We have entered into a new era of macroeconomics in advanced countries.

As late as 2006, we were in the Great Moderation

No more inflation, business cycle had been greatly moderated

Economists were fighting over who should get credit

- FED folks said it was due to astute monetary policy
- Others said it was due to technology: beter inventory management due to forecasting
- Others said it was good luck
- Still other said it was due to Ronald Reagan and new credibility

But there were warning: no more CPI inflation but asset price inflation

Should the FED have burst the bubbles in asset prices and real estate under Greenspan?

Experience of Japan was a waraning not to burst bubble.
Monetary Policy

- Usual way to conduct monetary policy is through interest-rate rule known as the Taylor rule:

\[
\text{normal}: i_t = (1 - \rho) \left[ \pi^r \pi_t + \kappa^y \log \left( \frac{Y_t}{Y^*_t} \right) \right] + \rho i_{t-1} \quad (1)
\]

\[
ZLB: i_t = 0; \rho = 0 \quad (2)
\]

\[
1 + i_t = R_{t+1} \frac{E_t P_{t+1}}{P_t} \quad (3)
\]

- Interest rates cannot go below zero.

- What is key is the relation between the real interest rate and the nominal rate.

- Real interest rates can rise if the expected inflation is negative.

- This is nightmare on Elm Street and Friday the 13th all wrapped up into one.
Quantitative Easing = Large Scale Asset Purchases = Long Term Repurchase Operations

Billion here, billion there: soon it adds up to real money

This is quasi-fiscal monetary policy: FED was buying assets of non-bank financial institutions.
If interest rates are stuck at zero, we can use tax-rate changes on consumption and income.

These changes affect decisions on consumption and labor supply the same way interest rate changes do.

Idea is that the tax rate on consumption affects intertemporal trade off between current and future consumption.

Tax rate on labor affects the intratemporal tradeoff between work and leisure.

So if tax rates can change, no big deal if interest rates are stuck.

We tried this briefly with "cash for clunkers" in 2009. Did it go far enough?
Model development

- A model with two regimes: one with totally flexible interest rates one with the zero lower bound
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- This is a regime-switching model, or a model with occasionally binding constraints.
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2. We then evaluate the performance with QE policies and with tax rate rules for consumption and labor income
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1. We simulate the model with the switching regimes and the one with flexible interest rates
2. We then evaluate the performance with QE policies and with tax rate rules for consumption and labor income
3. Model is driven in one case by recurring productivity shocks and in another by recurring financial shocks.
The model is simulated for recurring shocks and simulated for $T=100,000$ periods.

We then isolate sub-periods when the GDP is two standard deviations below its stochastic mean.

This then allows us to examine the adjustment of key macroeconomic variables for five years before and five years after the crisis event. In the non-crisis regime, an optimal Taylor rule is operational for the interest rate.

In the crisis regime, we first examine the case of the zero lower bound with no fiscal or monetary alternatives.

Then we compare and contrast results for two alternative cases:

- (optimal quantitative easing rule
- (ii)optimal rules for the tax rates on consumption and wages.

Like impulse response paths, the method shows the paths for the different scenarios

The approach has the added advantage that we can also ascertain the frequency/likelihood of crisis compared to normal times.
## Table 1

### Stochastic Mean and Std dev (%Y): Simulated Data for Productivity Shock

<table>
<thead>
<tr>
<th>Variable</th>
<th>ZLB</th>
<th>QE</th>
<th>FR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std dev</td>
<td>Mean</td>
</tr>
<tr>
<td>Y</td>
<td>0.692</td>
<td>1</td>
<td>0.708</td>
</tr>
<tr>
<td>C</td>
<td>0.434</td>
<td>0.762</td>
<td>0.434</td>
</tr>
<tr>
<td>I</td>
<td>0.080</td>
<td>0.453</td>
<td>0.082</td>
</tr>
<tr>
<td>W</td>
<td>1.379</td>
<td>2.731</td>
<td>1.386</td>
</tr>
<tr>
<td>Q</td>
<td>1.000</td>
<td>0.474</td>
<td>1.000</td>
</tr>
<tr>
<td>Π</td>
<td>1.000</td>
<td>0.131</td>
<td>1.000</td>
</tr>
<tr>
<td>$(R^k_t - R_t)$</td>
<td>0.023</td>
<td>0.102</td>
<td>0.023</td>
</tr>
<tr>
<td>N</td>
<td>3.734</td>
<td>1.651</td>
<td>2.956</td>
</tr>
<tr>
<td>ψ</td>
<td>–</td>
<td>–</td>
<td>0.226</td>
</tr>
<tr>
<td>G</td>
<td>0.178</td>
<td>–</td>
<td>0.193</td>
</tr>
<tr>
<td>τ&lt;sup&gt;c&lt;/sup&gt;</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>τ&lt;sup&gt;w&lt;/sup&gt;</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Welfare</td>
<td>-318.264</td>
<td>45.243</td>
<td>-320.422</td>
</tr>
<tr>
<td>% Crisis</td>
<td>0.066</td>
<td>0.040</td>
<td>0.050</td>
</tr>
</tbody>
</table>
Table 2
Summary Min-Max Values for Recurring Productivity Shock

<table>
<thead>
<tr>
<th>Variable</th>
<th>ZLB</th>
<th>QE</th>
<th>FR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Υ</td>
<td>0.612 0.768</td>
<td>0.626 0.781</td>
<td>0.577 0.780</td>
</tr>
<tr>
<td>C</td>
<td>0.382 0.487</td>
<td>0.367 0.482</td>
<td>0.438 0.465</td>
</tr>
<tr>
<td>I</td>
<td>0.052 0.129</td>
<td>0.053 0.120</td>
<td>0.070 0.087</td>
</tr>
<tr>
<td>W / Pm</td>
<td>1.187 1.604</td>
<td>1.145 1.609</td>
<td>1.145 1.610</td>
</tr>
<tr>
<td>Q</td>
<td>0.962 1.038</td>
<td>0.971 1.027</td>
<td>0.925 1.026</td>
</tr>
<tr>
<td>Π</td>
<td>0.990 1.010</td>
<td>0.984 1.012</td>
<td>0.973 1.025</td>
</tr>
<tr>
<td>ln (R_k / R_t)</td>
<td>0.012 0.030</td>
<td>-0.006 0.042</td>
<td>-0.064 0.089</td>
</tr>
<tr>
<td>ψ</td>
<td>– –</td>
<td>0.193 0.251</td>
<td>– –</td>
</tr>
<tr>
<td>G</td>
<td>0.178 0.178</td>
<td>0.188 0.197</td>
<td>0.034 0.261</td>
</tr>
<tr>
<td>τc</td>
<td>– –</td>
<td>– –</td>
<td>-0.153 0.104</td>
</tr>
<tr>
<td>τw</td>
<td>– –</td>
<td>– –</td>
<td>-0.199 0.135</td>
</tr>
<tr>
<td>Welfare</td>
<td>-321.886</td>
<td>-314.670</td>
<td>-313.218</td>
</tr>
</tbody>
</table>

Quasi-Fiscal Monetary and Quasi-Monetary Fiscal Policies
May 2015
Figure: Productivity Shocks - GDP, Consumption, Wage, and Gov. Spending
Figure: Productivity Shocks: Spread, Net Worth, LSAP, Tax Rates