

Stress Tests, Default Risk, and the Macroeconomy

by

Alan S. Blinder*

Princeton University and Promontory Financial Group

September 24, 2001

Summary

This paper considers the likely macroeconomic backdrop that underlies the proposed stress test for Freddie Mac. It concludes that (a) the conditions presumed in the “downrate” stress test are reminiscent of the Great Depression, (b) for a host of reasons, a macroeconomic situation as severe as the Depression is extremely unlikely in the future and, therefore, most likely too pessimistic to be reasonable and (c) the degree of counterparty risk assumed in the stress test (due to default and loss given default assumptions) for a well-diversified and high quality portfolio of debt instruments is in excess of a reasonable "worst case" scenario.

The stress test

There can be little doubt that a stress test is an appropriate—indeed, an exceedingly useful—component of any effort to develop risk-based capital standards for a large financial institution. Stress tests are employed regularly (though not always successfully) in private-sector risk management and also by a variety of regulators, both in the U.S. and abroad. But the details matter. Among the key questions for designers of stress tests are:

* Alan S. Blinder is a consultant to Freddie Mac, which requested the analysis in this paper. The conclusions, however, are Blinder’s alone and should not be attributed to any organization with which he is affiliated.

- ◆ the *severity* of the hypothesized stress: If the presumed scenario is not sufficiently adverse, the resulting test will be too easy to “pass.” If, on the other hand, it is excessively harsh, then requiring enough capital to pass the test may eliminate much of the enterprise’s profit and/or the public benefit that accrues from its operations.
- ◆ the *nature* of the hypothesized stress: Does the test focus on the relevant risks going forward or does it, like the proverbial general, focus on fighting the last war? This question is, of course, intimately related to the nature of the shock or shocks—whether economy-wide or sectoral—that are (tacitly or explicitly) thought to lead to the stressful situation.

Section 1361 of the Federal Home Loan Mortgage Corporation Act specifies that the risk-based capital test for Freddie Mac should embody, among other things, the following conditions:

- a. a stress period that lasts 10 years
- b. mortgage loan losses on a nationwide basis equivalent to the worst two-year experience of any region containing at least 5% of the U.S. population (the so-called ALMO region).
- c. (in the *downrate* scenario) what amounts to a 50% *decrease* in the interest rate on 10-year Treasuries, with commensurate changes elsewhere along the yield curve.¹
- d. (in the *uprate* scenario) what amounts to a 75% *increase* in the interest rate on 10-year Treasuries, also with commensurate changes elsewhere along the yield curve.
- e. “a correspondingly higher rate of general price inflation.”²

¹ Campbell’s (1998) statistical analysis suggests that changes in the yield curve slope would not be dramatic.

The macroeconomic scenario

From a macroeconomic perspective, these five conditions immediately suggest three observations about the underlying situation that is tacitly subsumed in the stress test:

1. Condition e should probably be interpreted as calling for the inflation rate to rise or fall nearly as much as the (nominal) interest rate. After all, real interest rates rarely move by magnitudes anywhere near as large as the changes in nominal rates contemplated in Conditions c and d—and they virtually never do so for periods as long as a decade.³ Thus this aspect of the shock is best thought of as a sizable change in the *inflation rate*, rather than as a large swing in real interest rates.

2. Conditions a and b suggest an extraordinarily long period of extremely weak macroeconomic performance—at least in the housing market (more on this below). After all, the worst postwar recession in U.S. history (1981-1982) lasted only 16 months, and the economy began growing rapidly shortly after the trough. A stress period of ten years, with rampant defaults on mortgages, seems comparable only to the Great Depression.

3. It is difficult to imagine how an economy could be depressed for a decade and yet still suffer from high inflation—that is, it is hard to imagine a macroeconomic situation that combines Conditions a and b with the inflationary situation implied by the uprate scenario. That would presumably require a severe and amazingly long lasting “supply shock,” such as an oil shock. Thus, in terms of possible defaults, the most consistent and important part of the stress test would appear to be the downrate scenario,

² As long as the interest rate changes are at least 50%, which they are.

³ Both Darby (1997) and Campbell (1998) make this point.

which is redolent of the Great Depression.⁴ After all, financial institutions fail more often in weak economies than in strong ones.

This paper concentrates on the downrate scenario because the likely losses from default in that case are almost certainly larger than the likely default losses in the uprate scenario.⁵ In developing macroeconomic underpinnings for such a stress test, it is natural to look back at the most adverse episodes in U.S. economic history—making due adjustments for relevant structural and institutional changes since then. Of course, the Great Depression stands out as by far the worst macroeconomic situation this country has ever faced. So an extremely stringent stress test might utilize a macroeconomic environment similar to the Depression. I emphasize the adverb “extremely” in the previous sentence, however, for I believe that the overwhelming majority of economists would rate the probability of repeating the Great Depression as negligible.⁶ Such an extreme event is probably rarer than the proverbial hundred-year flood. Not only was the Great Depression far worse than any *postwar* recession, it was also the deepest (though not the longest) of *any* recession in the entire NBER business cycle chronology—which dates all the way back to 1854.⁷

To reinforce this point, Table 1 compares the contractionary phase of the Great Depression to selected aspects of the worst business cycle experiences in the United

⁴ However, the downrate scenario cannot be viewed as a *replication* of the Great Depression. As will be noted below, too many structural features of the U.S. economy have changed since then.

⁵ I do not mean to imply, however, that the uprate scenario is inappropriate. Proper risk management requires assessing Freddie Mac’s exposure to *both* increases *and* decreases in interest rates.

⁶ The doleful experience of Japan over the last decade is *not* evidence to the contrary. Neither the decline in real GDP nor the deflation in modern Japan is in any way comparable to what happened in the U.S. (and elsewhere) during the Great Depression.

⁷ See Moore and Zarnowitz (1986), Table A.4, pp. 760-763.

States since then.⁸ In every case, the differences are dramatic. The Depression lasted almost three times as long and was more than 11 times as deep, when measured by the decline in real GNP/GDP.⁹ The Federal Reserve, which is commonly blamed for letting the Depression get out of hand, allowed the money supply to shrink 27 - 30%, whereas the money supply has virtually never declined in any postwar recession. The cumulative deflation between 1929 and 1933, which seriously exacerbated the plight of debtors, was also extraordinary—including the decline in the prices of (newly constructed) houses. Interestingly, the only criterion on which the worst postwar experience is in any way comparable to that of the Great Depression was in the volume of homebuilding¹⁰—which declined 84% from peak to trough in 1929-1933 versus 32% in 1973 - 1975, for a ratio of “only” 2.6:1. This observation underscores the wisdom of focusing, in the stress test, on extreme weakness in the housing market, as OFHEO does. Combining a “sectoral shock” to the housing market with a general macroeconomic shock seems entirely appropriate in this context.

⁸ According to the National Bureau of Economic Research, the peak quarter was 1929:3 and the trough was in 1933:1. The worst recession since then, both in terms of length and depth, was in 1981-1982. But other recessions have scored worse on several of the other criteria in Table 1.

⁹ It was about six times as deep when measured by the rise in the unemployment rate.

¹⁰ Of course, there are numerous other criteria that are not shown in the table. The table was constructed to highlight the macroeconomic variables most relevant to the performance of Freddie Mac.

Table 1
Comparisons between the Great Depression and Postwar Recessions

Criterion	Great Depression	Worst Postwar Recession	Which Recession?
Length of contraction (months)	43	16	1981-1982
Decline in real GDP (percent)	-32.6	-2.8	1981-1982
Rise in unemployment rate (percentage points)	+21.7	+3.6	1981-1982
Decline in M1 (percent)	-27.3	-0.4	1948-1949
Decline in M2 (percent)	-30.0	-0.3	1948-1949
Decline in GDP deflator (percent)	-26.9	-2.1	1948-1949
Decline in wholesale prices (percent)	-37.4	-6.4	1948-1949
Decline in spending on residential structures (percent)	-84.2	-31.9	1973-1975
Decline in deflator for residential structures (percent)	-33.1	-2.6	1948-1949

Sources: Moore and Zarnowitz (1986), Balke and Gordon (1986), and Bureau of Economic Analysis

In sum, while there are not enough recessions in U.S. history to make the kinds of statistical judgments that are desirable in quantitative risk management (e.g., what is a “three-sigma” event?), my opinion is that a repeat of the Great Depression is an excessively pessimistic macroeconomic scenario. Perhaps something a bit worse (and lasting longer) than the 1981 - 1982 recession, with special difficulties in the housing market, would be a more appropriate backdrop.

More than just a perusal of U.S. business cycle history supports this view. It is well known that the U.S. and other nations have put in place a number of institutional and policy innovations designed to make a repetition of the Great Depression next to impossible. While this is not the place for a lengthy disquisition on this subject, it is worth listing a few of the more important ones:

- ◆ federal deposit insurance, plus the entire web of bank supervision and regulation designed to minimize bank failures and eliminate contagion;
- ◆ automatic fiscal stabilizers such as the personal income tax and unemployment insurance;
- ◆ improvements in the performance of discretionary fiscal and, especially, monetary policy as macro stabilizers.

None of these features were present in 1929, and all are important now. Regarding the last of them, a number of economists have recently observed that the U.S. economy has been much more stable since the recovery from the 1981 - 1982 recession—and especially in the 1990s—than it was before. They attribute a good part of this decreased volatility to improvements in stabilization policy, principally monetary policy.¹¹ So do I.

The housing sector: Is the experience of the Great Depression still relevant?

Because homebuilding amounts to only about 4% of GDP, the above short list of post-Depression innovations did not include changes in the mortgage market. But those have been quite remarkable.¹² For example: The Federal National Mortgage Association (the predecessor of Fannie Mae) was established as a government agency in 1938.

Fannie Mae and Freddie Mac followed in 1968 and 1970, respectively, as federally chartered corporations designed to create a secondary market in mortgages. In the late 1970s and early 1980s, the authority to issue adjustable rate mortgages—which shift some of the risk from lenders to borrowers—was first granted and then liberalized.

Regulation Q ceilings on interest rates disappeared in stages between 1978 and 1986. In

¹¹ See, for example, Blanchard and Simon (2001) and Taylor (2001).

¹² For a recent summary and analysis, see McCarthy and Peach (2001).

1983, Freddie Mac issued the first Collateralized Mortgage Obligation (CMO). And so on.

It is no exaggeration to say that these and other financial innovations revolutionized the housing finance system in the United States—especially since the mid-1980s. In the process, they transformed the mortgage market from one dominated by thrift institutions that both originated mortgages and held them on their balance sheets to one dominated by mortgage bankers and brokers and securitized mortgage instruments that are traded as capital-market instruments. They also transformed a market subject to frequent credit rationing and episodes of sharp “disintermediation” when the Fed tightened monetary policy into one that behaves more like a normal, price-mediated capital market. One result of all these legal and institutional changes has been a less volatile housing market—which, of course, was precisely what was intended.

The conclusion is *not* that a severe housing slump is now impossible. Rather, it is that the terrible experience with mortgage defaults in the 1930s would appear to be even *less* relevant to the housing market than the Great Depression is to the economy as a whole.

Default rates and counterparty risk

More specific questions pertain to Freddie Mac’s counterparty risk. In particular, questions have been raised about the “haircuts” (which represent assumed losses) in the stress test. This is not the place to engage in a lengthy discussion of the details, but a few remarks relating this specific issue to the underlying macroeconomic scenario are in order.

First, I have just argued that the general macroeconomic conditions of the Great Depression are most likely too pessimistic to be reasonable. Thus, both the default and loss (given default) rates experienced during the 1930s should be taken as very generous *upper bounds* on plausible default and loss rates during the stress period. Where would such upper bounds be?

The best available information pertains to default rates on *corporate bonds*, which naturally vary by credit rating. Moody's has estimated that the 10-year cumulative default rate on *all* U.S. corporate bonds in the decade 1930 - 1940 was 20.4%. Unsurprisingly, that rate peaked (at around 33%) for the cohorts in existence around 1929 - 1931 and then fell rapidly as more "good years" were added to the 10-year period. The 20.4% average figure for the decade is comparable to (though slightly below) the loss rates assumed in the OFHEO stress test—which reinforces the view that the test contemplates a scenario similar to the Great Depression.

However, the average 1930 - 1940 default rate is highly skewed by the extremely adverse experience of speculative-grade bonds. The corresponding ten-year default rate for *investment-grade* bonds—which are much more germane to Freddie Mac's counterparties¹³—was just 10.7%. The *worst* 10-year experience for such bonds (the 1930 cohort) was a default rate of 19.7%. Hickman's (1958) study of bond defaults between 1912 and 1943 found *four-year* default rates for investment grade corporate bonds of 6.2% in the four years spanning 1932 - 1935.¹⁴ But performance was much better in the quadrennia immediately before (1928 - 31 which includes the first two years of the Depression) and after (1936-1939 which were still Depression years)—just 1.4%

¹³ Freddie Mac's counterparties are concentrated in the AAA class and very few are rated lower than A.

and 3.3% respectively. All this suggests that a presumed default rate *for investment grade bonds* of, say, 10.7%, lasting for a decade, is, if anything, on the high side for a forward-looking stress test.

Second, a corporate default does not normally lead to 100% loss of the investor's principal and interest. Moody's (2001, p. 24) study found average loss rates of 47% for senior secured bonds, 53% for senior unsecured bonds, and 68% for subordinated bonds over the 1981 - 2000 period. Surprisingly, these loss rates are roughly comparable to those found by Hickman (1958) for the period 1900 - 1943. So perhaps this is one area in which the earlier experience—which includes the Great Depression—is still relevant. However, the approximately 50% loss rate suggested by experience is roughly half the 100% loss rate that appears to have been used in the stress test.

Third, and finally, there turns out to be surprisingly little correlation between default rates on corporate bonds and the overall macroeconomic situation—at least in the more recent data. Figure 1 illustrates this fact by plotting default rates (from Moody's) against the growth rate of real GDP over the 1970 - 2000 period. The correlation, while negative, is evidently extremely weak. (It is, in fact, -0.23.) Adding more lags of GDP growth, or switching to the unemployment rate instead (scatter plots not shown), does not appreciably increase the correlation. Thus corporate default rates seem to have a life of their own, wholly apart from the overall business cycle. For example, while the three highest default rates shown in Figure 1 pertain to 1990, 1991 and 1970 (in that order), which were all recession years, defaults ran far lower during the much more severe recessions of 1973 - 1975 and 1981 - 1982. Furthermore, default rates were rather high

¹⁴ See his Table 35, p. 189. Actually, this was not the period of highest default rate. Some 7.0% of corporate bonds defaulted in the 1912-1915 quadrennium.

in the two most recent “boom years” 1999 and 2000. The historical lesson may be that defaults tend to run high after long booms (in the 1960s, the 1980s, and the 1990s) lead to “irrational exuberance,” less cautious lending, and high leverage.

Conclusions

The main conclusions of this short paper are easy to summarize:

1. Simple macroeconomic analysis suggests that the most worrisome scenario for the credit risks faced by an institution like Freddie Mac would be a severe and lengthy recession with particular problems in the housing market. This is rather similar to the “downrate” scenario in the stress test. But macroeconomic conditions as dire as those of the Great Depression seem entirely too pessimistic.

2. A variety of institutional and policy changes have made both the overall economy and the housing sector in particular more stable today than they were in the 1930s. So even if the same sorts of severe “shocks” were to occur today (e.g., a 1929-style stock market crash, an international financial calamity), their effects would be less devastating.

3. Cumulative *10-year* default rates on *investment grade* corporate bonds appear to have averaged around 10% during the 1930s. Coupled with a (roughly) 50% recovery rate, that implies total investor losses of around 5%. That seems to be a reasonable assumption for a “worst case” scenario going forward, as long as the portfolio of debt instruments is well-diversified and of reasonably high quality. The haircuts in OFHEO’s rule are well in excess of this level.¹⁵

¹⁵ The following calculation may help put a more contemporary perspective on what a 5% loss rate means. Moody’s (2001, p. 27) default study combined 1970 - 2000 average default rates and 1981 - 2000 average recovery rates to estimate typical *one-year* loss rates of 0.1% on Baa bonds and 0.9% on Ba bonds. This means that a hypothetical *low-quality* portfolio consisting of 50% Baa bonds and 50% Ba bonds might have

4. Surprisingly, the two constituent rates in the above calculation (default and recovery) do not appear to be terribly cyclical, although the bond default rate was extraordinarily high during the 1930s.

suffered an average *10-year* loss rate of about 5% over the last three decades. (Performance over the *worst* 10 years would have been worse than this, of course.)

References

Nathan Balke and Robert Gordon, "Appendix B: Historical Data," in R.J. Gordon (ed.) The American Business Cycle: Continuity and Change (Chicago: University of Chicago Press for NBER), 1986, pp. 781-850.

Olivier Blanchard and John Simon, "The Long and Large Decline in U.S. Output Volatility," Brookings Papers on Economic Activity, 2000:1, pp. 135-164.

John Campbell and Analysis Group/Economics, "The Yield Curve and Proposed Stress Tests for Freddie Mac," May 1998, appended to Freddie Mac's comment (dated March 10, 2000) on OFHEO's April 13, 1999 Notice of Proposed Rulemaking.

Michael Darby, "Consistent Macroeconomic Conditions for a Risk-Based Capital Stress Test," June 1997, appended to Freddie Mac's comment (dated March 10, 2000) on OFHEO's April 13, 1999 Notice of Proposed Rulemaking.

W. Braddock Hickman, Corporate Bond Quality and Investor Experience, (Princeton, NJ: Princeton University Press for NBER), 1958.

Jonathan McCarthy and Richard Peach, "Monetary Policy Transmission to Residential Investment," unpublished paper, Federal Reserve Bank of New York, April 2001.

Moody's Investors Service, Default and Recovery Rates of Corporate Bond Issuers: 2000, February 2001.

Geoffrey Moore and Victor Zarnowitz, "The Development and Role of the National Bureau of Economic Research's Business Cycle Chronologies," in R.J. Gordon (ed.) The American Business Cycle: Continuity and Change (Chicago: University of Chicago Press for NBER), 1986, pp. 735-779.

John Taylor, "Comment" in Federal Reserve Bank of Kansas City, Economic Policy for the Information Economy, 2001 (forthcoming).