Debt Markets and Banks

- **Capital Markets:** In the US, capital markets, fixed income and equity, are a critical source of capital for businesses and governments (federal, state and local), funding 65% of total U.S. economic activity.

- **Debt Markets:** Compared with bank lending, debt capital markets provide a more efficient form of borrowing for corporations. In the US, the ratio of debt-market financing to bank lending is 80%/20%, and reversed in other developed markets and China.

- **Banks:** The fixed-income markets have historically been bilateral and performed by banks. Post-crisis regulatory constraints on balance sheets have forced banks to pull back from some fixed-income activities.

- **Repo Madness:** The recent repo market disruption (September 2019) is a case in point of unintended consequences of well-meaning regulations.
Global Fixed Income Markets

$100T Global FI Markets

- US, 39%
- EU, 22%
- Japan, 13%
- China, 12%
- Canada, 2%
- EM, 2%
- Canada, 2%
- HK, 0.5%
- Other DM, 0.5%
- Singapore, 0.4%

Source: Bank of International Settlements
Note: As of FY17

US FI Outstanding, $41T

- UST, 35%
- MBS, 23%
- Corporates, 22%
- Munis, 9%
- Agency, 5%
- ABS, 4%

Source: SIFMA
The US Bond Markets

US Bond Markets, Amount Outstanding ($T)

- UST
- MBS
- Corp
- Muni
- Agency
- ABS
- MM

Trillion USD

- $15.9T
- $9.9T
- $9.5T
- $3.8T
- $1.9T
- $1.6T
- $1.1T

Years:
- 1980
- 1985
- 1990
- 1995
- 2000
- 2005
- 2010
- 2015

Values:
- $0
- $5
- $10
- $15
- $20
- $25
- $30
- $35
- $40
- $45

Dec 9-10, 2019
Treasury Yield Curve, Monetary Policy, and Macroeconomic Indicators

Graph showing the Treasury Yield Curve, Monetary Policy, Inflation, and GDP over time from 1960 to 2020. The graph includes lines for Real GDP, 2-year Treasury, 10-year Treasury, and Core Inflation. The periods marked with different shades of yellow represent the tenure of various Federal Reserve chairmen: Martin, Burns, Volcker, Greenspan, Bernanke, Yellen, and Powell.
Fed Balance Sheet and Quantitative Easing

Securities Held Outright on Fed Balance Sheet ($T)

<table>
<thead>
<tr>
<th>Period</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>QE1</td>
<td>2008/11/25</td>
<td>2010/3/31</td>
</tr>
<tr>
<td>QE2 Twist</td>
<td>2010/11/3</td>
<td>2011/6/30</td>
</tr>
<tr>
<td>QE3</td>
<td>2012/9/13</td>
<td>2014/10/29</td>
</tr>
<tr>
<td>Twist</td>
<td>2011/9/21</td>
<td>2012/12/31</td>
</tr>
</tbody>
</table>

$ trillion


June Pan

December 9-10, 2019
Fed Balance and Bank Reserves


Trillion USD

Fed Balance, Assets
Bank Reserves
"Excess" Reserves
Required Reserves
Borrowed Reserves

Bank Reserves by Types

Sources: Board of Governors of the Federal Reserve System and the Federal Financial Institutions Examination Council (FFIEC).
Composition of Bank Assets

Figure 1: Composition of U.S. Commercial Bank Assets before and after 2008
Banks’ HQLA Assets

Percent of total assets

- HQLA-eligible
- Reserves
- GSE mortgage-backed securities
- GNMA mortgage-backed securities
- Treasuries
Composition of Banks’ HQLA Assets

Note: GSIBs include J.P. Morgan Chase and Company (JPM), Bank of America Corporation (BAC), State Street Corporation (STT), Wells Fargo and Company (WFC), Citigroup Inc. (C), Morgan Stanley, and Bank of New York Mellon Corporation (BK).
Monetary Base

![Graph showing the total monetary base, currency in circulation, and balance maintained from 2006 to 2018. The graph indicates a significant increase in monetary base over the years, with peaks in 2014 and 2018.](image-url)
The overnight repo rate spiked in September

Overnight repo rate (%)
Money Market Rates: Fund Fund and Repo

Repo and Effective Federal Funds Rates

Source: Federal Reserve, BNY Mellon
Before and After the Crisis

Repo and Effective Federal Funds Rates, 2019 and 2005

Source: Federal Reserve, DTCC
He and Krishnamurthy (2013): Intermediary asset pricing.
Intermediary Capital and Asset Pricing, Empirical Findings

- Adrian and Shin (2010): Aggregate liquidity can be seen as the rate of change of the aggregate balance sheet of the financial intermediaries, whose marked-to-market leverage is found in this paper to be strongly procyclical.

- Hu, Pan, and Wang (2013): Use price deviations in the US Treasury market to measure the amount of arbitrage capital in the financial markets; estimate the premium for this aggregate liquidity risk using cross-sectional returns on hedge funds and currency carry trades, both known to be sensitive to the general liquidity conditions of the market.

- Adrian, Etula, and Muir (2014): Use shocks to the leverage of securities broker-dealers to construct an intermediary stochastic discount factor. The single-factor model prices size, book-to-market, momentum, and bond portfolios with an R2 of 77% and an average annual pricing error of 1%.

- He, Kelly and Manela (2017): Shocks to the equity capital ratio of financial intermediaries possess significant explanatory power for cross-sectional variation in expected returns on many asset classes.
Adrian and Shin (2010)

- In a financial system where balance sheets are continuously marked to market, changes in asset prices show up immediately on balance sheets, and have an instant impact on the net worth of all constituents of the financial system.
- The net worth of financial intermediaries are especially sensitive to fluctuations in asset prices given the highly leveraged nature of such intermediaries’ balance sheets.
- If financial intermediaries were passive and did not adjust their balance sheets to changes in net worth, then leverage would fall when total assets rise. Change in leverage and change in balance sheet size would then be negatively related.
- Far from being passive, the evidence points to financial intermediaries adjusting their balance sheets actively, and doing so in such a way that leverage is high during booms and low during busts. That is, leverage is procyclical.
- There are aggregate consequences of such behavior for the financial system as a whole that might not be taken into consideration by individual institutions. We exhibit evidence that procyclical leverage affects aggregate volatility and particularly the price of risk.
This paper shifts attention from measuring the SDF of the average household to measuring a “financial intermediary SDF.”

Financial intermediaries fit the assumptions of modern finance theory nicely: they trade in many asset classes following often complex investment strategies; they face low transaction costs, which allows trading at high frequencies; and they use sophisticated, continuously updated models and extensive data to form forward-looking expectations of asset returns.

Therefore, if we can measure the marginal value of wealth for these active investors, we can expect to price a broad class of assets. In other words, the marginal value of wealth of intermediaries can be expected to provide a more informative SDF.
As funding constraints tighten, balance sheet capacity falls and intermediaries are forced to deleverage by selling assets at fire sale prices, as in the recent financial crisis.

These are times when intermediaries’ marginal value of wealth is high. Assets that pay off poorly when constraints tighten and leverage falls are therefore risky and must offer high returns.

Equivalently, the cross-sectional price of leverage risk should be positive. These theories imply that leverage captures aspects of the intermediary SDF that other measures (such as aggregate consumption growth or the return on the market portfolio) do not capture.

We provide empirical support for the view that leverage represents funding constraints by showing that our leverage factor correlates with funding constraint proxies such as volatility, the Baa-Aaa spread, asset growth, and a betting-against-beta factor that goes long leveraged low-beta securities and short high-beta securities.
We define the intermediary capital ratio, denoted $\eta_t$, as the aggregate value of market equity divided by aggregate market equity plus aggregate book debt of primary dealers active in quarter $t$.

Our main empirical result is that assets’ exposure to intermediary capital ratio shocks (innovations in $\eta_t$) possess a strong and consistent ability to explain cross-sectional differences in average returns for assets in seven different markets, including equities, US government and corporate bonds, foreign sovereign bonds, options, credit default swaps (CDS), commodities, and foreign exchange (FX).

Assets that pay more in states of the world with a low intermediary capital ratio (that is, assets with low betas on $\eta_t$ shocks) also have lower expected returns in equilibrium. This implies that low capital-risk-beta assets are viewed as valuable hedges by marginal investors or, in other words, that primary dealers have high marginal value of wealth when their capital ratio is low.