‘Quantifying the Lasting Harm to the U.S. Economy from the Financial Crisis’
Bob Hall

Discussion, Martin Eichenbaum
The Great Questions in the wake of the Great Recession

- What caused it?

- What are the ‘mechanical’ sources of the enormous and persistent declines in output?
  - Capital, Labor, TFP.....

- What, if anything, can we do to hasten the recovery?

- The ‘deeper’ research issue: what class of models are most useful for thinking about this seminal economic event?
Overview

- The ‘War and Peace’ of what happened in the aftermath of the crisis.
  - Fascinating, exhaustive and exhausting.
  - Primary focus: the mechanical sources of the declines in output.

- Nuanced discussion of what policy might be able to achieve in the short and intermediate run.

- Closely connected to the implicit stand that Bob takes (in this paper) on what the best models are for thinking about the Great Recession.
My discussion

- Summarize Bob’s main conclusions.

- Complementary calculations and potential sensitivities.

- Why is the recovery so slow?
  - Kill the vampire squid ‘mismatch’ theory of low employment (again).
  - It’s not policy uncertainty.
  - It’s not credit frictions

- What’s left?
  - Models which explain the depth and persistence of the Great Recession as confluence of the fall in aggregate demand with a binding ZLB.

- CET (2014) and this paper agree there’s a large role for ‘demand policy’, even in the short run.
Decomposing the shortfall in output

  - Calculate ‘shortfall’ as difference between projected and actual level of output.

- Project input values of capital and different components of labor input using trends calculated over sample 1990 - 2007.
  - Calculate ‘shortfall’ of inputs as difference between projected and actual input levels.

- Contribution of TFP is calculated as residual so that the decomposition is additive.
Components of the current shortfall in output

Employment rate = (1 - unemployment rate).

<table>
<thead>
<tr>
<th>Year(s)</th>
<th>Output</th>
<th>Productivity</th>
<th>Capital contribution</th>
<th>Population</th>
<th>Labor-force participation</th>
<th>Employment rate</th>
<th>Hours per week</th>
<th>Labor quality</th>
<th>Business fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>4.9</td>
<td>3.0</td>
<td>0.2</td>
<td>0.3</td>
<td>0.0</td>
<td>0.8</td>
<td>0.5</td>
<td>-0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>2009</td>
<td>7.4</td>
<td>1.7</td>
<td>0.8</td>
<td>0.3</td>
<td>0.6</td>
<td>2.4</td>
<td>1.6</td>
<td>-0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>2010</td>
<td>0.1</td>
<td>-1.6</td>
<td>1.0</td>
<td>0.3</td>
<td>0.6</td>
<td>0.3</td>
<td>-0.5</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>2011</td>
<td>0.5</td>
<td>0.3</td>
<td>0.8</td>
<td>0.4</td>
<td>0.5</td>
<td>-0.4</td>
<td>-0.2</td>
<td>0.1</td>
<td>-0.9</td>
</tr>
<tr>
<td>2012</td>
<td>-0.1</td>
<td>0.1</td>
<td>0.6</td>
<td>-0.1</td>
<td>0.4</td>
<td>-0.6</td>
<td>-0.4</td>
<td>0.0</td>
<td>-0.1</td>
</tr>
<tr>
<td>2013</td>
<td>0.5</td>
<td>0.1</td>
<td>0.5</td>
<td>0.3</td>
<td>0.3</td>
<td>-0.3</td>
<td>-0.2</td>
<td>0.3</td>
<td>-0.3</td>
</tr>
<tr>
<td>2007 through 2010</td>
<td>12.4</td>
<td>3.1</td>
<td>2.1</td>
<td>0.8</td>
<td>1.2</td>
<td>3.5</td>
<td>1.6</td>
<td>-0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>2007 through 2013</td>
<td>13.3</td>
<td>3.5</td>
<td>3.9</td>
<td>1.3</td>
<td>2.4</td>
<td>2.2</td>
<td>0.8</td>
<td>-0.3</td>
<td>-0.5</td>
</tr>
</tbody>
</table>
Cumulative output shortfall relative to 2007 base level
Calculated using Hall (2014) methodology, data

<table>
<thead>
<tr>
<th>Year(s)</th>
<th>Output</th>
<th>Productivity</th>
<th>Capital contribution</th>
<th>Population</th>
<th>Labor-force participation</th>
<th>Employment rate</th>
<th>Hours per week</th>
<th>Labor quality</th>
<th>Business fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>4.9</td>
<td>3.0</td>
<td>0.2</td>
<td>0.3</td>
<td>0.0</td>
<td>0.8</td>
<td>0.5</td>
<td>-0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>2009</td>
<td>12.3</td>
<td>4.7</td>
<td>1.1</td>
<td>0.5</td>
<td>0.6</td>
<td>3.2</td>
<td>2.1</td>
<td>-0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>2010</td>
<td>12.4</td>
<td>3.1</td>
<td>2.1</td>
<td>0.8</td>
<td>1.2</td>
<td>3.5</td>
<td>1.6</td>
<td>-0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>2011</td>
<td>12.9</td>
<td>3.4</td>
<td>2.9</td>
<td>1.2</td>
<td>1.8</td>
<td>3.1</td>
<td>1.4</td>
<td>-0.6</td>
<td>-0.1</td>
</tr>
<tr>
<td>2012</td>
<td>12.9</td>
<td>3.5</td>
<td>3.4</td>
<td>1.1</td>
<td>2.1</td>
<td>2.5</td>
<td>1.0</td>
<td>-0.6</td>
<td>-0.2</td>
</tr>
<tr>
<td>2013</td>
<td>13.3</td>
<td>3.5</td>
<td>3.9</td>
<td>1.3</td>
<td>2.4</td>
<td>2.2</td>
<td>0.8</td>
<td>-0.3</td>
<td>-0.5</td>
</tr>
</tbody>
</table>

Cumulative output short-falls:
- 2007 through 2010
  - Output: 29.6
  - Productivity: 10.8
  - Capital contribution: 3.4
  - Population: 1.6
  - Labor-force participation: 1.8
  - Employment rate: 7.6
  - Hours per week: 4.2
  - Labor quality: -1.6
  - Business fraction: 1.8
- 2007 through 2013
  - Output: 68.6
  - Productivity: 21.2
  - Capital contribution: 13.6
  - Population: 5.2
  - Labor-force participation: 8.1
  - Employment rate: 15.3
  - Hours per week: 7.4
  - Labor quality: -3.0
  - Business fraction: 0.9
‘Demand policy’ and the output shortfall

- One upper bound for ‘demand’ policy to affect output in short-run: its potential effect on labor input.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>38%</td>
<td>36%</td>
<td>45%</td>
</tr>
</tbody>
</table>

- If part of productivity movements are due to labor hoarding and capacity utilization, upper bound for demand policy would be higher.

- Over time, upper bound rises because we can eliminate the capital shortfall.

- By affecting investment, demand policies can hasten the elimination of the capital shortfall.
Affecting Labor Input

- Key issue: how much of labor shortfall is cyclical, how much reflects low frequency, structural factors.

- Hall’s paper contains a nuanced discussion of these issues.
  - Labor force participation, unemployment benefits, Social Security disability benefits, implicit taxes from food stamp like programs.

- LFPR: demographics are undeniably important, probably account for about 1/3 of the fall in LFPR.

- Hall attributes a relatively minor role to the next three categories.

- That leaves the mismatch hypothesis to limit potential effectiveness of ‘demand policy’.
Motivating the mismatch hypothesis

U.S. Beveridge Curve

Vacancy Rate, $V$, (%) vs. Unemployment Rate, $U$, (%)
Reasons to be skeptical about the mismatch hypothesis

- Reduced form evidence from Shierholz (2014).
- Davis et. al. (2013): cyclical variations in recruiting intensity.
- Hall’s heterogeneity hypothesis.
- Theory doesn’t predict a strictly downward sloping Beveridge Curve in a severe, prolonged recession
- All these explanations are consistent with ‘demand policy’ having a large expansionary impact on employment.
Doubts about the mismatch hypothesis: Shierhlotz (2014)

- Unemployment is high at all levels (even including for those with college degrees) relative to 2007.

- Unemployment is high in all occupations relative to 2007.

- The number of unemployed vastly outnumber the number of job openings in all occupations.

- There’s no evidence of an increase in number of hours worked in any occupation (except legal).
Doubts about the mismatch hypothesis

- Suppose that what’s holding firms back from hiring is inability to find right type of workers.

- Then wages of some types of workers (the ‘right types’) should be skyrocketing.

- But wages across lots of occupations are rising at pretty modest rates.

- In fact, wages are rising at less than average productivity in all occupations.
Doubts about the mismatch hypothesis

Since the early 1970s, National Federation of Independent Business, a small business association, has surveyed its members to find out what their ‘top problem is’.

- Ten categories:
  - Taxes, Inflation, Poor sales, Finance & interest rates, Cost of labor, Government regulations & red tape, Competition from large businesses, Quality of labor, Cost/availability of insurance, Other.

Since 2008

- ‘Poor sales’ surged to ‘top problem’ selected by the largest number of firms.
- Number of firms reporting ‘Labor quality’ as top problem has collapsed.
SELECTED SINGLE MOST IMPORTANT PROBLEM
Sales, Fin. & Interest Rates, Labor Cost, Labor Quality, and Taxes
January Quarter 1974 to January Quarter 2013

- Taxes
- Sales
- Interest Rates
- Labor Quality

Percent of Firms

YEAR

74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12
What about the decline in match efficiency?

Daily job filling rate, 1/2001-2/2013
Job-filling rate rises strongly with gross hires rate in cross section of establishments.

One way to reconcile this empirical relationship with standard search theory

- Assume recruiting intensity per vacancy covaries positively with vacancy rate in the cross section.

Davis et. al. apply this idea to aggregate time series in their AER PP (2012).

Recruiting intensity function is parametrized to be consistent with how the finding rate varies with gross hires in the cross section.
Davis et. al. provide evidence that recruiting intensity has declined sharply. They argue this decline accounts for most of apparent decline in match efficiency.
Match efficiency differs across workers as a function of why they became non-employed.

Categories with lowest normal exit rate (lowest match efficiency) expanded dramatically during the post-2007 period.

<table>
<thead>
<tr>
<th>Source</th>
<th>Normal exit rate, percent per month</th>
<th>Change in percent of unemployment, 2007 to 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layoff</td>
<td>64.7</td>
<td>-2.2</td>
</tr>
<tr>
<td>Permanent loss</td>
<td>41.4</td>
<td>17.7</td>
</tr>
<tr>
<td>Temp job</td>
<td>51.1</td>
<td>-0.9</td>
</tr>
<tr>
<td>Quit</td>
<td>55.7</td>
<td>-5.0</td>
</tr>
<tr>
<td>New entrant</td>
<td>49.2</td>
<td>-1.6</td>
</tr>
<tr>
<td>Reentrant</td>
<td>48.7</td>
<td>-8.0</td>
</tr>
</tbody>
</table>
Overall Composition-Adjusted Matching Efficiency
Beveridge curve *should* appear to shift in a severe recession

- Simplest DMP style model

\[ U_{t+1} - U_t = (1 - \rho)(1 - U_t) - f_t U_t \]

\[ f_t = \sigma_{m,t} \left( \frac{V_t}{U_t} \right)^\alpha = (1 - \rho) \frac{(1 - U_t)}{U_t} - \frac{U_{t+1} - U_t}{U_t} \]

\[ V_t = \left[ (1 - \rho) \frac{(1 - U_t)}{\sigma U_t^{1-\alpha}} - \frac{U_{t+1} - U_t}{\sigma U_t^{1-\alpha}} \right]^{1/\alpha} \]

- The variable $U_{t+1} - U_t$ is positive in downturn phase of recession, then becomes negative as economy recovers.

- This force generates what looks like a shift in the Beveridge curve (the ‘hook pattern’).
Standard Approximation

- Standard derivation assumes

\[ U_{t+1} = U_t \]

- We obtain a standard Beveridge Curve

\[
V_t = \left[ (1 - \rho) \frac{(1 - U_t)}{\sigma U_t^{1-\alpha}} \right]^{1/\alpha}
\]

- Only way to capture a cyclical shift in relationship between \( V_t \) and \( U_t \) are changes in match efficiency, \( \sigma \).

- But they could just reflect cyclical movements in \( U_{t+1} - U_t \).
How important is this argument empirically?
Is the recovery slow because of policy uncertainty?

- If employers are holding back from hiring new workers because of policy, then we should see them using their existing work force more intensely.
  - There's no evidence of this effect in average weekly hours data.

- Baker, Bloom and Davis construct a measure of economic policy uncertainty, and this indeed shows an elevated level after 2007.

- Index has been declining, little evidence that employment is increasing in response to the decrease in uncertainty.
Baker, Bloom and Davis Uncertainty Index

U.S. Economic Policy Uncertainty Index

Source: Baker, Bloom, Davis
Is the recovery slow because of credit constraints?

- Large corporations have no trouble borrowing at historically low interest rates.

- Small firms don’t cite credit conditions as an important problem.
  - In NFIB small business survey, sales is by far the biggest problem.

**Small Business Credit Conditions**

**Credit Conditions**
Loan Availability Compared to Three Months Ago*

*January 1986 to March 2014*

*For the population borrowing at least once every three months.*
Net Percent Reporting Tightening Standards for Commercial and Industrial Loans

Source: Board of Governors of the Federal Reserve System
Net Percent Reporting Tightening Standards for Consumer Loans

* From 2011Q2, auto loans are split out from the other consumer loans category.
Source: Board of Governors of the Federal Reserve System
* From 2007Q2, loans are split into prime, sub-prime and non-traditional loans.
** Sub-prime series is not reported when the number of respondents is three or fewer.
Source: Board of Governors of the Federal Reserve System
What’s left?

- The collision of low aggregate demand and a binding ZLB.

- Implicit subtext of Hall’s paper: this is the key force driving the cyclical shortfall in output.

- Along with his quantitative analysis of the input shortfalls, that assumption is the basis of his Table 10.

<table>
<thead>
<tr>
<th>Component</th>
<th>Contribution to shortfall</th>
<th>Immediately</th>
<th>Within a few years</th>
<th>Ultimately</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity</td>
<td>3.5</td>
<td>No</td>
<td>No</td>
<td>Possibly</td>
</tr>
<tr>
<td>Capital</td>
<td>3.9</td>
<td>No</td>
<td>A little</td>
<td>Yes</td>
</tr>
<tr>
<td>Unemployment</td>
<td>2.2</td>
<td>Partly</td>
<td>Mostly</td>
<td>Yes</td>
</tr>
<tr>
<td>Participation</td>
<td>2.4</td>
<td>Partly</td>
<td>Partly</td>
<td>Partly</td>
</tr>
</tbody>
</table>
relationship to CET (2014) and some numbers

- NK model in which firms face moderate degrees of price rigidities, no nominal rigidities in wage setting process.

- Hall-Milgrom wage bargaining in DMP-like environment.

- Endogenize LFPR so there’s three state labor market.
  - employment, unemployment, not in labor force (home production).

- Estimate model using data on 11 variables, pre-2008 sample.

- Project behavior of these variables using simple trends calculated over sample 2001 - 2007.
  - Calculate ‘shortfall’ as difference between projected and actual level of these variables.
Accounting for the shortfalls

- Allow for four shocks and a binding ZLB

- First shock motivated by literature stressing reduction in consumption as trigger for ZLB episode.
  - Perturbation to intertemporal Euler equation governing the accumulation of risk-free asset: *consumption wedge*.

- Second shock motivated by sharp increase in credit spreads observed in post-2008 period.
  - Wedge in households’ first order condition for optimal capital accumulation: *financial wedge*.

- Third and fourth shocks: TFP and government purchases.
Notes: Data are the differences between raw data and forecasts; see Figure 4.
Substantial potential for ‘demand’ policy

- CET attribute vast bulk of decline in economic activity to financial wedge and, to somewhat smaller extent, consumption wedge.

- Shortfall in per capita output as of end of 2012:
  - CET: 9%
  - Hall: 11.8%

- From this perspective we’re more conservative than Hall (different output measures, different trends).

- We estimate that cyclical component of labor accounts for about 65% of output shortfall.

- Hall upper bound on labor contribution to output shortfall as of end of 2012 is a bit over 40%

- In this sense, we’re less conservative than him.
Hall’s paper is a must read for anyone interested in accounting for the aftermath of the financial crisis.

Aside from pure accounting, it provides an estimate of upper bound for what demand policy could do in short-run.

- Abstracts from labor hoarding, capacity utilization which could raise this upper bound.

Key conclusion

- Stimulating product demand would help eliminate an important portion of output shortfall in short run.

Demand policy would also help encouraging investment, thereby more quickly eliminating drag due to capital shortfall.
One big complaint:

- Why in 2014 is anyone still working with I/K rather than Î adjustment costs?