Transmission of Economic and Financial Shocks: Getting Prepared for the Next Downturn or Crisis

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Preamble

“Would I say there will never, ever be another financial crisis? ... Probably that would be going too far. But I do think we're much safer, and I hope that it will not be in our lifetimes, and I don't believe it will be…”

- Janet Yellen, Former U.S. Federal Reserve Chair
Agenda

1. Where Are We in the Credit Cycle?
2. Assessing Risk and Vulnerabilities
3. Transmission of Shocks
4. Getting Prepared for Next Downturn
Where Are We in the Credit Cycle?
Where Are We in the Credit Cycle?

The $1.3 trillion loan market that’s spooking everyone right now

Subprime Auto Loans Blow Up, 60-Day Delinquencies Shoot Past Financial Crisis Peak

WTO cuts forecast for global trade growth amid U.S.-China dispute, broader economic slowdown

Increasing Portfolio Similarities of Investment Funds Raise the Potential to Transmit Shocks
Economic Recessions & Credit Downturns

![Graph showing default rates and recessions over time](image-url)
Probability of Credit Downturn Elevated
Assessing Risk and Vulnerabilities
Assessing Risk and Vulnerabilities

Widely Cited Vulnerabilities: Corporate Credit

Significant rise in non-financial corporate credit

Prolonged decline in overall borrower quality

Decrease in covenant protection

Record level of repayment and debt rollover ahead

Abilities of our financial markets, central banks, regulators and governments to absorb and deal with a large shock and crisis

Increasing holdings of riskier and more illiquid assets by institutional investors

Sources: Fed, OECD, IIF, OFR, BIS, IMF, Moody’s Analytics, etc.
Assessing Risk and Vulnerabilities

Questions to ponder

What drives the significant expansion of corporate credit?

Have the borrowers been putting debt into productive use?

Can the borrowers service and repay the debt, both under current and stressed economic conditions?

What do realized default rates and forward looking measure say about the level of credit risk now?
Assessing Risk and Vulnerabilities

Low EDF

US corporates with sales larger than $100 MM

Source: Moody’s Analytics
Assessing Risk and Vulnerabilities

Good Repayment Capacity

US corporates with sales larger than $100 MM

- High Leverage (Debt / EBITDA > 4)
- Low Leverage (Debt/EBITDA <= 4)
- All

Source: Moody’s Analytics
Assessing Risk and Vulnerabilities

Increased payouts, M&As, LBOs Financed with Debt

5. US Leveraged Loan M&A and LBO Volume
(Billions of US dollars; percent)
- US leveraged loan LBO volume (left scale)
- US leveraged loan M&A volume (left scale)
- Percent of LBO deals > 6 times leverage (right scale)

2. High-Yield Bonds and Leveraged Loans Used for Dividend and Share Buyback Recapitalizations
(Billions of US dollars)
- Euro area
- United States

Source: IMF
Assessing Risk and Vulnerabilities
High Yield Default Rates Are Still Low

Global Default Rates and Forecast

Source: Moody’s Investor Service
Debt Credit Quality Deteriorating

Nonfinancial Firms: Speculative Grade Debt
(percent of total corporate debt)

Source: International Monetary Fund
Cyclical Industries seen Increase in EDF
Debt-at-Risk Under Stressed Scenarios

Sources: IMF
Transmission of Shocks
Credit Loss and Consequence

Usually happens during downturn or crisis, with concentrated or correlated loss

Expected Loss

No bonus!

Re-org of Risk Dept!

CRO gets fired!

CEO gets fired!

Concentrated loss increases!

Probability

0%

100%
Which May Tip the Balance?

» Burst of Valuation Bubbles?

» Trade Wars?
  – U.S. vs. China, U.S. vs. Europe, etc.

» Geopolitical?
  – Sino-American new cold war
  – Brexit
  – Oil price shock, conflict with Iran

» Monetary or fiscal policy mistake?
Shock Propagation Channels to Watch

1. Re-valuation and repricing of risk
2. Supply chain
3. Regional link
4. Spillover from financial sectors to real economy

Concentrated Default and Loss
Transmission of Re-Valuation and Repricing of Risk

It all sounds familiar:

- High valuation
- Eager investors
- Overlooking earnings and profitability
- High cash burn rate
- Potential unsustainability
Propagation Through Supply Chain: Evidence from the CDS Market

» How many supply chain layers does a laptop manufacturer have?

» Credit risk propagates through multiple tiers of supply chains:
   – Sizeable CDS spread changes in the same direction as shocks, both for customers and suppliers in a network.
   – Considerable effects continue to hold for the 2nd- and 3rd-tier supply chain partners for bad credit shocks.
   – Contagion is magnified with longer-term supply-chain relations and trade credit, percentage of sales from a supplier to the customer, with differentiated products, and customer leverage.

Transmission of Shocks Through Trade Route

Industries with Heavy Supply Chain Activities in China

Time Series of Equity Returns

Source: Moody's Analytics
Transmission of Shocks Through Regional Economic Clusters
Shocks from the Financial Sector to Real Economy

» Is the recent repo turmoil a sign of a longer-term problem?

» It remains to be seen how the post-crisis financial system and market infrastructure will respond and absorb a major shock, and how central banks, regulators, and governments will respond to a major shock or crisis.

» Is the fiscal policy risk looming?
Preparing for the Next Downturn
Implications of Previous Analyses

» We are at the tail-end of the credit cycle, observing significant increases in credit risk recently.

» There are pronounced vulnerabilities in corporate credit.

» It is critically important to understand how economic shocks are transmitted and how credit risk propagates.
Managing Risk at the Tail-End of the Cycle

» Having a cycle-sensitive, risk-appetite framework
  – Socializing the concept of credit cycle with a long-term view
  – Dynamic and cycle-sensitive limiting setting

» Conducting stress testing and scenario analysis
  – CCAR type of framework is inadequate
  – Measuring correlation and contagion is critical
  – Incorporating scenarios

» Building and leveraging early warning system and indicators

» Maintaining proper trade-off between risk and return, avoiding excess at both ends

Perhaps the most sensible, time-tested, and realistic approach is to ensure your portfolio is well-diversified, with appropriate trade-off of risk and return.
Appendix | Supporting Material
Where Are We in the Credit Cycle?

What is a Downturn?

Downturns: \( \text{Default Rate} > \text{mean} + 1\text{Stdev} \)

- Beginning: \( \text{Default rate} > \text{mean} \)
- End: \( \text{Default rate} < \frac{1}{3} \times (\text{peak} - \text{mean}) \)
Where Are We in the Credit Cycle?

Models

**Traditional:** \[ P(Y_t = 1|X_t) = \Phi(X_T^{T}\beta) \]

- **Pros**
  - Natural: Binary definition of stage of cycle; output of probabilities
  - Popular in the literature

- **Cons**
  - Fewer explanatory variables
  - Restrictive model framework

**Machine Learning**

- **Pros**
  - Complex and flexible: Comprehensive feature space; Non-linearity
  - Ensemble Modeling

- **Cons**
  - Interpretability and Explainability
  - Overfitting concerns
Where Are We in the Credit Cycle?

Probabilities of being in Downturns?

\[ \sum_t P(Y_t = 1 | Y_0 = 0) \]

Credit Downturn Within 12 months

Credit Downturn

Credit Downturn WITHIN 12 months

Where Are We in the Credit Cycle?

Downturn in 6 & 12 months: Historical Predictions

Probability (Downturn within 6 months) = 33.08% @Sept. 2019

Probability (Downturn within 12 months) = 45.79% @Sept. 2019
Where Are We in the Credit Cycle?

Downturn Indicator Examples
Appendix 1.2  Supporting Material for Section 2
Assessing Risk and Vulnerabilities
Low Spreads and EDF

US corporates with sales larger than $100 MM
Median – High Leverage (Debt / EBITDA > 4) – Low Leverage (Debt/EBITDA <= 4) – All

Source: Moody’s Analytics
Assessing Risk and Vulnerabilities
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Source: Moody’s Analytics
Assessing Risk and Vulnerabilities

Increased payouts, M&As, LBOs Financed with Debt

1. S&P 500 Nonfinancial Firms: Payouts
   (Percent of total assets and of own debt, annualized)
   - Funded by earnings, percent of assets, all firms
   - Funded by debt with low leverage, percent of assets, all firms
   - Funded by debt with high leverage, percent of assets, all firms
   - Funded by debt with high leverage, percent of own debt

6. US Leveraged Loan Deals with EBITDA Add-Backs
   (Percent of new issuance)
   - Mergers and acquisitions
   - Leveraged buyouts
   - All deals

Source: IMF
Countries with EDF Increase

Top 10 Countries with largest EDF increase for the financial firms

1. Pakistan
2. India
3. Japan
4. Korea
5. USA
6. Germany
7. Netherlands
8. Saudi Arabia
9. Hong Kong
10. France

Percentage Change: 2019.09/2018.09

Top 10 Countries with largest EDF increase for the non-financial firms

1. Pakistan
2. USA
3. Mexico
4. Norway
5. Canada
6. France
7. Germany
8. New Zealand
9. Hong Kong
10. India

Percentage Change: 2019.09/2018.09
Financial System Vulnerabilities

Source: Office of Financial Research
Appendix 1.3 Supporting Material for Section 3
Transmission of Shocks

An Example of Propagation through Supply Chain

Top Suppliers

<table>
<thead>
<tr>
<th>Company</th>
<th>Economic Value</th>
<th>Financial Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tokyo Electron Limited</td>
<td>1.7B</td>
<td>3.71%</td>
</tr>
<tr>
<td>Applied Materials, Inc.</td>
<td>1.6B</td>
<td>7.27%</td>
</tr>
<tr>
<td>Fujitsu Limited</td>
<td>1.6B</td>
<td>3.42%</td>
</tr>
<tr>
<td>Veolia Environnement S.A.</td>
<td>1.1B</td>
<td>2.44%</td>
</tr>
<tr>
<td>Lam Research Corporation</td>
<td>964M</td>
<td>4.69%</td>
</tr>
<tr>
<td>Micron Technology, Inc.</td>
<td>900M</td>
<td>14.19%</td>
</tr>
<tr>
<td>NEC Corporation</td>
<td>826M</td>
<td>1.97%</td>
</tr>
<tr>
<td>Rolls-Royce Holdings plc</td>
<td>563M</td>
<td>1.28%</td>
</tr>
<tr>
<td>Ibiden Co., Ltd.</td>
<td>562M</td>
<td>1.32%</td>
</tr>
</tbody>
</table>
Transmission of Shocks
An Example of Propagation through Supply Chain
Transmission of Shocks
Propagation through Supply Chain: Trade War

Time Series of Equity Returns
Heavy vs. Light/No Activities in China

Source: Moody's Analytics

Time Series of EDF
Heavy vs. Light/No Activities in China

Source: Moody's Analytics