The US Treasury (UST) market is unique:
- The most credit-worthy, essentially free of default risk.
- Large amount outstanding, highly liquid.
- Supported by well developed repo and derivatives markets.

UST provides the most important benchmark curve:
- The reference curve for cost of funds at different borrowing horizons.
- Price discovery about inflation and macroeconomic fundamentals happens here.
- Information on US monetary policy also happens here.

UST has also become politically charged:
- Three rounds of quantitative easing after 2008 and the current infinite QE.
- Large foreign holdings because of the reserve currency status of US dollar.
- Financing the large and ever growing deficits of the US government.
Ratios of UST to GDP

US Public Debt $23.41T USD.

US Treasuries $16.89T USD:
- Bills: $2.56T.
- Notes: $9.99T.
- Bonds: $2.41T.
- TIPS: $1.51T.

US Muni’s: $3.85T USD.

US GSE’s: $1.83T USD.

中国利率债 55.51 万亿 CNY:
- 国债 16.79 万亿.
- 政策银行债 16.09 万亿.
- 地方政府债 22.63 万亿.
Major Holders of UST

Holdings in USD Trillion

- MMMF+MF+ETF
- Private Pension
- Insurance Companies
- Depository Institutions
- Monetary Authority
- Rest of the World

Holdings as Fraction of Total Marketable Treasuries (%)

- MMMF+MF+ETF
- Private Pension
- Insurance Companies
- Depository Institutions
- Monetary Authority
- Rest of the World
Who Will be Funding the US Deficits?

Holdings as Fraction of Total Marketable UST (%)

Yearly Difference in Fraction of Holdings (%)
Foreign Holdings of UST (USD Trillion)

Holdings of US Treasuries (USD Trillion)

Jan 2020 (USD Billion)

<table>
<thead>
<tr>
<th>Country</th>
<th>Holdings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>1211.7</td>
</tr>
<tr>
<td>China, Mainland</td>
<td>1078.6</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>372.7</td>
</tr>
<tr>
<td>Brazil</td>
<td>283.3</td>
</tr>
<tr>
<td>Ireland</td>
<td>271.4</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>255.2</td>
</tr>
<tr>
<td>Switzerland</td>
<td>238.1</td>
</tr>
<tr>
<td>China, Hong Kong</td>
<td>229.6</td>
</tr>
<tr>
<td>Cayman Islands</td>
<td>216.1</td>
</tr>
</tbody>
</table>
Monthly Net Purchases of US Treasury Securities by China (USD Billion)

- US Treasuries
- US Securities
- Non-US Securities

Financial Markets, Spring 2021, SAIF
Class 2: The U.S. Treasury Market and Its Monetary Policy
Jun Pan 8 / 24
Amidst global dollar shortage, foreign institutions sold UST to raise USD cash.

- FIMA Repo Facility: FIMA account holders can use UST held at Fed as collateral to borrow USD cash.
- Announced: March 31.
- Effective: April 6.
FX Reserves Held in Gold vs UST

Global FX Reserves (USD Trillion)

- Held in Gold (left)
- Held in UST

Global FX Reserves

- Held in Gold (million ounce)
- Held in UST (USD trillion)
Gold

Since 1990

Since 2000

Since 2010

Since 2020

Financial Markets, Spring 2021, SAIF
Class 2: The U.S. Treasury Market and Its Monetary Policy
Jun Pan 11 / 24
### SPX, UST, and Gold

<table>
<thead>
<tr>
<th></th>
<th>SPX</th>
<th>UST</th>
<th>GOLD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monthly Returns 1988-2018</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\mu$</td>
<td>0.87</td>
<td>0.56</td>
<td>0.42</td>
</tr>
<tr>
<td></td>
<td>[4.15]</td>
<td>[7.69]</td>
<td>[1.91]</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>4.13</td>
<td>1.44</td>
<td>4.34</td>
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<tr>
<td><strong>Monthly Returns 2000-2018</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\mu$</td>
<td>0.49</td>
<td>0.44</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>[1.78]</td>
<td>[5.07]</td>
<td>[2.72]</td>
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<tr>
<td>$\sigma$</td>
<td>4.28</td>
<td>1.37</td>
<td>4.68</td>
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<tr>
<td><strong>Monthly Returns 2010-2018</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>$\mu$</td>
<td>0.93</td>
<td>0.34</td>
<td>0.42</td>
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<tr>
<td></td>
<td>[2.70]</td>
<td>[3.32]</td>
<td>[1.02]</td>
</tr>
<tr>
<td>$\sigma$</td>
<td>3.85</td>
<td>1.13</td>
<td>4.52</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corr (%)</th>
<th>SPX</th>
<th>UST</th>
<th>GOLD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monthly Returns 1988-2018</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPX</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UST</td>
<td>-8</td>
<td>100</td>
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</tr>
<tr>
<td>GOLD</td>
<td>-6</td>
<td>12</td>
<td>100</td>
</tr>
<tr>
<td><strong>Monthly Returns 2000-2018</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPX</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UST</td>
<td>-36</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>GOLD</td>
<td>0</td>
<td>24</td>
<td>100</td>
</tr>
<tr>
<td><strong>Monthly Returns 2010-2018</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPX</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UST</td>
<td>-51</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>GOLD</td>
<td>2</td>
<td>33</td>
<td>100</td>
</tr>
</tbody>
</table>
The Fed controls the short-end of the yield curve:
- FOMC meets every six weeks to set the Fed funds target rate.
- The Fed funds market: depository institutions lend reserve balances to one another overnight.
- The Fed uses open market operations to adjust the supply of reserve balances so as to keep the fed funds rate around the target established by the FOMC.

Fed traditionally does not control the long-end of the yield curve, but
- Since late 2008, the Fed did three rounds of QE.
- Since March 2020, the Fed commits to infinite QE.

Absent of the Fed, the fundamental drivers of the long-term interest rates:
- Inflation expectations.
- Long-term economic growth.
Fed Funds Target Rate, Yield Curve, and Business Cycle

Financial Markets, Spring 2021, SAIF

Class 2: The U.S. Treasury Market and Its Monetary Policy

Jun Pan 14 / 24
Monetary policy decision is informed by macroeconomic fundamentals and markets.

The Taylor (1993) rule is an example:

$$ r = 2\% + \pi + 0.5y + 0.5(\pi - 2) $$

- $\pi$: rate of inflation.
- $y$: deviation of real GDP from a target.

Markets anticipate future Fed actions:
- The shape of the yield curve (e.g., slope).
- Federal funds futures and options.

Uncertainties in the target rate affect the markets. Fed: more transparency and better communications.

Fed’s dual mandate:
- Price stability.
- Maximum employment.
Macroeconomic Indicators: GDP, Inflation, and Employment

GDP, Inflation, and Unemployment (1958-2019)

- Martin
- Burns
- Volcker
- Greenspan
- Bernanke
- Yellen
- Powell


-10 -5 0 5 10 15 20

Rates (%)

- Real GDP (avg = 3.12%)
- Core Inflation (avg = 3.67%)
- Unemployment (avg = 6%)

Financial Markets, Spring 2021, SAIF
When the short-term interest rates reach to zero, how to bring down longer-term interest rates?

- QE1: buy Treasury securities, agency debt, and MBS.
- QE2: buy Treasury securities.
- QE3: buy Treasury securities and MBS.

In buying Treasury securities, the ultimate goal was to precipitate a broad reduction in the cost of credit (e.g., rates on mortgage and corporate bonds).

*Our purchases of hundreds of billions of dollars of securities were probably the most important and definitely the most controversial tool we would employ.*

– Ben Bernanke in *The Courage to Act.*
Three Rounds of QE, 2008-2014

Total Reserve Bank Credit: $4.45T:
- Securities Held Outright: $4.22T.
  - UST: $2.46T.
  - Agency: $39.7B.
  - MBS: $1.72T.
- Repo: 0.
- Loans: $206M.
- Maiden Lane: $1.7B.
- Central Bank Swaps: 0.

Fed announcements:
- March 15: $700B QE.
- March 23: Infinite QE.

Total Fed Credit: $5.77T:
- Securities Held Outright: $4.80T.
  - UST: $3.34T.
  - MBS: $1.46T.
- Repo: $263B.
- Loans: $129B.
  - PDCF: $33B.
  - MMMFLF: $53B.
- Central Bank Swaps: $348.5B.

As of Apr 1, 2020.
Fed Balance Sheet, April 15

<table>
<thead>
<tr>
<th>Reserve Bank credit, related items, and reserve balances of depository institutions at Federal Reserve Banks</th>
<th>Averages of daily figures</th>
<th>Wednesday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apr 15, 2020</td>
<td>Apr 15, 2020</td>
</tr>
<tr>
<td>Reserve Bank credit</td>
<td>6,196,020</td>
<td>6,329,072</td>
</tr>
<tr>
<td>Securities held outright (1)</td>
<td>5,195,539</td>
<td>5,359,376</td>
</tr>
<tr>
<td>U.S. Treasury securities</td>
<td>3,717,414</td>
<td>3,788,858</td>
</tr>
<tr>
<td>Bills (2)</td>
<td>326,044</td>
<td>326,044</td>
</tr>
<tr>
<td>Notes and bonds, nominal (2)</td>
<td>3,140,587</td>
<td>3,206,144</td>
</tr>
<tr>
<td>Notes and bonds, inflation-indexed (2)</td>
<td>217,244</td>
<td>222,692</td>
</tr>
<tr>
<td>Inflation compensation (3)</td>
<td>33,539</td>
<td>33,978</td>
</tr>
<tr>
<td>Federal agency debt securities (2)</td>
<td>2,347</td>
<td>2,347</td>
</tr>
<tr>
<td>Mortgage-backed securities (4)</td>
<td>1,475,778</td>
<td>1,568,171</td>
</tr>
<tr>
<td>Unamortized premiums on securities held outright (5)</td>
<td>250,328</td>
<td>262,334</td>
</tr>
<tr>
<td>Unamortized discounts on securities held outright (5)</td>
<td>-7,123</td>
<td>-6,896</td>
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<tr>
<td>Repurchase agreements (6)</td>
<td>201,596</td>
<td>181,100</td>
</tr>
<tr>
<td>Foreign official</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Others</td>
<td>281,596</td>
<td>181,100</td>
</tr>
<tr>
<td>Loans</td>
<td>128,604</td>
<td>120,349</td>
</tr>
<tr>
<td>Primary credit</td>
<td>41,034</td>
<td>36,284</td>
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<tr>
<td>Secondary credit</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Seasonal credit</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Primary Dealer Credit Facility</td>
<td>35,590</td>
<td>33,409</td>
</tr>
<tr>
<td>Money Market Mutual Fund Liquidity Facility</td>
<td>51,944</td>
<td>50,656</td>
</tr>
<tr>
<td>Other credit extensions</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Net portfolio holdings of Commercial Paper Funding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facility II LLC (7)</td>
<td>141</td>
<td>141</td>
</tr>
<tr>
<td>Float</td>
<td>-266</td>
<td>-361</td>
</tr>
<tr>
<td>Central bank liquidity swaps (8)</td>
<td>393,063</td>
<td>378,291</td>
</tr>
</tbody>
</table>
QE and Treasury Yield Curve

U.S. Treasury Securities on Fed Balance Sheet ($B)

Term Spread: 10Y minus 2Y (%)

Slope = 10Y-2Y

(1990 to 2016):
- avg = 124 bps
- min = -52 bps
- max = 291 bps
Post-2020 Monetary Policy: The Fed is Playing with Fire?

Broda and Druckenmiller, May 10, 2021:

The current stage of recovery:
- GDP back to pre-recession levels.
- Unemployment recovers by 70%, four times as fast as in a typical recession.

Normally, the Fed would be planning its first rate hike. Instead, the Fed
- Tells the market that the first hike will happen in 32 months.
- Continues the $120B a month bond purchases.
Future Fiscal Burdens of USA

US Congressional Budget Office:

- **Deficits:** Largest since 1945.
- **Federal Debt:** Projected to be 202% by 2051.
- **Spending:**
  - Interest expenses.
  - Social security and medicare for an aging population.
- **A growing debt burden:**
  - Fiscal crisis.
  - Higher inflation.
  - Undermine confidence in USD.