Unemployment Insurance and Macro-Financial (In)Stability

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Views expressed here are those of authors and do not reflect the views of the FED Board.
Unemployment insurance (UI) as an automatic stabilizer

- Study of unemployment insurance can be summarized by Baily-Chetty formula.
- Optimal unemployment insurance weighs social insurance benefits through better consumption smoothing - Brown (1955), Blinder (1975), Christiano (1984)
- Weighs social costs through higher taxes, discouraged job creation and job search - Moffitt (1985), Hagedorn et al (2019)

- This paper:
  - Two new mechanisms.
  - A higher unemployment insurance weakens household balance sheets: Households reduce precautionary (liquid) savings & increase mortgage debt/leverage.
  - Weakens bank balance sheets: Banks hold more and riskier mortgages.

- Literature 1 / 25
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   - interactions between household, bank, and firm balance sheets.

2. County and state level evidence on house prices and mortgages
1. **Quantitative GE model evidence:**

- **Higher UI →**
  - **Higher** loan-to-income (LTI) ratios
  - **More** and **higher**-LTI mortgages in bank balance sheets.

However, unexpected discretionary increases in UI stabilize recessions. 

GE effects matter: Increasing UI for the whole economy creates a systemic risk, not captured by cross-sectional variation across regions within the economy. Cross-sectional studies potentially understate destabilizing effects of UI.
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- Higher UI → higher loan-to-income (LTI) ratios
  - Cross-sectional (border-county) evidence
  - Event study after an unexpected cut in UI in Missouri
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- House prices and mortgage loans respond more to aggregate shocks
  - Cross-sectional (border-county) evidence
Quantitative Model
Environment: Households-I

- OLG of finitely-lived households

- Subject to idiosyncratic income and unemployment risk.

- Unemployed receive UI benefits.

- HHs receive utility from consumption and housing services.

- HHs can either rent or own a house of desired size; can save in liquid assets.
Environment: Households-II

- House purchase can be done through a defaultable fixed-rate mortgage
- Terms of mortgage contracts (down payment and mortgage interest rate) are endogenous
- Homeowners can resize their house and/or refinance their mortgage
Final Good Producers and Banks

- **Final Good Producers**
  - combine labour and capital to produce final good
  - finance a fraction of their wage bill in advance from banks

- Banks accept deposits at an exogenous rate, give short-term loans to production firms, and issue and invest in long-term mortgages to households. Banks can default with a fraction of their assets and not pay creditors → endogenous leverage constraint & credit supply \( \propto \) bank net worth. Credit supply = credit demand from firms & households → equilibrium bank lending rate.
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Quantitative Results
Calibrate the model economy to match US moments, most importantly

- E-U-E transition rates, income risk, unemployment insurance
- Household and bank balance sheets
- Aggregate quantities and prices
Quantitative Exercise

- Calibrate the model economy to match US moments, most importantly
  - E-U-E transition rates, income risk, unemployment insurance
  - Household and bank balance sheets
  - Aggregate quantities and prices

- Study
  1. Steady state effects of higher UI on household and bank balance sheets
  2. Destabilizing effects of UI: a boom-bust experiment.
Large variation in UI replacement rates (maximum UI benefit / county median income) in US counties
Steady-State Comparisons

Household Financial Asset

Mortgage Debt to Output Ratio

Down Payment Ratio

Mortgage Share in Banks Assets
**A Remark:**

Results generalize to productivity, house price expectations, & bank leverage shocks.
Boom-Bust Dynamics (UI=40%)

- **Bank Lending Rate**
- **Bank Net Worth (Δ%)**
- **Foreclosure Rate (percent)**
- **Output**
- **House Price (Δ%)**
- **Consumption**
Higher UI amplifies the **bust** in the housing market

![Graphs showing the impact of UI replacement rate on household mortgage debt, house price, and foreclosure rate.](image-url)
Higher UI amplifies the bust in the banking sector

Bank Net Worth: $N_t (\Delta \%)$

Credit Spread ($\Delta$)
Higher UI amplifies the **bust** in income, output, and consumption.
UI helps **unemployed** but hurts **employed**

**Consumption**

**Foreclosure Rate**
GE Matters: Bank balance sheet channel **amplifies** the destabilizing effect of UI

**Benchmark** = **No BBS Effect** + **BBS Effect**

![Graphs showing the effect of UI replacement rate on output and consumption](image)

- **Output** and **Consumption**
- **House Price**, **HH Debt**, and **ForeC**

![Graphs showing the effects of UI replacement rate on various economic indicators](image)
Unexpected temporary UI expansion stabilizes

- Increase discretionary UI benefits in the benchmark model (UI=40%) to 60% during the bust

Consumption

<table>
<thead>
<tr>
<th>UI replacement rate (%)</th>
<th>40</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent (Benchmark)</td>
<td>-6.6</td>
<td>-5.6</td>
</tr>
<tr>
<td>Unexpected 1-period</td>
<td>-6.6</td>
<td>-5.6</td>
</tr>
</tbody>
</table>

House Price

<table>
<thead>
<tr>
<th>UI replacement rate (%)</th>
<th>40</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent (Benchmark)</td>
<td>-7.7</td>
<td>-7.6</td>
</tr>
<tr>
<td>Unexpected 1-period</td>
<td>-7.7</td>
<td>-7.6</td>
</tr>
</tbody>
</table>
Evidence from US States and Border Counties
Evidence for two key implications of the quantitative model

1. Mortgage debt/leverage is higher in regions with higher UI.

2. Regions with higher UI experience larger fluctuations in aggregates.
We use counties that have borders to each other but are in different states.
1. UI and Loan-to-Income Ratio

Strong positive correlation between UI Generosity and Loan-to-Income ratio
Using Panel data at the county level:

\[ LTI_{bcy} = \beta \ast UI\text{benefits} + \gamma \ast Controls + YearFE + CountyFE + BankFE + \epsilon_{bcy} \]

<table>
<thead>
<tr>
<th>Dependent Variable: Loan-to-income ratio</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UI Benefits</td>
<td>0.462***</td>
<td>0.261***</td>
<td>0.148***</td>
<td>0.216***</td>
<td>0.220***</td>
<td>0.213***</td>
<td>0.042***</td>
<td>0.056***</td>
</tr>
<tr>
<td>Controls</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Year FE</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>County FE</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Bank FE</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Bank*Time FE</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Pair*Time FE</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Obs.</td>
<td>2,950,010</td>
<td>2,021,977</td>
<td>2,021,977</td>
<td>2,021,977</td>
<td>2,021,365</td>
<td>2,008,819</td>
<td>2,220,346</td>
<td>1,510,563</td>
</tr>
<tr>
<td>R²</td>
<td>0.075</td>
<td>0.082</td>
<td>0.100</td>
<td>0.183</td>
<td>0.305</td>
<td>0.370</td>
<td>0.204</td>
<td>0.415</td>
</tr>
</tbody>
</table>

Notes: This table documents the positive association between the LTI ratios and UI generosity. The dependent variable is LTI ratio, which is the ratio of the mortgage amount to the income. The main independent variable is UI generosity, which is the log of the maximum amount of money a person can get from UI. Control variables and fixed effects are indicated at the bottom of each column. Control variables are the log of county-level average income, the share of subprime borrowers, the log of the size of labor force, county-level HHI of industry composition and deposit markets, state-level log of minimum wage, health insurance payments, non-UI transfer payments, and union coverage. Columns (1)-(6) use the whole sample. Columns (7)-(8) use county-pairs, in which the counties are neighbors to each other but located in different states. Standard errors are clustered at the state-year level.
2. UI amplifies the effect of interest rates on newly issued mortgages

This table estimates the effect of long-term interest rates on mortgages and how generous UI benefits increase the effect of the rate. In all models, the dependent variable is quarterly log change of mortgages, $\Delta \log(HMDA_c)$. The main independent variable is 10-year interest rate, $\Delta Int. Rate_{10y}^{t-1}$ and its interaction with UI benefits, $UI Ben$. $UI Ben$ is a dummy variable which is 1 if the value is above median of the sample of each year. Control variables and fixed effects are indicated at the bottom of each column. County controls are log of total wage, log change of labor force, log of population, log change of establishments, log change of nominal personal income, change in sectoral employment HHI, change in deposit market HHI. County controls are yearly. Macro controls are log change in GDP, change in unemployment rate, change in VIX, change in CPI, and interaction of these variables with $UI Ben$. All macro controls are quarterly and enter model with 1 quarter lag. State controls include minimum wage, aggregate non-UI transfers, aggregate state health insurance payments and their interactions with $Int. Rate_{10y}^{t-1}$. These variables are dummy variables which is 1 if the value is above median of the sample of each year. Column (1) and (2) use the entire sample. Column (3) uses matched sample. Column (4) uses contiguous counties in different states. In columns (3) and (4), crucial fixed effects are $Pair\times Time$ fixed effects. Standard errors are clustered at state and date level in columns (1)-(3), at border segment and state level in column (4).

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Pair(matching)</th>
<th>Pair(border)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>$\Delta Int. Rate_{10y}^{t-1} \times UI Ben.$</td>
<td>-0.039***</td>
<td>-0.036***</td>
<td>-0.016*</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.011)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>$\Delta Int. Rate_{10y}^{t-1}$</td>
<td>-0.337***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.113)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>County Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>State Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Macro Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>County FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Month FE</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Time FE</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Pair(matching)*Time FE</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Pair(border)*Time FE</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Obs.</td>
<td>93,873</td>
<td>93,873</td>
<td>29,214</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.490</td>
<td>0.774</td>
<td>0.892</td>
</tr>
</tbody>
</table>

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01
2. UI amplifies the effect of interest rates on **house prices**

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</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>$Int.Rate_{q-1}^{10y} \times UI$ Ben.</td>
<td>-0.002***</td>
<td>-0.002***</td>
<td>-0.002**</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>$Int.Rate_{q-1}^{10y}$</td>
<td>-0.017***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>County Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>State Controls</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Macro Controls</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>County FE</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Seasonality FE</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Time FE</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Pair(matching) * Time FE</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Pair(border) * Time FE</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Obs.</td>
<td>280,903</td>
<td>280,903</td>
<td>175,826</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.180</td>
<td>0.297</td>
<td>0.705</td>
</tr>
</tbody>
</table>

Standard errors in parentheses

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Conclusions

- We provided evidence from
  - a quantitative GE model &
  - micro data from US and mortgage markets that
    UI destabilizes aggregate fluctuations and raise financial instability risks.

- The arguments can be extended to other policies that lowers income risk, e.g.
  - other social insurance policies and progressive income taxation.
Thanks!
Motivation: unemployment and homeownership

In PSID, on average over the years,

- 34% of unemployed head of households were homeowners when they were unemployed.
- 38% if either head or spouse were unemployed.
- 51% homeownership rate among head of households who experienced some unemployment.
- 58% homeownership rate among households where head or spouse experienced some unemployment.
Literature on Stabilizing Effects of Unemployment Insurance

Unemployment insurance as an **automatic** stabilizer:


Stabilizing effects of **discretionary** unemployment insurance extensions:


**Countercyclical** unemployment insurance:


**Contribution relative to**

- Quantitative papers: we study new channels
- Micro evidence: we provide new facts on mortgages and house prices
Missouri Experiment

- Unexpected cut in UI generosity in Missouri in April 13, 2011.
- UI duration in Missouri decreased from 73 weeks to 57 weeks.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Missouri</th>
<th>Synthetic Missouri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticutt</td>
<td>0.021</td>
<td>LTI</td>
</tr>
<tr>
<td>Illinois</td>
<td>0.113</td>
<td>Ave. Wages</td>
</tr>
<tr>
<td>Indiana</td>
<td>0.294</td>
<td>$\Delta \log(Wages)$</td>
</tr>
<tr>
<td>Minnesota</td>
<td>0.041</td>
<td>HP</td>
</tr>
<tr>
<td>Nebraska</td>
<td>0.024</td>
<td>Unemp. Rate</td>
</tr>
<tr>
<td>Ohio</td>
<td>0.004</td>
<td>Pop.</td>
</tr>
<tr>
<td>Tennessee</td>
<td>0.402</td>
<td>$\Delta \log(GDPpc)$</td>
</tr>
<tr>
<td>West Virginia</td>
<td>0.101</td>
<td>log(GDP pc)</td>
</tr>
</tbody>
</table>
The graph shows the trend of LTI from 2004 to 2014 for Missouri and Synthetic Missouri. Missouri's LTI values peak around 2008, while Synthetic Missouri shows a significant dip around 2010.
Renter’s problem given individual state \( \hat{\theta} = (i, j, a, y) \)

Renter can either continue to rent or buy a house:

\[
V^r(\hat{\theta}) = \max \left\{ V^{rr}(\hat{\theta}), V^{rh}(\hat{\theta}) \right\}
\]

The value of becoming a homebuyer is given by

\[
V^{rh}(\hat{\theta}) = \max_{c, h, d, d' \geq 0} \left\{ u(c, h) + \beta_i EV^h(\theta') \right\}
\]

subject to

\[
c + p_h h + d' = y(j, z; w) + R_i a + d(q^m(\hat{\theta}; h, d) - \varphi_m) - \varphi_f I(d > 0)
\]

\[
d \leq (1 - i) p_h h = 0
\]
Homeowner's Problem

Homeowner can stay, sell, resize, refinance or default:

\[ V^h(\theta) = \max \left\{ V^{hh}, V^{hr}, V^{hu}, V^{hf}, V^d \right\} \]

where \( V^{rh} \) is the homebuyer's value, given by:

\[ V^{hd}(\theta) = \max_{c,s,a'} \left\{ u(c, s) + \beta E \left[ \pi V^r(\theta') + (1 - \pi) V^d(\theta') \right] \right\} \]

s.to

\[ c + \frac{a'}{1 + r_i} + p_r s = a + w(1 - \tau) y(j, z) + \max\{(1 - \varphi_e) p_h h - d, 0\}, \]

In case of selling the house:

- \( \pi = 1 \) and the highlighted part is replaced by \( p_h h - d \)
### External Parameters

#### Preferences:

\[ u(c, s) = \frac{(c^{1-\gamma} s^\gamma)^{1-\sigma}}{1 - \sigma} \]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Explanation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\sigma)</td>
<td>risk aversion</td>
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<td>(\alpha)</td>
<td>capital share</td>
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<td>(\rho_\varepsilon)</td>
<td>persistence of income</td>
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<tr>
<td>(\sigma_\varepsilon)</td>
<td>std of innovation to AR(1)</td>
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<td>(\varphi_h)</td>
<td>selling cost for a household</td>
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<tr>
<td>(\varphi_e)</td>
<td>selling cost for foreclosures</td>
<td>25%</td>
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<tr>
<td>(\zeta)</td>
<td>fixed cost of mortgage origination</td>
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<tr>
<td>(\delta_h)</td>
<td>housing depreciation rate</td>
<td>2.5%</td>
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<tr>
<td>(\tau)</td>
<td>variable cost of mortgage origination</td>
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<td>(\eta)</td>
<td>rental adjustment cost</td>
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<td>Parameter</td>
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<tr>
<td>$\beta_K$</td>
<td>discount factor–capitalist</td>
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<tr>
<td>$\beta_D$</td>
<td>discount factor–depositor</td>
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<td>$h$</td>
<td>minimum house size</td>
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<tr>
<td>$r$</td>
<td>deposit rate</td>
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<td>$\gamma$</td>
<td>weight of housing services in utility</td>
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<td>$\bar{H}$</td>
<td>housing supply</td>
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<td>$\phi_k$</td>
<td>share of wage bill financed from banks</td>
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<td>$\beta_L$</td>
<td>bank discount factor</td>
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<td>$\xi$</td>
<td>bank seizure rate</td>
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<td>$\kappa$</td>
<td>rental maintenance cost</td>
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<tr>
<td>$\delta_k$</td>
<td>capital depreciation rate</td>
<td>0.10</td>
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</table>
Interactions and amplification channels during the bust

Households

- House Prices
- Foreclosures
- Income
- Savings
- Consumption

Firm

- Labor Demand
- Capital

Bank

- Bank Net Worth

Bank Lending Rate \( r_f \)

Foreclosure Channel

Long-term mortgages

Valuation Channel

Short-term debt
Focus on the effects of long-term interest rates on the housing markets at the county level and estimate

\[ \Delta y_{c,t} = \beta_1 \Delta \text{Int. Rate}_{t-1}^{10y} + \beta_2 \Delta \text{Int. Rate}_{t-1}^{10y} \cdot \text{UIBen}_{c,t} + \text{UIBen}_{c,t} \\
+ \text{Macro Controls}_{t-1} + \text{State Controls}_{c,t} + \text{County Controls}_{c,t} \]

+ \theta_c + \mu_t + \epsilon_{c,t}

Monthly county level mortgage (compiled by Neil Bhutta) and house prices data
The share of callable debt in the secondary market has varied substantially over the sample period, with almost all bonds being subject to a call provision until the late 1980s. Likely spurred by the decline in long-term nominal interest rates and the accompanied reduction in interest rate volatility, the share of callable debt fell to its historic low of about 25 percent by the mid-1990s. Over the past decade and a half, however, this trend has been almost completely reversed, as non-financial firms resumed issuing large amounts of callable senior unsecured debt.

In terms of default risk—at least as measured by the S&P credit ratings—our sample spans the entire spectrum of credit quality, from "single D" to "triple A." At "BBB1," however, the median observation is still solidly in the investment-grade category. An average bond has an expected return of 204 basis points above the comparable risk-free rate, while the sizable standard deviation of 281 basis points reflects the wide range of credit quality in our sample.

Using this micro-level dataset, we construct a simple credit-spread index that is representative of the entire maturity spectrum and the range of credit quality in the corporate cash market. Specifically, the GZ credit spread is calculated as

$$GZ = \frac{1}{N_t} \sum_i \sum_k S_{it}[k],$$

where $N_t$ is the number of bond/firm observations in month $t$—that is, the GZ credit spread is simply an arithmetic average of the credit spreads on outstanding bonds in any given month. Figure 1 shows the GZ credit spread along with two widely used default-risk indicators that are also available over our sample period: the spread between yields on indexes of Baa- and Aaa-rated seasoned industrial corporate bonds (the dashed line); and CP–Bill = the spread between the yield on one-month A1/P1 nonfinancial commercial paper and the one-month Treasury yield (the dotted line). The shaded vertical bars represent the NBER-dated recessions.

**Figure 1. Selected Corporate Credit Spreads**

*Notes:* Sample period: 1973:1–2010:9. The figure depicts the following credit spreads: GZ spread = the average credit spread on senior unsecured bonds issued by nonfinancial firms in our sample (the solid line); Baa–Aaa = the spread between yields on Baa- and Aaa-rated long-term industrial corporate bonds (the dashed line); and CP–Bill = the spread between the yield on one-month A1/P1 nonfinancial commercial paper and the one-month Treasury yield (the dotted line). The shaded vertical bars represent the NBER-dated recessions.