

# Financial Frictions\*

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A comprehensive measure of financial friction is the difference between the return businesses earn from capital—plant and equipment—and the market cost of capital. The latter is the amount that investors earn from holding financial claims. I measure this friction as the difference between the marginal product of capital adjusted for capital gains and losses on that capital and the short-term interest rate. The friction measured in that way rose to an unprecedented level after the financial crisis that began in late 2008 and remained high four years later. Macro models show that overall economic activity is seriously adversely affected by such a large widening of frictions.

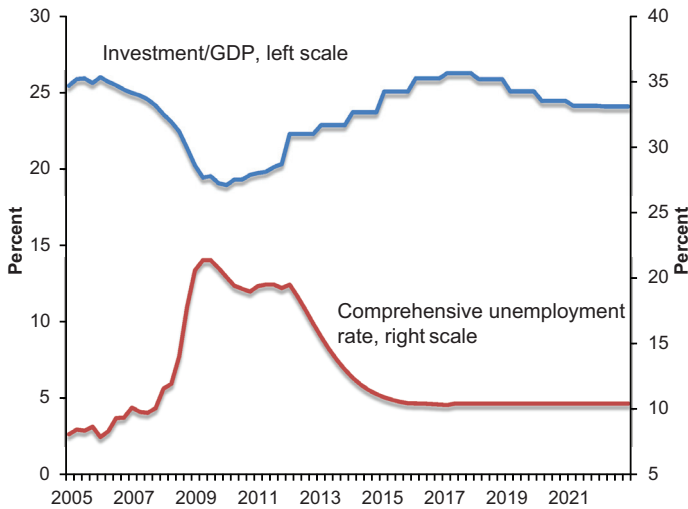
JEL Codes: E3, E5, G11.

In the wake of the financial crisis of September 2008, output and employment fell precipitously in the United States. Although economic activity had begun to decline gradually starting in the previous December, the dramatic decline immediately after the crisis suggests that financial events—specifically the tightening of lending standards by surviving financial institutions—had a major role in the deep and prolonged slump in the economy. Events in financial markets stand at the forefront of most explanations of the slump. Commentary has focused on two channels. The first, household deleveraging, emphasizes cutbacks in consumption forced on credit-dependent households by the elimination of opportunities to borrow

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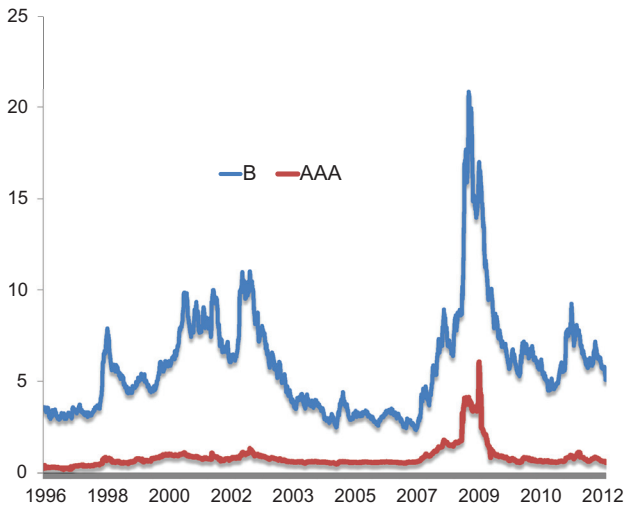
**Figure 1. Investment/GDP Ratio and Comprehensive Unemployment Rate, 2005 to 2022**



and by rising requirements to repay existing debt. The second, financial frictions, emphasizes the cutback in plant, equipment, and inventory investment resulting from a rising gap between returns earned by savers and the effective cost of funds for credit-dependent businesses and households. That gap—or financial friction—rose both because financial institutions earned higher spreads between their funding costs and their interest charges and because the institutions rationed credit.

In late 2008, the Federal Reserve lowered its policy interest rate to essentially zero, where it remains at this writing. The transition from an earlier policy regime, where the rate responded to current developments, to one that was incapable of any response, was an important feature of the economy in the aftermath of the crisis.

Two key macroeconomic indicators describe the response of the economy to the crisis: the unemployment rate, taken as a measure of overall economic activity, and the ratio of gross investment to output, a variable known to be sensitive to financial frictions. Figure 1 shows actual values of the two key variables from 2007 through 2011 and projections for 2012 through 2022. The projections are updates

**Figure 2. Corporate Bond Spreads**

of forecasts of the Congressional Budget Office made in January 2012.

A big issue is the persistence of the slack following the financial crisis, plainly visible in both key indicators. A reliable law of macro models holds that frictions and wedges have mostly contemporaneous effects; they do not trigger persistent changes in employment and output. The persistent slump in the American economy that began in 2008 is presumptively the result of lingering adverse forces, financial frictions and otherwise.

Some commentators have taken interest rate spreads as measures of financial frictions. The crisis saw a sharp decline in safe interest rates, especially on obligations of the federal government, while rates on default-prone obligations rose. The spread—the difference between the risky and safe rates—rose dramatically. Figure 2 shows an example, the spread between low-quality corporate bonds rated single B and U.S. Treasury bonds of the same maturity (the upper line) and the spread between high-quality bonds rated AAA and Treasuries (the lower line). Both spreads jumped at the crisis but recovered to normal levels quickly. Long after spreads returned to normal, output and employment remained far below trend. I

conclude that spreads between the returns of liquid traded assets do not measure frictions of the sort that could help understand prolonged slumps.

The most basic concept of a financial friction is a spread between the return earned in businesses from the use of physical capital—plant and equipment—and the return earned by savers. This spread combines the influences of agency frictions within producing firms, in the relation between those firms and suppliers of funds (lending institutions together with markets for equity and debt), agency frictions within financial intermediaries, and frictions between financial institutions and investors. I measure the spread as the difference between the return to capital over a year and the one-year interest rate available to savers. This approach implies that I include the tax wedge and the risk premium in my calculation as well as the spread from all financial frictions.

I let  $f_t$  denote the spread arising from the various frictions. It is modeled as a tax and, as mentioned above, includes business taxes. The market or shadow value of physical capital is  $q_t$  (Tobin's  $q$ ). If a firm invests a unit of output at the beginning of period  $t$ , the firm gets  $1/q_t$  units of capital to hold during period  $t + 1$ , which results in the ability to sell

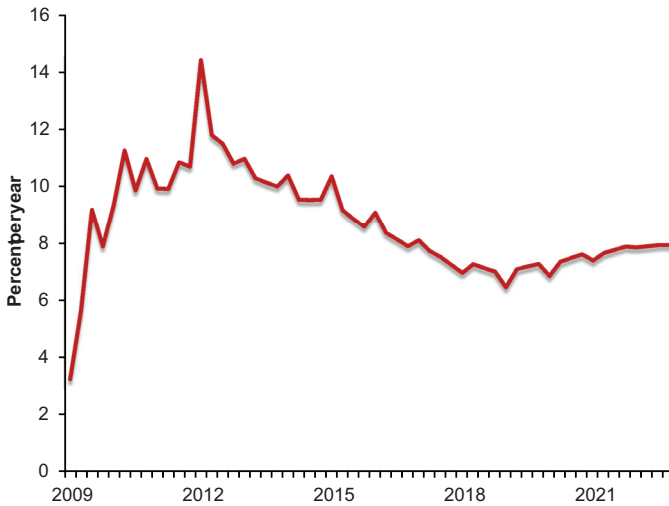
$$1 + r_t = \frac{1}{q_t} \left[ \alpha \frac{y_t}{k_t} + (1 - \delta)q_{t+1} \right] - f_t \quad (1)$$

extra units of output at the beginning of period  $t + 1$ . Here  $r_t$  is the real return on capital,  $\alpha$  is the elasticity of the production function with respect to capital (assuming Cobb-Douglas technology),  $y_t$  is output,  $k_t$  is the amount of capital, and  $\delta$  is the rate of depreciation of capital.

Tobin's  $q$  depends on adjustment costs in investment, indexed by the parameter  $\kappa$ . One unit of output at the beginning of period  $t$  becomes one unit of installed capital held during the period. Installation incurs a cost at the beginning of the period of  $\kappa(k_t/k_{t-1} - 1)$ . Thus the price of a unit of installed capital at the beginning of the period is

$$q_t = \kappa \left( \frac{k_t}{k_{t-1}} - 1 \right) + 1. \quad (2)$$

**Figure 3. The Spread between the Return to Capital and the Safe Real Short Rate**



The wedge  $f_t$  is the value that equates the return to capital from this formula to the one-year real interest rate. It is the spread between the return to capital and the safe real short rate:

$$f_t = \frac{1}{q_t} \left[ \alpha \frac{y_t}{k_t} + (1 - \delta)q_{t+1} \right] - 1 - r_t. \quad (3)$$

Figure 3 shows the calculation using aggregate U.S. data. The comprehensive spread rose rapidly after the crisis, continued to rise through 2011, and is projected to fall gradually back to normal over the coming decade. Unlike the spreads for corporate bonds shown earlier, this spread is highly persistent.

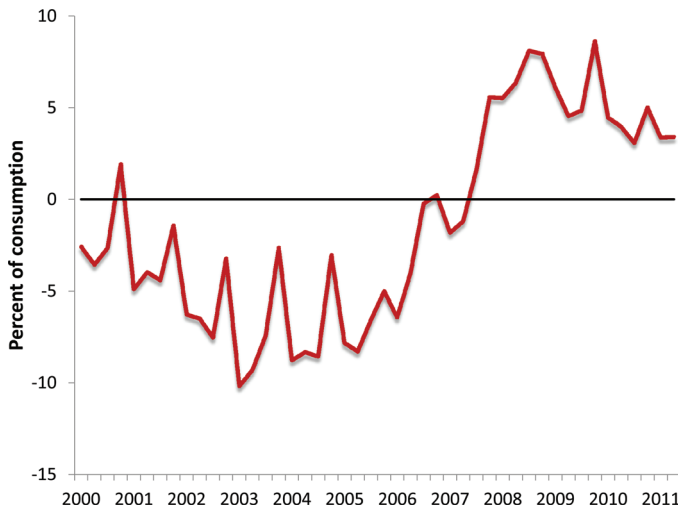
The calculation of the comprehensive spread confirms the hypothesis that some combination of the factors incorporated in the spread created a persistent drag on the economy. Hall (2010, 2011) explains why the effects of the spread on output and employment are so large, according to standard principles of modern macroeconomics. Research has yet to make much progress in breaking down the comprehensive spread into its components, except that to date no important changes in business taxes have occurred. Some economists believe that the risk premium for business activity increased

dramatically as a result of the crisis, though there is some doubt about how persistent that increase was. Others emphasize rationing of credit by lending institutions—measures of rationing such as the Federal Reserve’s Survey of Senior Loan Officers confirm the persistence of higher lending standards. But many large corporations accounting for a high fraction of investment have direct access to securities markets, where borrowing costs are low. The non-financial corporate sector as a whole has about zero net borrowing. Much more work remains to understand why the continuing high payoff to investment relative to the cost of funds has not set off a wave of high investment. Figure 1 shows that, instead, investment has been extraordinarily weak since the crisis.

With respect to consumer deleveraging, the other main force generally blamed for the persistent slump, the Federal Reserve Board’s Flow of Funds data report a large decline in consumer debt—mainly mortgages, car loans, and credit card balances—prior to and after the financial crisis. But the decline in debt outstanding is not a good measure of deleveraging in the sense of cash flows out of households. Debt will decline with defaults, in which case no corresponding cash outflows squeeze consumption. Notwithstanding the name, the Flow of Funds accounts do not report flows of cash out of households—the flow item for consumer debt is literally the first difference in outstanding debt. The same obstacle to measurement of deleveraging, in the sense that I use the term, applies to any research based on loan balances outstanding.

Figure 4 shows a provisional calculation of the deleveraging flow of cash out of households, adjusted for defaults. The measurement of defaults is a challenge. Banks report a concept called *charge-offs* to account for losses on loans. The amount represents the bank’s estimate of the impairment of the value of non-performing loans occurring in a given period. The use of charge-offs as an offset to loan balance reductions to measure deleveraging is conceptually appealing, because the charge-off is net of the bank’s expected recovery from the sale of the collateral. For example, if a homeowner defaults on a \$120,000 mortgage on a house that sells for \$100,000, the charge-off is \$20,000. Suppose a new owner buys the house with a no-downpayment loan of \$100,000. The household sector has no cash outflow to the financial sector. Outstanding mortgage loans fall by \$20,000, the amount of the charge-off. Subtracting the charge-off

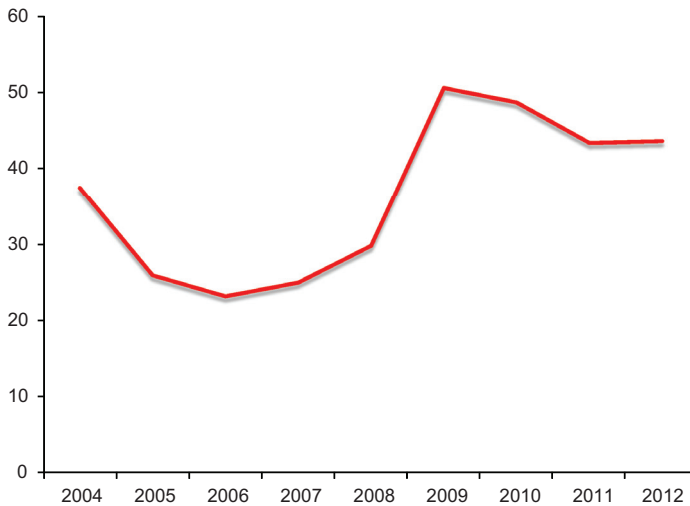
**Figure 4. Burden of Deleveraging as a Percent of Consumption**



from the decline in outstandings gives the right answer of cash outflow from households of zero. In the case of unsecured credit card lending, it is immediately apparent that cash outflows to lenders from households is net of charge-offs.

Relying on banks' estimates of charge-offs may distort the timing of estimated cash outflows from deleveraging. Saulny (2012) reports that it is common for banks to leave defaulted homeowners in their homes to act as caretakers. Whether banks report full charge-offs for houses in this situation is not known—the low market value of banks with large mortgage portfolios relative to the book values of those portfolios suggests that there may be lags in updating book values. The book value of a loan declines each time a charge-off is reported on the loan.

Figure 4 suggests that household deleveraging was a powerful force contracting the U.S. economy immediately after the crisis, but the force abated quickly and cannot explain the persistence of the slump. Other evidence supports the view that financial factors held back the recovery in consumption. For example, figure 5 plots the frequency of Google searches for the term “withdrawal penalty.” These searches presumably reflect consumers' desire to withdraw

**Figure 5. Google Searches for “Withdrawal Penalty”**

early from CDs, retirement plans, and other savings vehicles with restrictions on withdrawals. A willingness to incur penalties indicates serious financial stress. Searches rose dramatically at the time of the crisis and have abated only slightly, indicating persistent stress that limits the recovery of consumption.

U.S. economic policy to offset the harm of the financial crisis has been remarkably ineffective; otherwise, the economy would be in much better shape today, four years after the crisis. The Federal Reserve acted swiftly to lower its policy rate to essentially zero as soon as the adverse effects of the crisis became apparent, but the zero lower bound limited the benefit of conventional stimulus through the short-term interest rate. A number of economists, including me, have advocated lowering the policy rate into negative territory, following the example of the courageous central bank of Denmark. The Federal Reserve's purchases of large volumes of mortgage-backed securities have lowered the yield on these securities, but the effects in the housing market are controversial. Rationing in the mortgage market has obviously increased dramatically. The Federal Reserve has been successful in lowering the yields on longer-term Treasury bonds, but the connection of these yields to output and employment is tenuous.



With respect to fiscal policy, the automatic stabilizers in the U.S. fiscal system—federal and state—appear to have been successful in preventing even larger declines in output and employment. Discretionary fiscal policy has been used extremely sparingly.

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