A Lesson from the Great Depression that the Fed Might have learned:
A Comparison of the 1932 Open Market Purchases with Quantitative Easing
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Motivation

- Significant challenges with discerning effects of QE1 on the economy
  - Conducted in a severely depressed economy
  - Novel features: ZLB environment, purchases of non-Treasury assets, signalling and forward guidance, interest rate on excess reserves
    - Theoretical: Baumeister and Benati (2010), Chen, Cúrdia and Ferrero (2012)
Motivating Questions

- Was the structure of the open-market operation announcement in QE1 important?

"Moreover, to help improve conditions in private credit markets, the Committee decided to purchase up to $300 billion of longer-term Treasury securities over the next six months" (FOMC Statement, March 18, 2009)

- Does the duration of debt being purchased by the Fed matter?
- Is the size of debt being held by the public important?
Propose to examine the effectiveness of QE1 through the lens of another OMO conducted by the Fed:

- Conducted at the height of the Great Depression
- Fed’s balance sheet increases holdings of long-term bonds ($1 billion in 1932$ or $16 billion in 2009$), and then divests Note holdings in 4-month period
- Novel features: Yields were in the zero-bound range, largest operation at the time, pure OMO, no forward guidance (or Interest on Ex Reserves)

"By entering upon a policy of controlled credit expansion, designed to turn the deflation in bank credit and to stimulate a rise in prices, the Federal Reserve System has undertaken the boldest of all central bank efforts to combat the depression."
Strategy and Contributions

- **Empirical:**
  - Event study analysis
  - Narrative record

- **Theoretical:**
  - Significant evidence on segmentation in financial markets in 1920s and 30s
  - DSGE model with two types of investors
  - Consider the OMO and importance of the program’s announcement structure, duration of debt and size of total debt
Context for the 1932 Operation

- Fed does very little at the start of the Great Depression; does not prevent three banking panics
  - Organizational disarray (*Friedman and Schwartz, 1963*); Reliance on nominal interest rates and discount window as policy guide - member bank borrowing and short-term nominal rates had not declined (*Meltzer, 2003*); Absence of clear lender of last resort policy and adherence to Gold Standard (*Bordo and Wheelock, 2013*).

- Governor Harrison of New York Fed proposes and helps initiate purchases of government securities on April 13, 1932
  - $100 million for 5 weeks
  - Second round of purchases of $500 million is agreed upon on May 17, 1932

- By July 1932, Harrison’s pleas for the program’s continuation are overwhelmed by dissent within the Fed system
1932 Operation vs. QE1: Similarities

- Conducted at the time of severely depressed economic activity
- Large scale OMOs; 1932 OMO was an unprecedented increase in the Fed’s holdings of US Treasuries over 4-month period
- Would continue for a specified period of time
1932 Operation vs. QE1: Differences and their Implications

- Gold Standard in 1932 vs. Floating exchange rate in 2008
  - Although the U.S. was on the GS, the OMO did not threaten the credibility of the Fed's commitment to the GS or cause expectations of devaluation (Hsieh and Romer, 2006 and Bordo, Choudhari and Schwartz, 2002)

- No forward guidance in 1932; only discussions in the Open Market Policy Conference
  - However, financial markets observed and understood that the balance sheet of the Fed was changing (narrative evidence from the NY Times)

- QE entailed purchases of non-Treasury assets, conducted at the time of IOER
  - Restrict our analysis to comparing effects of the OMOs
Empirical Strategy

- Construct weekly series of holdings of Treasury assets by the Federal Reserve, decomposed into different maturities from Fed Bulletins
- Corresponding series of Treasury yields
- There is no "announcement" of the open-market operation → the strategy used in QE1 studies cannot be used
- Instead, identify weeks in which Fed’s holdings of Treasury assets changed by 5% or more
- In contrast to other analyses which look at changes in total debt holdings (Meltzer (2003), Hsieh and Romer (2006))
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## Changes in Holdings of Notes and Corresponding Yields

<table>
<thead>
<tr>
<th>Week</th>
<th>% ΔNote Holdings</th>
<th>Changes in yields on 3-5 year notes (in b.p.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 27, 1932</td>
<td>11.7</td>
<td>-36</td>
</tr>
<tr>
<td>May 4, 1932</td>
<td>16.5</td>
<td>-11</td>
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<tr>
<td>May 11, 1932</td>
<td>38.2</td>
<td>3</td>
</tr>
<tr>
<td>May 18, 1932</td>
<td>7.6</td>
<td>-10</td>
</tr>
<tr>
<td>June 15, 1932</td>
<td>11.7</td>
<td>8</td>
</tr>
<tr>
<td>June 22, 1932</td>
<td>15.2</td>
<td>20</td>
</tr>
<tr>
<td>June 29, 1932</td>
<td>19.3</td>
<td>13</td>
</tr>
<tr>
<td>August 3, 1932</td>
<td>20.3</td>
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<tr>
<td>August 10, 1932</td>
<td>8.7</td>
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<td>August 17, 1932</td>
<td>5.1</td>
<td>13</td>
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<tr>
<td>Cumulative change</td>
<td></td>
<td>-14</td>
</tr>
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</table>
### Changes in Holdings of Bonds and Corresponding Yields

<table>
<thead>
<tr>
<th>Week</th>
<th>% $\Delta$Bond Holdings</th>
<th>Changes in yields on Bonds (in b.p.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 20, 1932</td>
<td>7.8</td>
<td>-8</td>
</tr>
<tr>
<td>May 25, 1932</td>
<td>5.4</td>
<td>8</td>
</tr>
<tr>
<td>June 1, 1932</td>
<td>5.9</td>
<td>3</td>
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<tr>
<td>June 8, 1932</td>
<td>8.4</td>
<td>-1</td>
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<td><strong>Cumulative change</strong></td>
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## QE1: Effects on Yields

<table>
<thead>
<tr>
<th>Week</th>
<th>Changes in yields on 10-year Bonds (in b.p.)</th>
<th>5-year Notes</th>
<th>1-year Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>K-V</td>
<td>GRRS</td>
<td>K-V</td>
</tr>
<tr>
<td>November 25, 2008</td>
<td>-36</td>
<td>-22</td>
<td>-23</td>
</tr>
<tr>
<td>December 1, 2008</td>
<td>-25</td>
<td>-19</td>
<td>-28</td>
</tr>
<tr>
<td>December 16, 2008</td>
<td>-33</td>
<td>-26</td>
<td>-15</td>
</tr>
<tr>
<td>January 28, 2009</td>
<td>28</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>March 18, 2009</td>
<td>-41</td>
<td>-47</td>
<td>-36</td>
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<tr>
<td>Cumulative change</td>
<td>-107</td>
<td>-104</td>
<td>-74</td>
</tr>
</tbody>
</table>

Source: Krishnamurthy and Vissing-Jorgensen (2011) and Gagnon, Raskin, Remache and Sack (2010)
## QE1: Effects on Yields

<table>
<thead>
<tr>
<th>Week</th>
<th>Change in yields on</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>10-year Bonds</td>
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<tr>
<td>November 25, 2008</td>
<td>-28</td>
</tr>
<tr>
<td>December 1, 2008</td>
<td>-44</td>
</tr>
<tr>
<td>December 16, 2008</td>
<td>-18</td>
</tr>
<tr>
<td>January 28, 2009</td>
<td>19</td>
</tr>
<tr>
<td>March 18, 2009</td>
<td>-17</td>
</tr>
<tr>
<td>Cumulative change</td>
<td>-88</td>
</tr>
</tbody>
</table>

Calculations based on weekly windows
Feb 28, 1932:

- [T]he Federal Reserve has given unmistakable signs [...] of its intentions to relax credit. [...] **Open market buying of government securities appears to be the only effective means whereby the Federal Reserve can pump out credit**

Apr 13, 1932

- The Federal Reserve system has been engaged since the final week in February in an easy-money campaign [...]. This policy has already resulted in [...] **a relaxation of bank credit so considerable as to cause a drop of 1-1/3% per cent in open market bill rates. [...]** Whether the time is not now ripe for the Federal Reserve to **enlarge its campaign by stepping up the rate of weekly purchases of "governments" to say $75,000,000**
Apr 15, 1932

Interest in the weekly bank statement converged upon the single item of United States Government securities which showed a rise of $100,010,000, **lifting the system’s holdings to a high record** at $985,024,000.

Apr 22, 1932

The weekly bank statement was **favorable beyond the general expectations of Wall Street in the indications it gave of the progress of the Federal Reserve’s new policy.** [...] Loans and investments, which had been falling sharply, went up $148,000,000, the rise in loans amounting to $64,000,000 and that in investments to $84,000,000.

May 13, 1932

This brings purchases for the last five weeks up to $500,000,000 and indicates that **there has been no slackening in the credit expansion program**.
July 19, 1932
- The **adjournment of Congress** has recalled the prediction in some quarters that **when this event occurred the Federal Reserve System would terminate its policy of keeping money easy through the purchase of United States Government securities.** There are indications that this may prove to be the case.

Aug 13, 1932
- With gold returning to the country and currency coming back from circulation, **there appears to be no further need for continued purchases** of United States Government securities by the Federal Reserve Banks.

Aug 19, 1932
- Open market purchases of United States Government securities by the Federal Reserve Banks, [...] **came to the expected end this week**
Effects on the Economy

- Analyze the effects of the OMO on the economy using a segmented markets model
- Evidence of segmentation in the 1920s and 1930s:
  - Non-bank public had limited access to the government securities markets which was dominated by a few investment banks (Garbade, 2012)
  - Loan rates varied: NY banks charged 3.82% on commercial loans; this was 5.01% in the South and West
- Assume two types of investors: households and institutional investors
Model Components

- Investors:
  - $\omega_u$ Unrestricted - hold long and short bonds; pay transactions cost to purchase long bonds
  - $\omega_r$ Restricted - hold long bonds only
- Intermediate, capital and final goods producers
- Government collects lump-sum taxes and issues long- and short-term debt
- Central bank sets the federal funds rate in response to output gap and inflation (Orphanides 2003, Taylor 1999)
Model Equations: Euler Equations

- For the short-term bond:

\[ 1 = \beta_u E_t \left[ \frac{MU_{t+1}^u}{MU_t^u} \frac{RS_t}{\Pi_{t+1}} e^{-\gamma-z_{t+1}} \right] \]

- For the long bond:

\[ 1 + \zeta_t = \beta_u E_t \left[ \frac{MU_{t+1}^u}{MU_t^u} \frac{RL_t}{\Pi_{t+1}} \frac{PL_{t+1}}{PL_t} e^{-\gamma-z_{t+1}} \right] \]
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- Pricing equation for restricted households:

\[ 1 = \beta_r E_t \left[ \frac{MU_{t+1}^r}{MU_t^r} \frac{RL_t}{\Pi_{t+1}} \frac{PL_{t+1}}{PL_t} e^{-\gamma z_{t+1}} \right] \]
Model Intuition: Effect of asset purchases

- The risk premium between $R_{EH}^L$ and $R_L$ with transactions cost is:

$$R_{L,t} - R_{EH}^L = \frac{1}{D_L} \sum_{j=0}^{\infty} \left( \frac{D_L - 1}{D_L} \right)^j E_t \zeta_{t+j}$$
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- Transactions cost function:

$$\zeta_t = \zeta \left[ \frac{P_{L,t} B_{L,t}}{B_{S,t}}, \epsilon_{\zeta,t} \right]$$

- Assume $\zeta, \zeta' > 0 \implies$ as public’s holdings of long bonds fall, yields on long bonds decline
  - Change in returns on long bonds affects the consumption and savings decisions of the restricted households
Model Estimation

- Estimate model with Bayesian methods
- Construct likelihood using Kalman filter based on the RE state space representation
- Posterior:
  - Maximize posterior density function to obtain the posterior mode
  - Use normal approximation around mode to generate a sample of parameter vector draws based on MCMC
Key Parameters

- Average duration of debt is set to match the duration of 5-year Notes
- Debt is 15% of the GDP on average over 1920s
- ZLB characterization: Short yields remained in the zero-lower bound range for approximately two years during and after the 1932 operation
Prior and Posterior Estimates of Key Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Prior</th>
<th>Posterior</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dist</td>
<td>Median</td>
</tr>
<tr>
<td>100ζ′</td>
<td>G</td>
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<td>ω_u</td>
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<tr>
<td>σ_r</td>
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<tr>
<td>φ_T</td>
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<td>φ_π</td>
<td>G</td>
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<tr>
<td>φ_y</td>
<td>G</td>
<td>0.3672</td>
</tr>
</tbody>
</table>
Benchmark simulation

$1 billion increase in Fed’s holdings over 1Q; divests over next quarter
Effects of Program Structure Announcement

$1$ billion increase in Fed’s holdings over $2Q$; assets are held on the balance sheet for $2Q$ and then divested (agents understand the full path)
Effects of Debt Maturity

$1$ billion increase in Fed’s holdings over $1Q$; divests over next quarter; Debt maturity is increased to $20Q$
Effects of Debt Level

$1$ billion increase in Fed’s holdings over 1Q; divests over next quarter; Debt is increased to 20% of GDP
Conclusions and Future Work

- Empirical results suggest the 1932 OMO affected yields on Treasury Notes and Bonds.
- In a segmented markets model, the purchase operation affects the risk premium on long bonds leading to a decline in long yields and a rise in output growth.
- Estimates of segmentation are large (approximately 76% of investors pay transactions cost to buy long bonds).
- If the Fed in 1932 had followed the announcement strategy of QE1, the effects on the real economy would be larger.
- Low degree of financial segmentation during the QE episodes suggests the Fed had to use other unconventional tools in combination with the OMO.