Credit Risk and Macroeconomic Activity: Evidence From an Estimated DSGE Model

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The XI Annual Seminar of the Central Bank of Brazil
May 14-15, 2009
Credit Spreads and Real Economic Activity

- Research on the role of financial asset prices in cyclical fluctuations stresses the information content of credit spreads for the state of the economy and risks to the economic outlook.
- Information content of credit spreads reflects disruption in the supply of credit stemming from:
  - Worsening of the quality of borrowers’ balance sheets.
  - Deterioration in the soundness of financial intermediaries.
- Gilchrist, Yankov & Zakrajšek (2009):
  - Predictive content of credit spreads is concentrated in long maturity corporate bonds issued by low/intermediate risk firms.
  - Shocks to low-risk long-maturity credit spreads account for a significant fraction of the variance in economic activity at 1–2 year horizon.
Outline of the Talk

- Compare the current economic downturn with 2001 and 1990–91 recessions.
- Use bond-level data to construct a low-risk long-maturity corporate credit spread.
  - Compare its predictive content for economic activity with that of other standard credit-risk indicators.
  - Predictive power of low-risk long-maturity spreads suggests important linkages between financial conditions and macroeconomic outcomes.
- Use real and financial data to estimate a DSGE model with the financial accelerator mechanism developed by BGG (1999).
  - Distinguish between movements in credit supply and demand.
  - Account for GE effects between financial and real sectors.
**Credit Spreads**: prices of outstanding corporate bonds traded in the secondary market (Lehman/Warga & Merrill Lynch):
- 5,548 senior unsecured issues.
- Spreads relative to yields on comparable-maturity Treasuries.

**Credit Risk**: Merton (1974) distance-to-default (1-year horizon)

**Low-Risk Long-Maturity Credit Spreads**:
- Distance-to-default between P20 and P60 of the cross-sectional distribution at time $t - 1$.
- Remaining term-to-maturity greater than 10 years.
Predictive Content of Credit Spreads for Economic Activity

- Forecasting specification:
  \[ \Delta^h Y_{t+h} = \alpha + \beta(L) \Delta Y_t + \gamma' S_t + \epsilon_{t+h} \]
  
  - \( Y_t \) = an indicator of economic activity
  - \( S_t \) = credit spread(s)

- Monthly indicators:
  - private nonfarm payrolls (log-level)
  - civilian unemployment rate
  - index of manufacturing industrial production (log-level)

- Quarterly indicators:
  - real GDP (log-level)
  - real fixed investment (log-level)
  - real personal consumption (log-level)
## Credit Spreads and Private Nonfarm Payrolls

(Jan1986–Dec2008; 12-Month Forecast Horizon)

<table>
<thead>
<tr>
<th>Credit Spread</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Risk Long-Maturity</td>
<td>-1.886</td>
<td>-2.153</td>
<td>-1.940</td>
<td>-1.652</td>
</tr>
<tr>
<td></td>
<td>(0.301)</td>
<td>(0.292)</td>
<td>(0.309)</td>
<td>(0.541)</td>
</tr>
<tr>
<td>Baa–Treasury</td>
<td>-</td>
<td>0.689</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.428)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aaa–Treasury</td>
<td>-</td>
<td>-</td>
<td>0.279</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.434)</td>
<td></td>
</tr>
<tr>
<td>Average Senior Unsecured</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.220</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.429)</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>0.704</td>
<td>0.725</td>
<td>0.706</td>
<td>0.705</td>
</tr>
</tbody>
</table>
### Credit Spreads and Manufacturing Industrial Production
(Jan1986–Dec2008; 12-Month Forecast Horizon)

<table>
<thead>
<tr>
<th>Credit Spread</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Risk Long-Maturity</td>
<td>-5.300</td>
<td>-5.331</td>
<td>-5.300</td>
<td>-3.913</td>
</tr>
<tr>
<td></td>
<td>(1.078)</td>
<td>(1.098)</td>
<td>(1.082)</td>
<td>(1.086)</td>
</tr>
<tr>
<td>Baa–Treasury</td>
<td>-</td>
<td>0.226</td>
<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td></td>
<td>(1.043)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aaa–Treasury</td>
<td>-</td>
<td>-</td>
<td>0.010</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(1.033)</td>
<td></td>
</tr>
<tr>
<td>Average Senior Unsecured</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-1.786</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.748)</td>
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<tr>
<td>Adj. $R^2$</td>
<td>0.402</td>
<td>0.400</td>
<td>0.399</td>
<td>0.442</td>
</tr>
</tbody>
</table>
Near-Term Outlook for Private Nonfarm Payrolls
(Jump-Off Date: Mar2009; 12-Month Forecast Horizon)
Near-Term Outlook for Industrial Production
(Jump-Off Date: Mar2009; 12-Month Forecast Horizon)

Industrial production

- Actual industrial production
- Range of model estimates (EDF−Q1 – EDF−Q3)
## Credit Spreads and Real Fixed Investment
*(1984:Q1–2008:Q4; 4-Quarter Forecast Horizon)*

<table>
<thead>
<tr>
<th>Credit Spread</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-Risk Long-Maturity</td>
<td>-11.38</td>
<td>-12.58</td>
<td>-12.30</td>
<td>-11.51</td>
</tr>
<tr>
<td></td>
<td>(2.414)</td>
<td>(2.049)</td>
<td>(2.195)</td>
<td>(2.949)</td>
</tr>
<tr>
<td>Baa–Treasury</td>
<td>-</td>
<td>4.569</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.899)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aaa–Treasury</td>
<td>-</td>
<td>-</td>
<td>5.898</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(2.295)</td>
<td></td>
</tr>
<tr>
<td>Average Senior Unsecured</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.164</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.736)</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>0.366</td>
<td>0.432</td>
<td>0.445</td>
<td>0.359</td>
</tr>
</tbody>
</table>
Key features of the model:

- Sticky nominal prices and wages with partial indexation.
- Habit formation in consumption and higher-order adjustment costs to investment.
- Variable capacity utilization.
- Nominal interest rate rule responds to inflation, output gap, and output growth.

Shocks and data:

- **6 shocks**: technology; preferences (inter-temporal); government spending; wage and price mark-ups; and monetary policy
- **7 data series**: growth of output, consumption, and investment (in per capita terms); labor hours; wage and price inflation; and (nominal) Federal funds rate

Adding the Financial Accelerator

- Use low-risk long-horizon credit spreads to measure external finance premium in the BGG (1999) framework.
- Allow for credit supply shocks:
  - Shocks to credit spreads (disturbances to credit intermediation process).
  - Shocks to net worth (disturbances to asset values that serve as collateral).
Responses to a Contractionary Monetary Policy Shock

- Output
- Consumption
- Investment
- Hours worked
- Wages
- Inflation
- Federal funds rate
- Credit spread

Graphs showing the percentage point responses of various macroeconomic indicators to a contractionary monetary policy shock, with shaded areas indicating confidence intervals.
Responses to an Adverse Credit Spread Shock

- **Output**: A gradual increase in output over time, with a peak around 20 quarters after the shock.

- **Consumption**: A sharp decrease initially followed by a gradual increase, with the peak around 16 quarters after the shock.

- **Investment**: A decrease in investment, reaching a minimum around 8 quarters after the shock, followed by a slight recovery.

- **Hours worked**: A decrease in hours worked, with the minimum around 24 quarters after the shock, followed by a gradual increase.

- **Wages**: A slight decrease in wages, with the minimum around 32 quarters after the shock.

- **Inflation**: A decrease in inflation, reaching a minimum around 16 quarters after the shock, followed by a gradual increase.

- **Federal funds rate**: A decrease in the federal funds rate, reaching a minimum around 4 quarters after the shock.

- **Credit spread**: An increase in credit spread, with the peak around 4 quarters after the shock.
Shock Decomposition of Output Growth
Concluding Remarks

- Low-risk long-maturity credit spreads have substantial predictive power for real activity variables such as employment, output, investment, and consumption.
- Estimation of a DSGE model that uses such credit spreads to identify financial market distortions implies important role for credit supply shocks for investment and output at business cycle frequency.
- Directions for future research:
  - Addition of frictions in the intermediation process linking household borrowing to asset prices.
  - Explicit modeling of the financial sector.