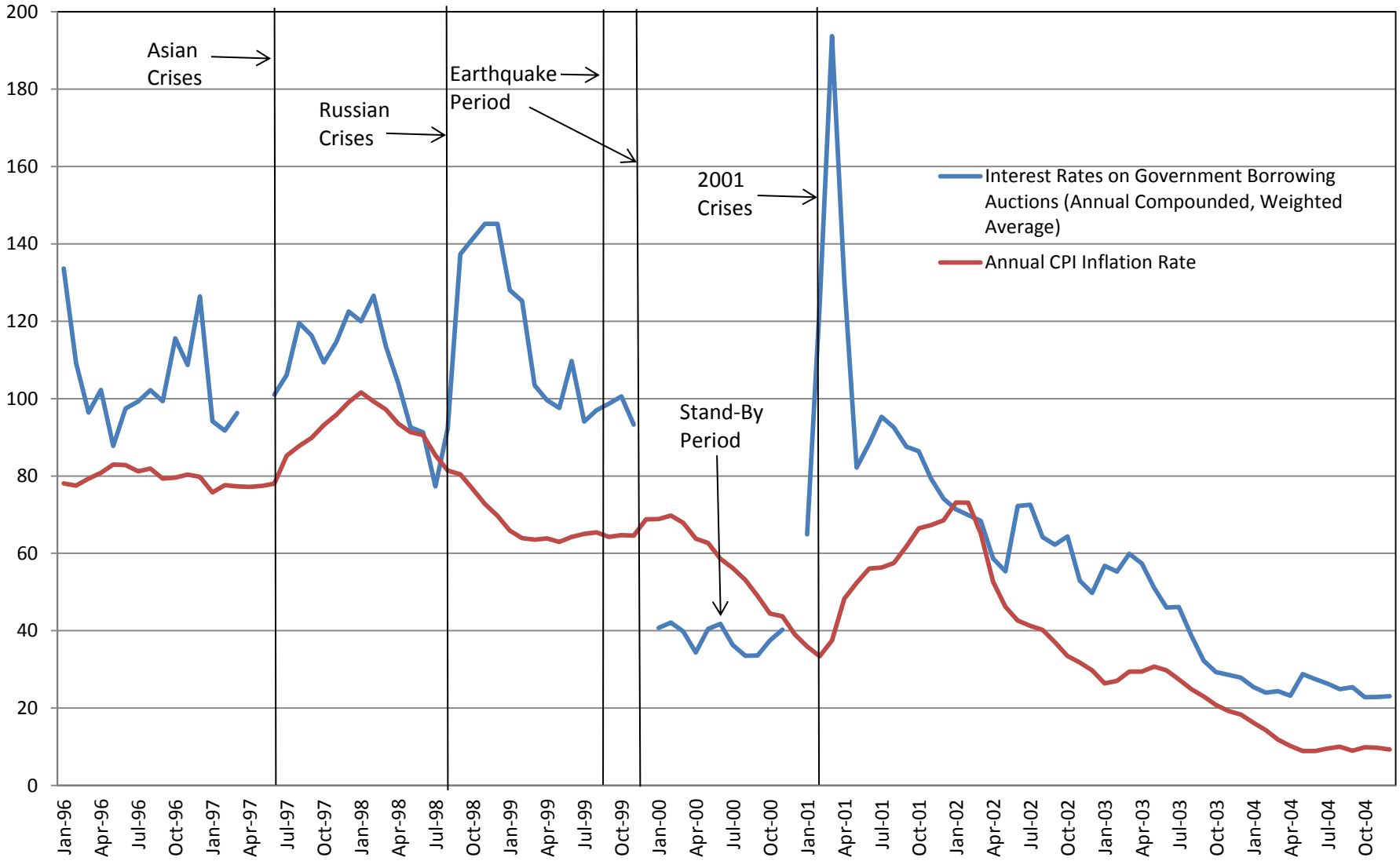

Figure 3: Government Securities Held By Banks as a Ratio to Credit to Non-Financial sector (Quarterly, Percent)-Average Bank

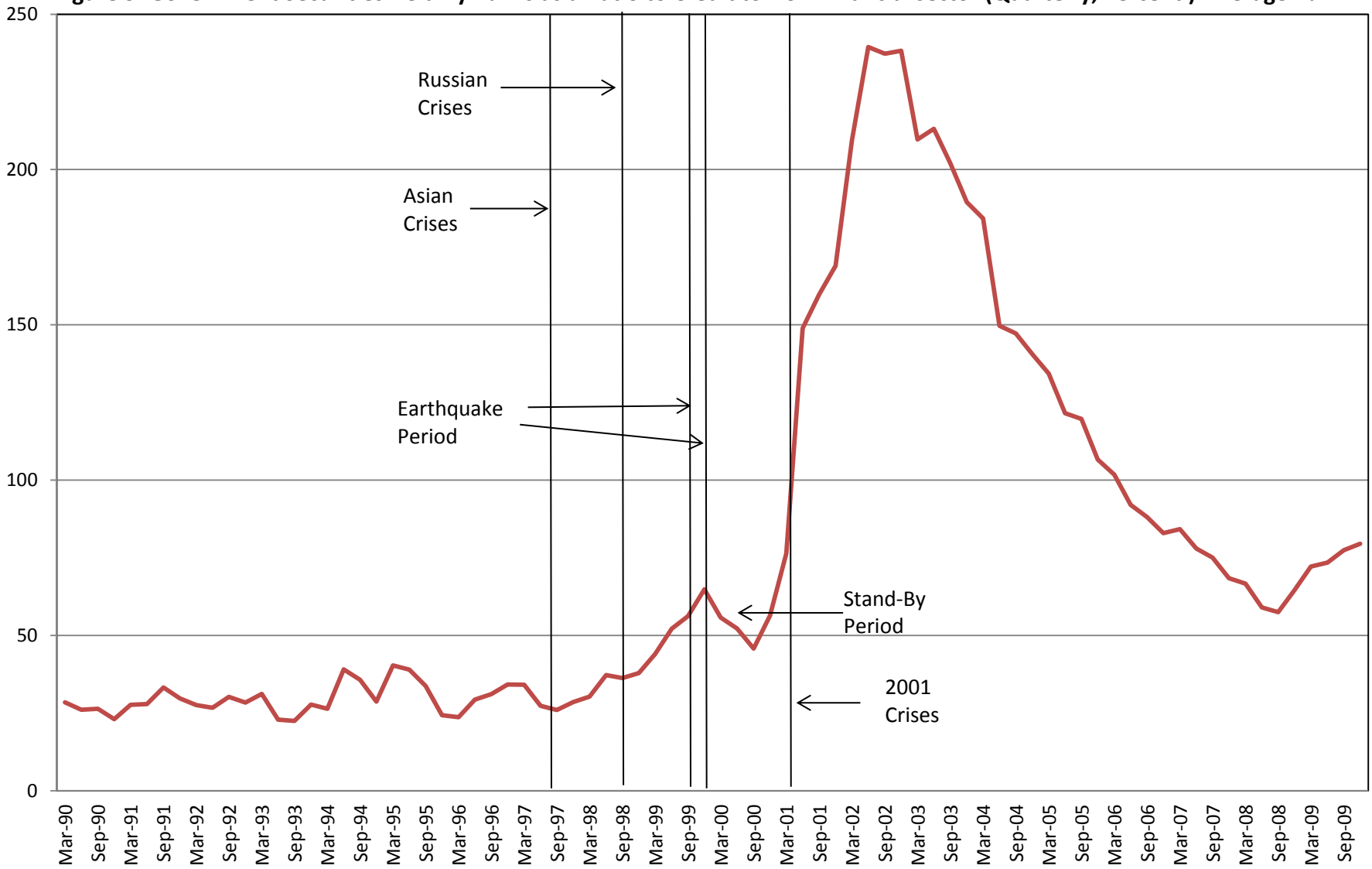

Figure 4: Government Securities Held By Banks as a Ratio To Banks' Total Assets (Percent)---Average Bank

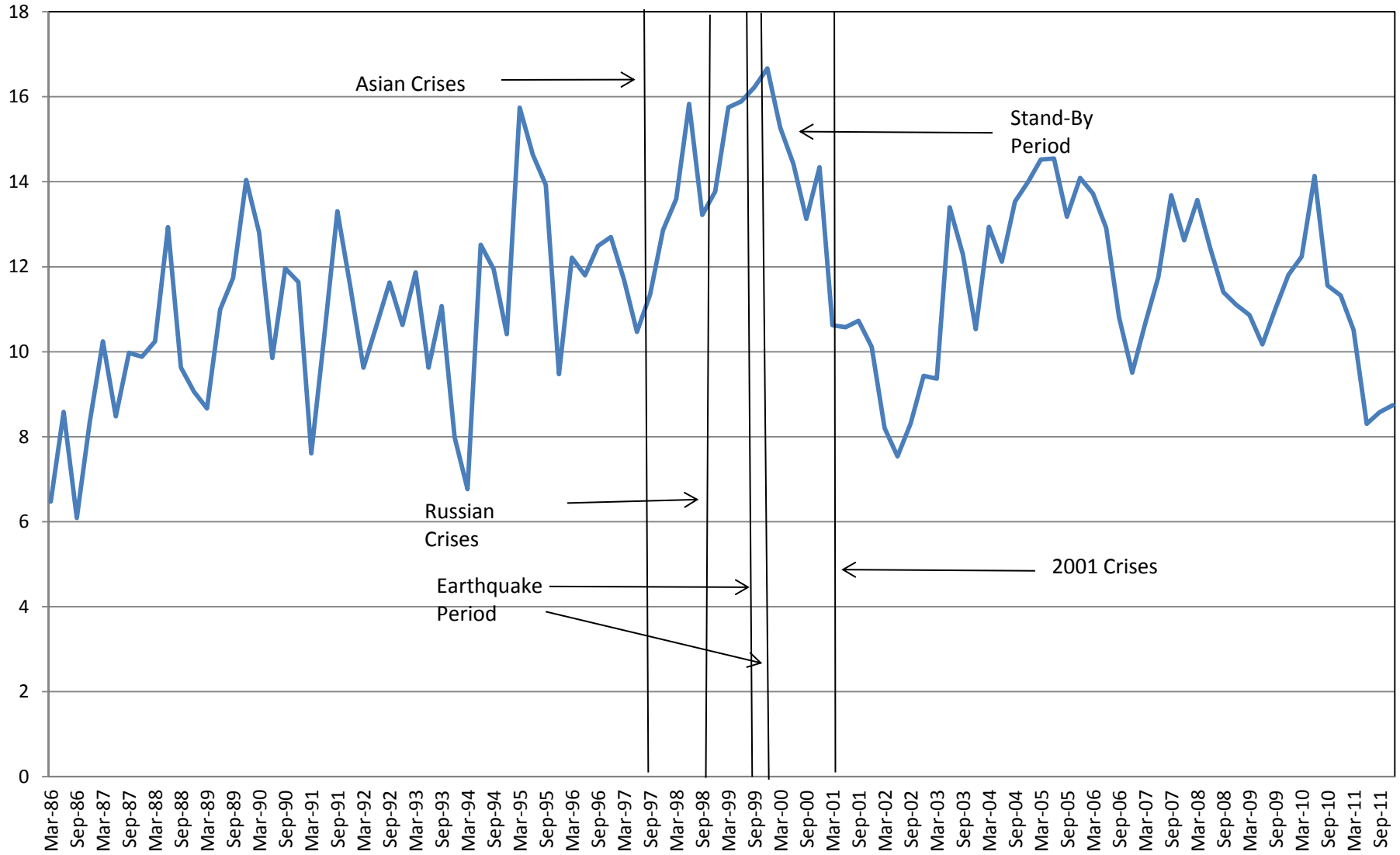

Figure 5: Credit to Non-Financial Sector as a Ratio to Banking Sectors' Assets (Percent)

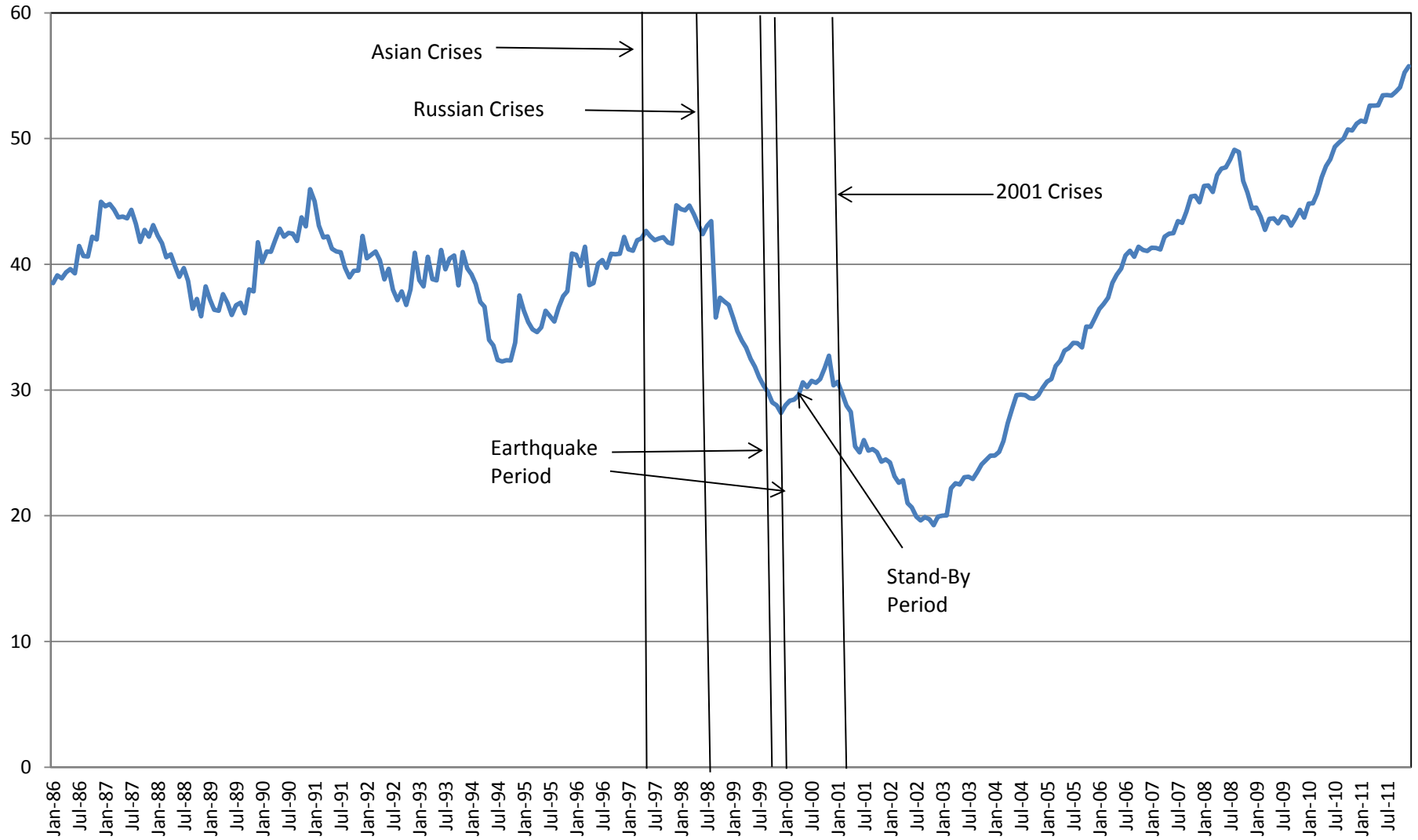

Figure 6: Bank Entry and Exit

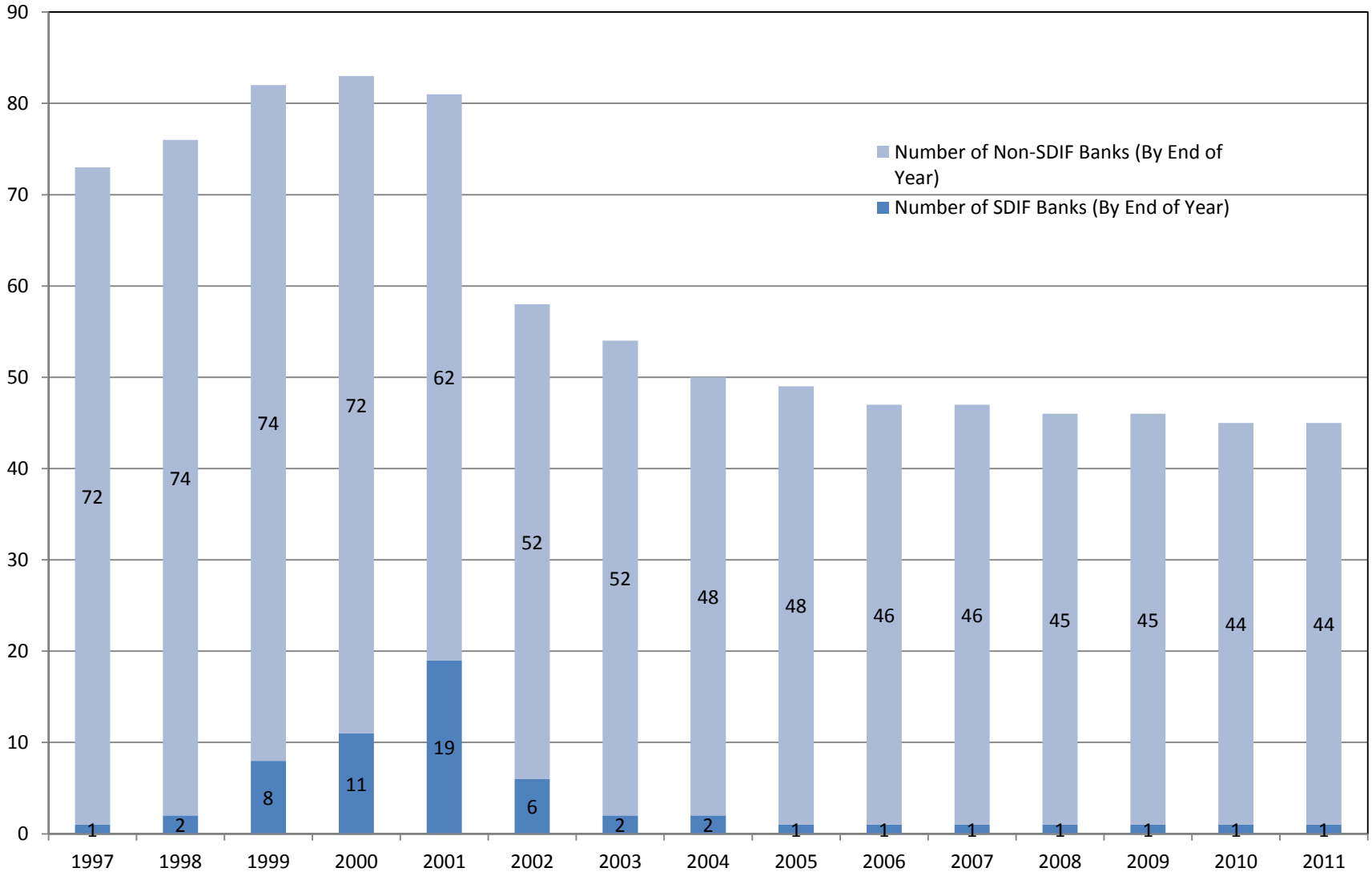

Figure 7a: Average Equity to Assets Ratio With Respect to Government Debt Exposure (Percent)

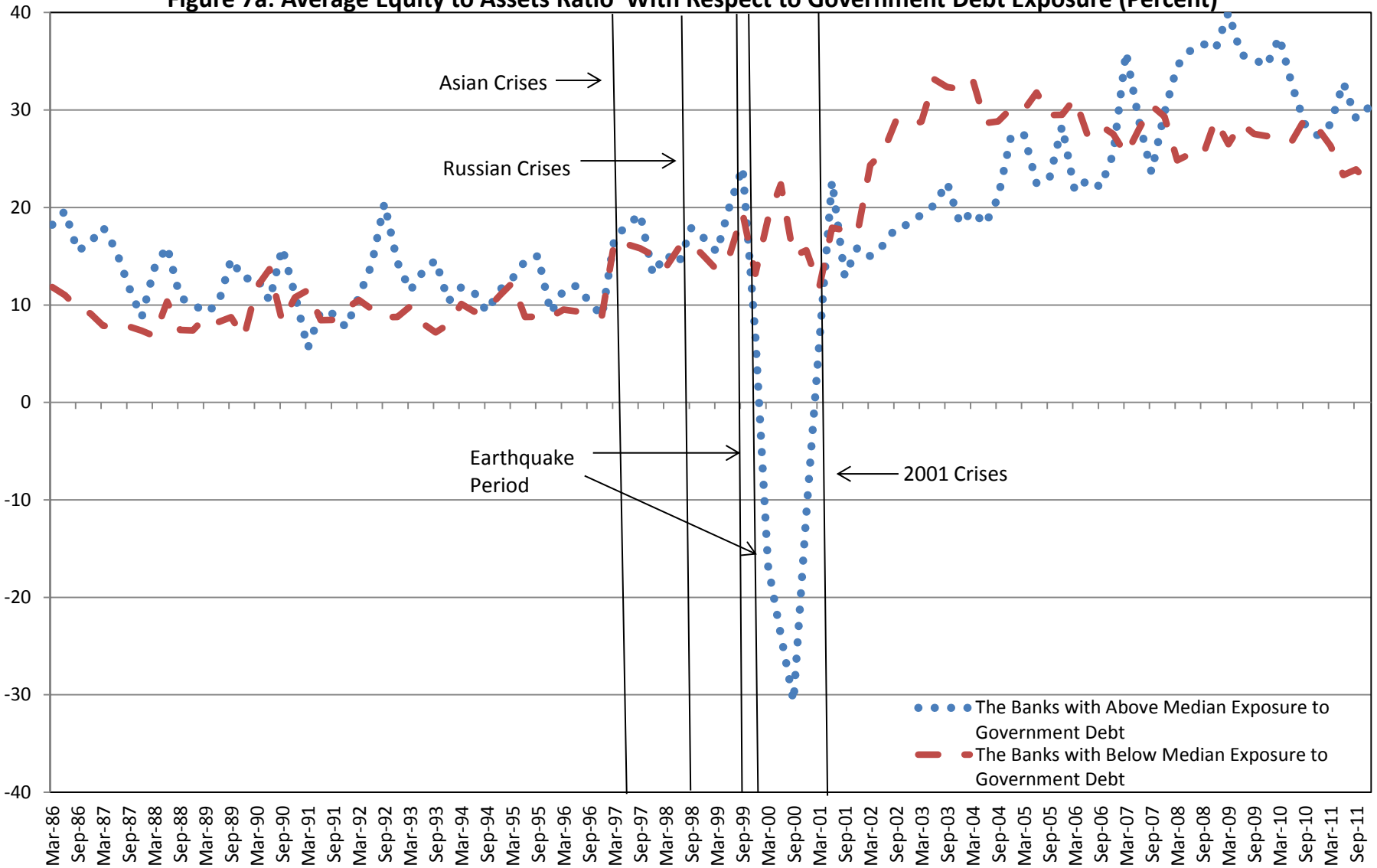

Figure 7b: Average Equity to Assets Ratio With respect to Government Debt Exposure (Percent)

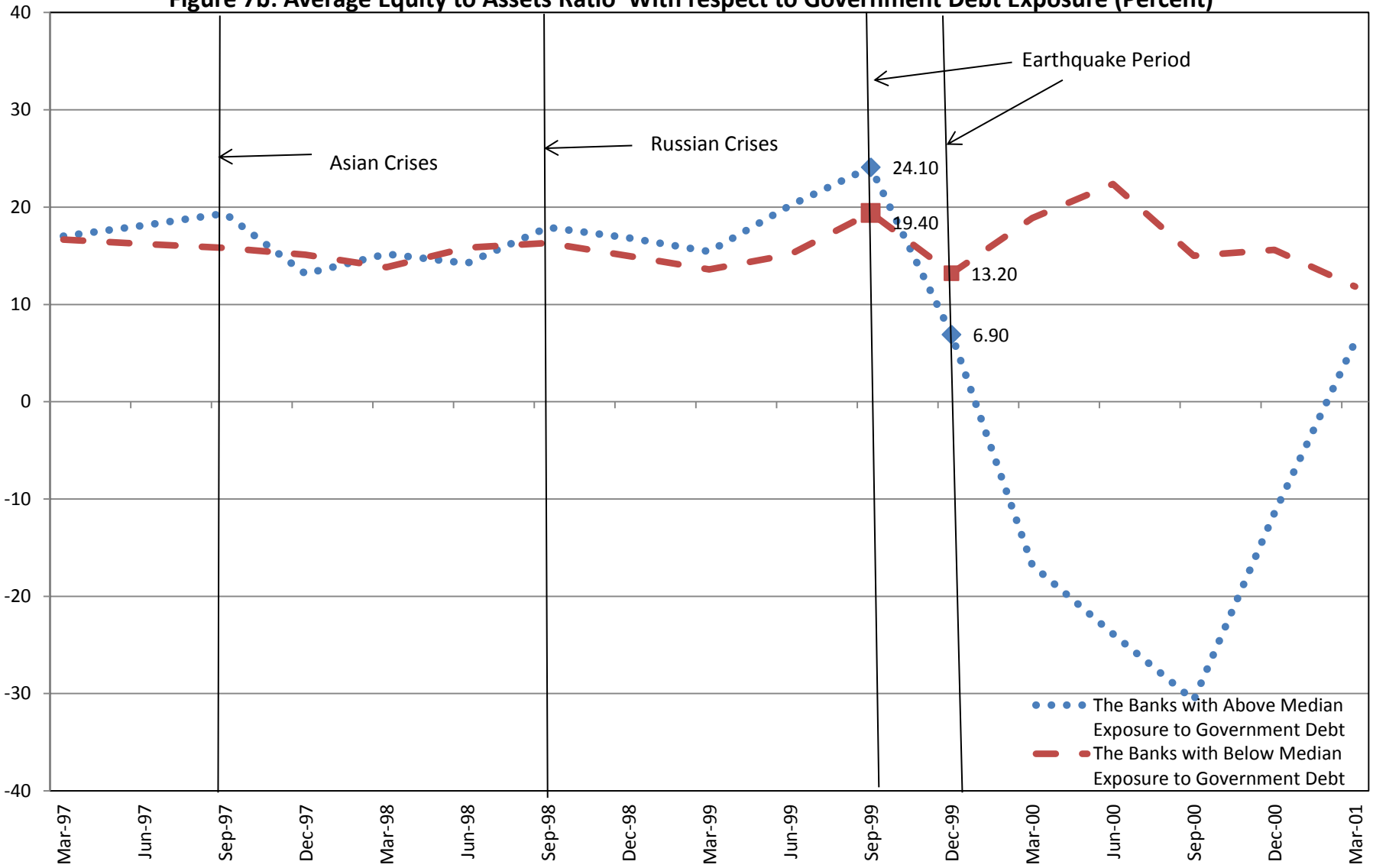

Figure 8a: Average Profits to Assets Ratio With respect to Government Debt Exposure (Percent)

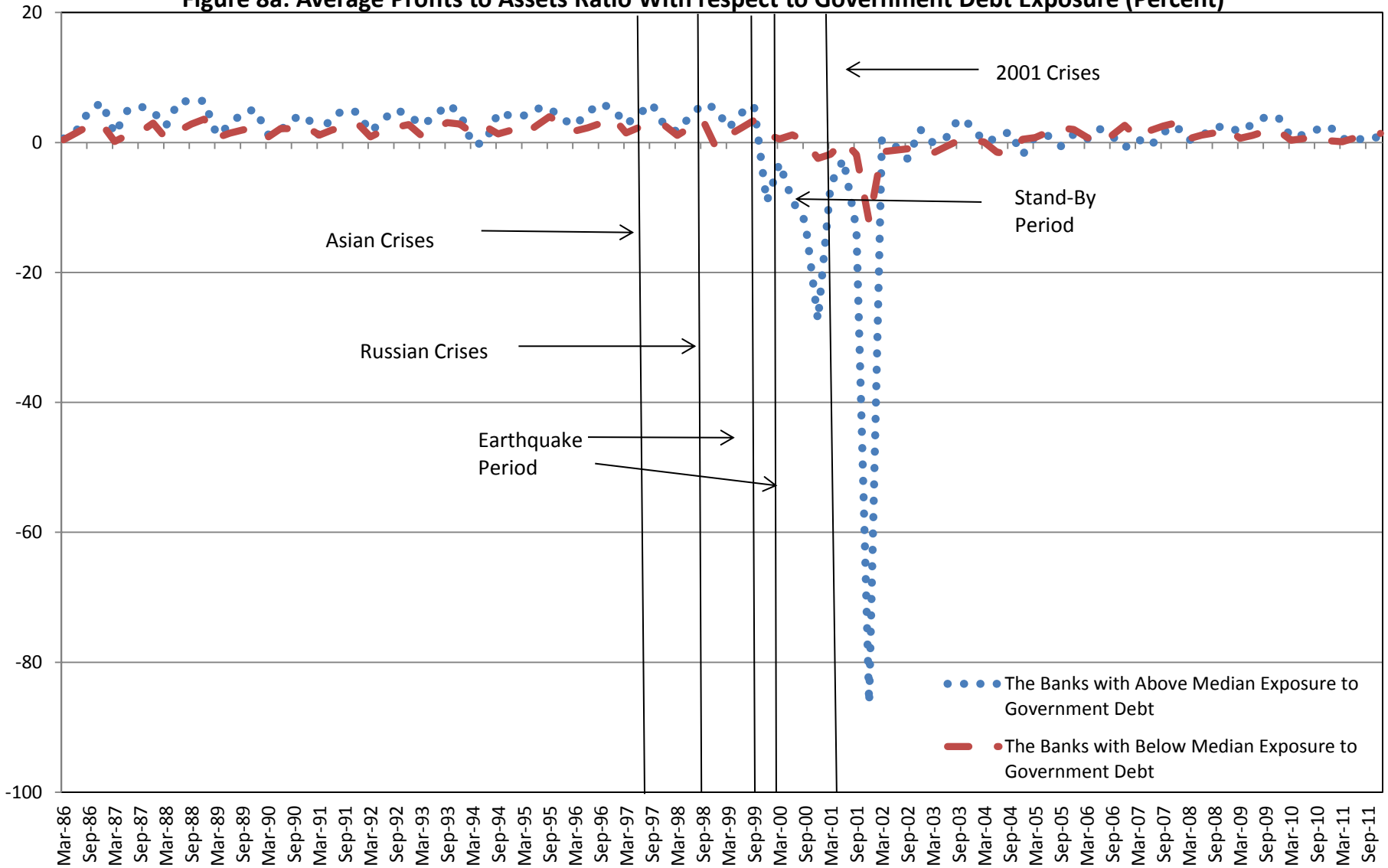

Figure 8b: Average Profits to Assets Ratio With respect to Government Debt Exposure (Percent)

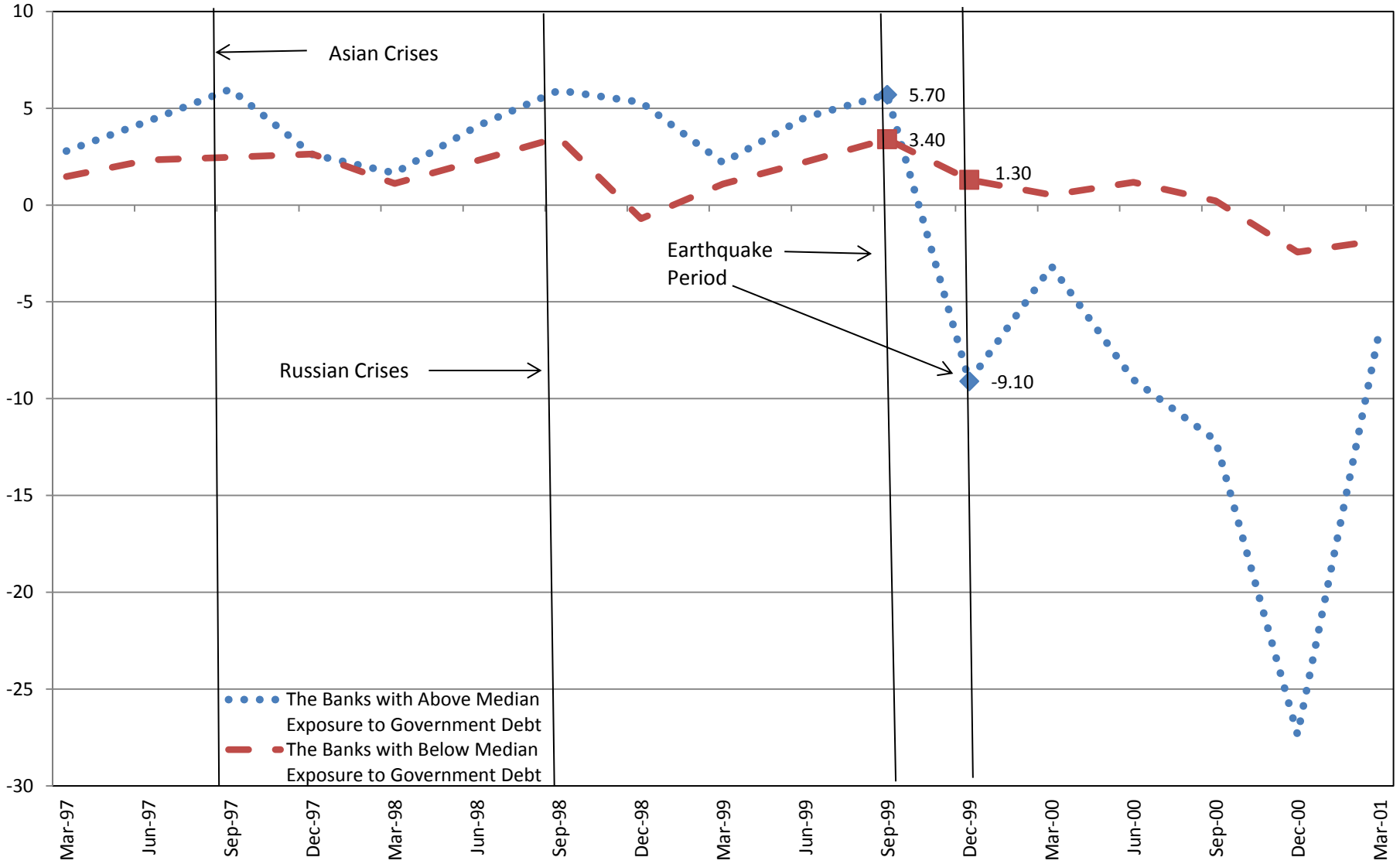

Figure A.1: Ratio of Banks in Corresponding Categories Holding Government Securities

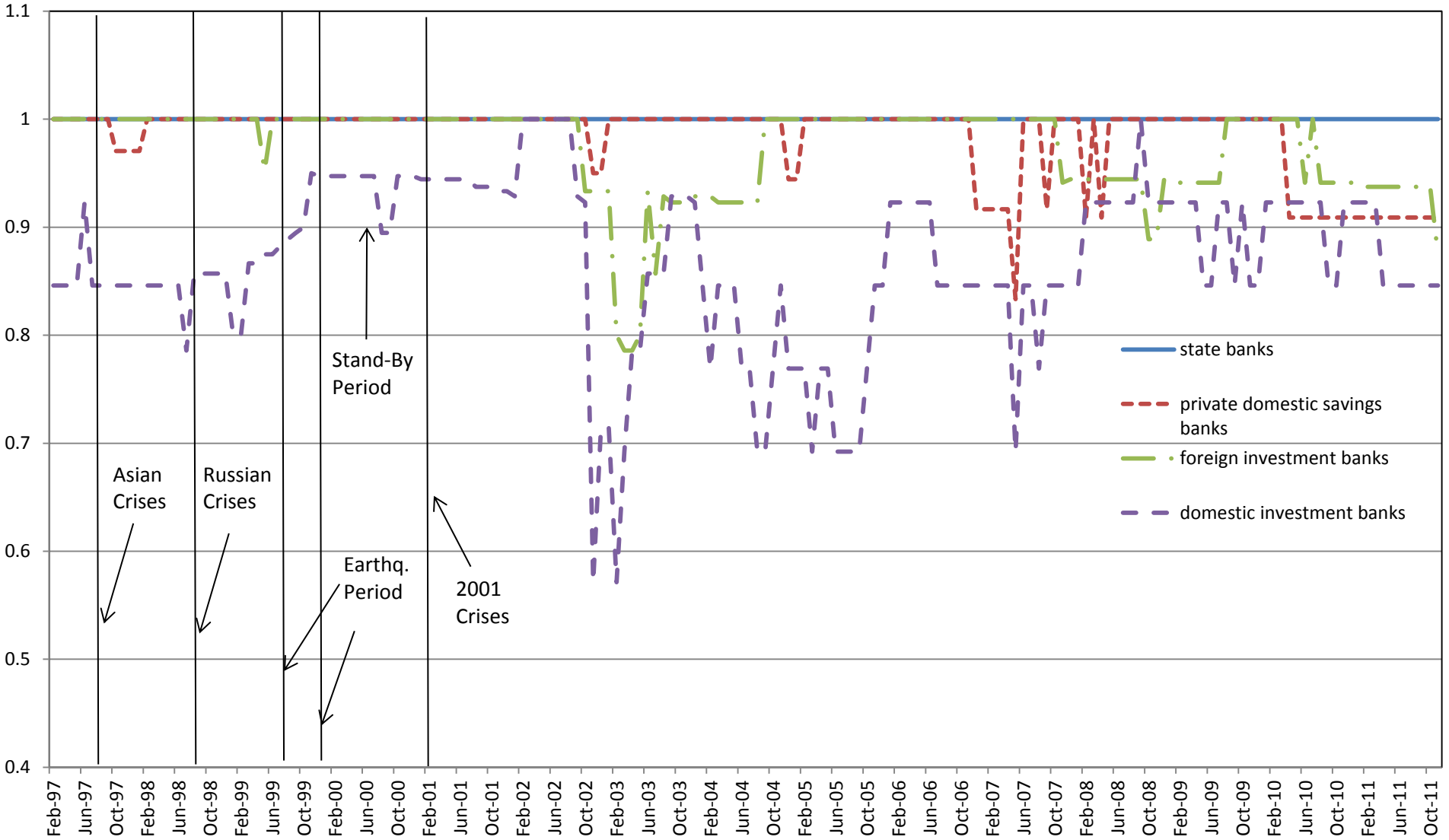

Figure A.2: Share of Government Securities in Banks' Assets by Bank Categories