

Economic Assumptions, I

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The Plan

- On Today's Agenda:
 - Productivity
 - Price Inflation
 - Average Real Wage Differential
 - Unemployment Rate
 - Annual Trust Fund Real Interest Rate
- For Later Meetings:
 - Labor Force Participation
 - Wage Dispersion
 - Methods

Focus on the Real Wage Differential

- Across the Alternatives in TR 2010, a percentage point increase in the RWD improves the 75-year balance by 1.375 percentage points.
- The RWD is the outcome of assumptions about productivity, inflation, earnings, and hours.
 - These are considered separately and in some detail.
 - The Trustees have not taken some recommendations from past TPAMs, which would have raised the RWD.
 - TPAM 2007's recommendations would increase the 75-year balance by 0.55 percent of taxable payroll.

Real Wage Differential – Sensitivity

Table VI.D4.—Sensitivity to Varying Real-Wage Assumptions
 [As a percentage of taxable payroll]

Valuation period	Ultimate percentage increase in wages-CPI ^{a b}		
	3.4-2.8	4.0-2.8	4.6-2.8
Summarized income rate:			
25-year: 2010-34	15.13	14.99	14.85
50-year: 2010-59	14.41	14.23	14.06
75-year: 2010-84	14.21	14.01	13.82
Summarized cost rate:			
25-year: 2010-34	15.86	15.23	14.61
50-year: 2010-59	16.61	15.68	14.76
75-year: 2010-84	16.95	15.93	14.90
Actuarial balance:			
25-year: 2010-34	-.73	-.25	+.24
50-year: 2010-59	-2.20	-1.45	-.70
75-year: 2010-84	-2.74	-1.92	-1.09
Annual balance for 2084	-5.82	-4.12	-2.59
Year of combined trust fund exhaustion	2034	2037	2046

Real Wage Diff. – Projection History

	Low Cost	Intermediate	High Cost
2010 TR	1.80%	1.20%	0.60%
2009 TR	1.70%	1.10%	0.50%
2008 TR	1.60%	1.10%	0.60%
2007 TPAM	2.00%	1.50%	0.70%
2007 TR	1.60%	1.10%	0.60%
2006 TR	1.60%	1.10%	0.60%
2005 TR	1.60%	1.10%	0.60%
2004 TR	1.60%	1.10%	0.60%
2003 TPAM	1.80%	1.30%	0.80%
2003 TR	1.60%	1.10%	0.60%

TR 2010 is a response to PPACA, not TPAM.

Real Wage Linkages

$$(1) \quad \left(\begin{array}{c} \bullet \\ \text{Average} \\ \text{Real} \\ \text{Earnings} \end{array} \right) = \left(\begin{array}{c} \bullet \\ \text{Total} \\ \text{Economy} \\ \text{Productivity} \end{array} \right) + \left(\begin{array}{c} \bullet \\ \text{Average} \\ \text{Hours} \\ \text{Worked} \end{array} \right) + \left(\begin{array}{c} \bullet \\ \text{Compensation} \\ \text{Ratio} \end{array} \right) + \left(\begin{array}{c} \bullet \\ \text{Earnings} \\ \text{Ratio} \end{array} \right) + \left(\begin{array}{c} \bullet \\ \text{Price} \\ \text{Differential} \end{array} \right)$$

$\frac{\text{Earnings}}{\text{Employment} * \text{CPI}}$

$\frac{\text{Hours}}{\text{Employment}}$

$\frac{\text{Earnings}}{\text{Compensation}}$

$\frac{\text{Real_GDP}}{\text{Hours}}$

$\frac{\text{Compensation}}{\text{Real_GDP} * \text{PGDP}}$

$\frac{\text{PGDP}}{\text{CPI}}$

$$\text{TR}'10: 1.2 = 1.7 + 0.0 + 0.0 - 0.1 - 0.4$$

Real Wage Links – Projection History

Report	Average Real Earnings	Total Economy Productivity	Earnings Ratio	Price Differential
2010 TR	1.20%	1.70%	-0.10%	-0.40%
2009 TR	1.10%	1.70%	-0.20%	-0.40%
2008 TR	1.10%	1.70%	-0.20%	-0.40%
2007 TPAM	1.50%	1.70%	0.00%	-0.20%
2007 TR	1.10%	1.70%	-0.20%	-0.40%
2006 TR	1.10%	1.70%	-0.20%	-0.40%
2005 TR	1.10%	1.60%	-0.20%	-0.30%
2004 TR	1.10%	1.60%	-0.20%	-0.30%
2003 TPAM	1.30%	1.70%	-0.10%	-0.30%
2003 TR	1.10%	1.60%	-0.20%	-0.30%

Real Wage Links – Projection History

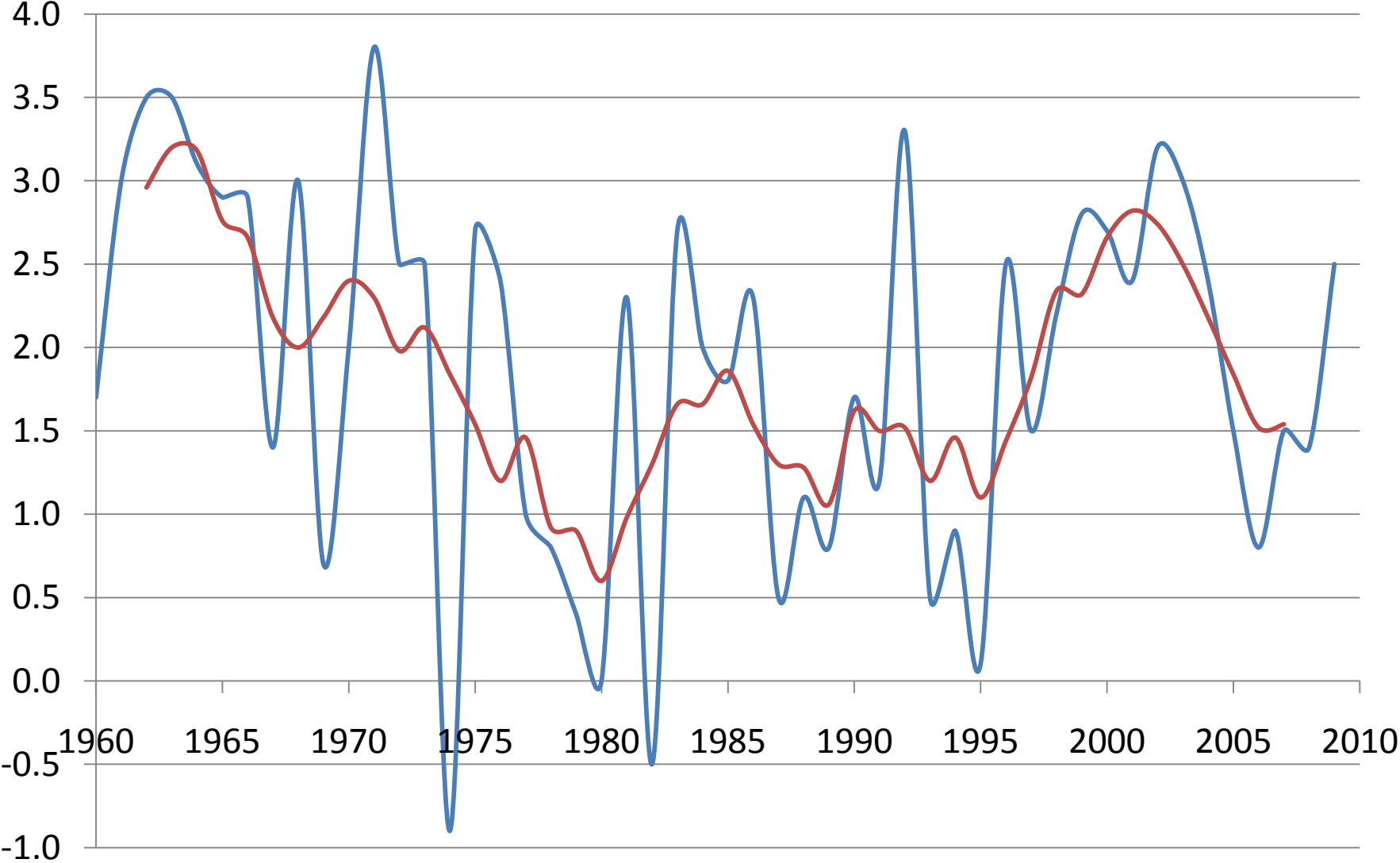
Report	Average Real Earnings	Total Economy Productivity	Earnings Ratio	Price Differential	PGDP	CPI-W
2010 TR	1.20%	1.70%	-0.10%	-0.40%	2.40%	2.80%
2009 TR	1.10%	1.70%	-0.20%	-0.40%	2.40%	2.80%
2008 TR	1.10%	1.70%	-0.20%	-0.40%	2.40%	2.80%
2007 TP	1.50%	1.70%	0.00%	-0.20%	2.30%	2.50%
2007 TR	1.10%	1.70%	-0.20%	-0.40%	2.40%	2.80%
2006 TR	1.10%	1.70%	-0.20%	-0.40%	2.40%	2.80%
2005 TR	1.10%	1.60%	-0.20%	-0.30%	2.50%	2.80%
2004 TR	1.10%	1.60%	-0.20%	-0.30%	2.50%	2.80%
2003 TP	1.30%	1.70%	-0.10%	-0.30%	2.20%	2.50%
2003 TR	1.10%	1.60%	-0.20%	-0.30%	2.70%	3.00%

TPAMs recommended lower inflation.

Productivity – Projection History

	Low Cost	Intermediate	High Cost
2010 TR	2.00%	1.70%	1.40%
2009 TR	2.00%	1.70%	1.40%
2008 TR	2.00%	1.70%	1.40%
2007 TPAM	2.00%	1.70%	1.40%
2007 TR	2.00%	1.70%	1.40%
2006 TR	2.00%	1.70%	1.40%
2005 TR	1.90%	1.60%	1.30%
2004 TR	1.90%	1.60%	1.30%
2003 TPAM	2.00%	1.70%	1.40%
2003 TR	1.90%	1.60%	1.30%

Productivity Growth



— Productivity — 5-Year Moving Average

Productivity – Issues

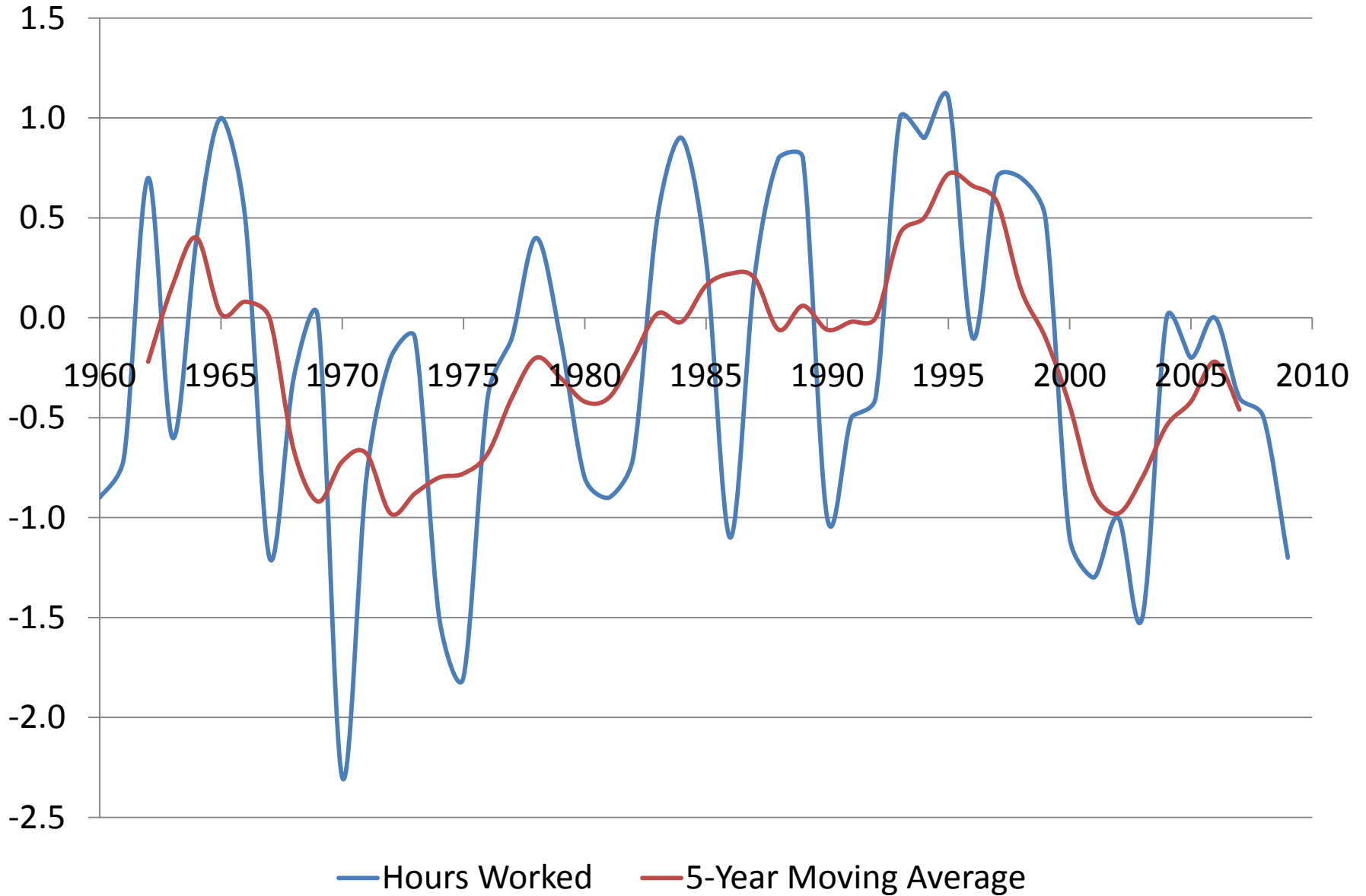
- Prior TPAMs wrestled with the permanence of the post-1995 productivity boom.
 - TR 2006 adopted TPAM 2003's recommendations.
 - TPAM 2007 maintained these assumptions.
- The intermediate assumption of 1.7% is reasonable given the data, as are the alternatives.
- There is some evidence that productivity declines occur when LF composition changes.

Hours Worked – Projection History

	Low Cost	Intermediate	High Cost
2010 TR	0.10%	0.00%	-0.10%
2009 TR	0.10%	0.00%	-0.10%
2008 TR	0.10%	0.00%	-0.10%
2007 TPAM	0.10%	0.00%	-0.10%
2007 TR	0.10%	0.00%	-0.10%
2006 TR	0.10%	0.00%	-0.10%
2005 TR	0.10%	0.00%	-0.10%
2004 TR	0.10%	0.00%	-0.10%
2003 TPAM	0.10%	0.00%	-0.10%
2003 TR	0.10%	0.00%	-0.10%

No disagreements between TRs and TPAMs.

Hours Worked -- Annual Percent Change



Hours Worked – Issues

- TRs and TPAMs have settled on zero as a LR ultimate assumption.
- This is convenient but not reflected in the historical data – “errors” have been more negative than positive.
- The periods of negative growth have coincided with greater relative participation by women (1970s) and older workers (this decade).
- Like Productivity and (later) the Unemployment Rate, we should consider whether this negative tendency will continue based on how we think the LF composition will change in the future.

Compensation Ratio – History

	Low Cost	Intermediate	High Cost
2010 TR	0.00%	0.00%	0.00%
2009 TR	0.00%	0.00%	0.00%
2008 TR	0.00%	0.00%	0.00%
2007 TPAM	0.00%	0.00%	0.00%
2007 TR	0.00%	0.00%	0.00%
2006 TR	0.00%	0.00%	0.00%
2005 TR	0.00%	0.00%	0.00%
2004 TR	0.00%	0.00%	0.00%
2003 TPAM	0.00%	0.00%	0.00%
2003 TR	0.00%	0.00%	0.00%

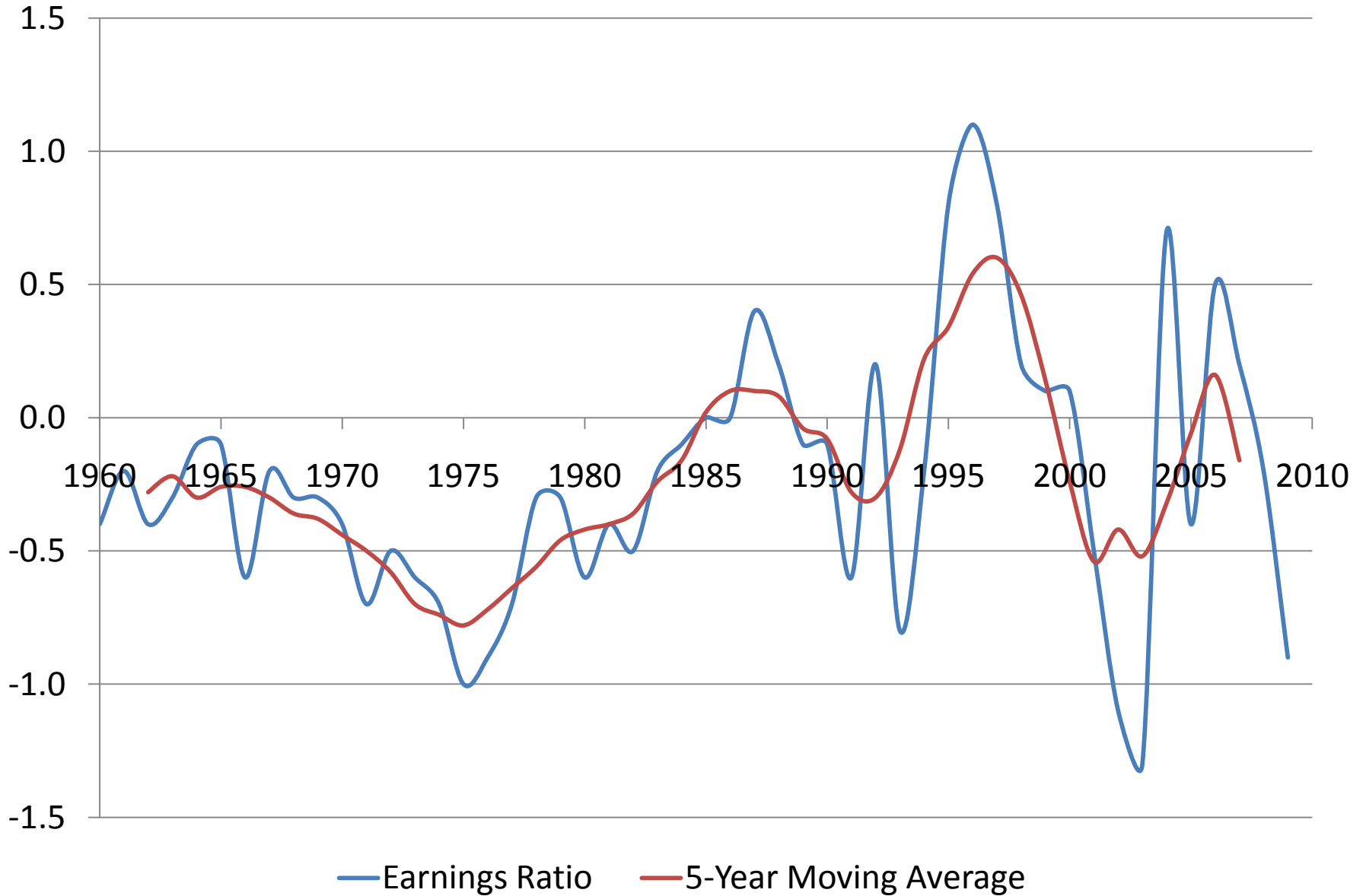
Nothing to see here ... move along.

Earnings Ratio – Projection History

	Low Cost	Intermediate	High Cost
2010 TR	0.00%	-0.10%	-0.20%
2009 TR	-0.10%	-0.20%	-0.30%
2008 TR	-0.10%	-0.20%	-0.30%
2007 TPAM	0.10%	0.00%	-0.20%
2007 TR	-0.10%	-0.20%	-0.30%
2006 TR	-0.10%	-0.20%	-0.30%
2005 TR	-0.10%	-0.20%	-0.30%
2004 TR	-0.10%	-0.20%	-0.30%
2003 TPAM	0.00%	-0.10%	-0.20%
2003 TR	-0.10%	-0.20%	-0.30%

TPAMs recommended higher earnings ratios.

Earnings Ratio -- Annual Percent Change



Earnings Ratio – Issues

- The graph reflects periods we can identify:
 - Early negative period is the rise of pensions.
 - Positive period in the 1990s is the rise of HMOs.
- I am not convinced the central estimate should be zero.
 - Negative periods seem to outweigh positive periods.
 - And I need a detailed explanation of PPACA's impact.

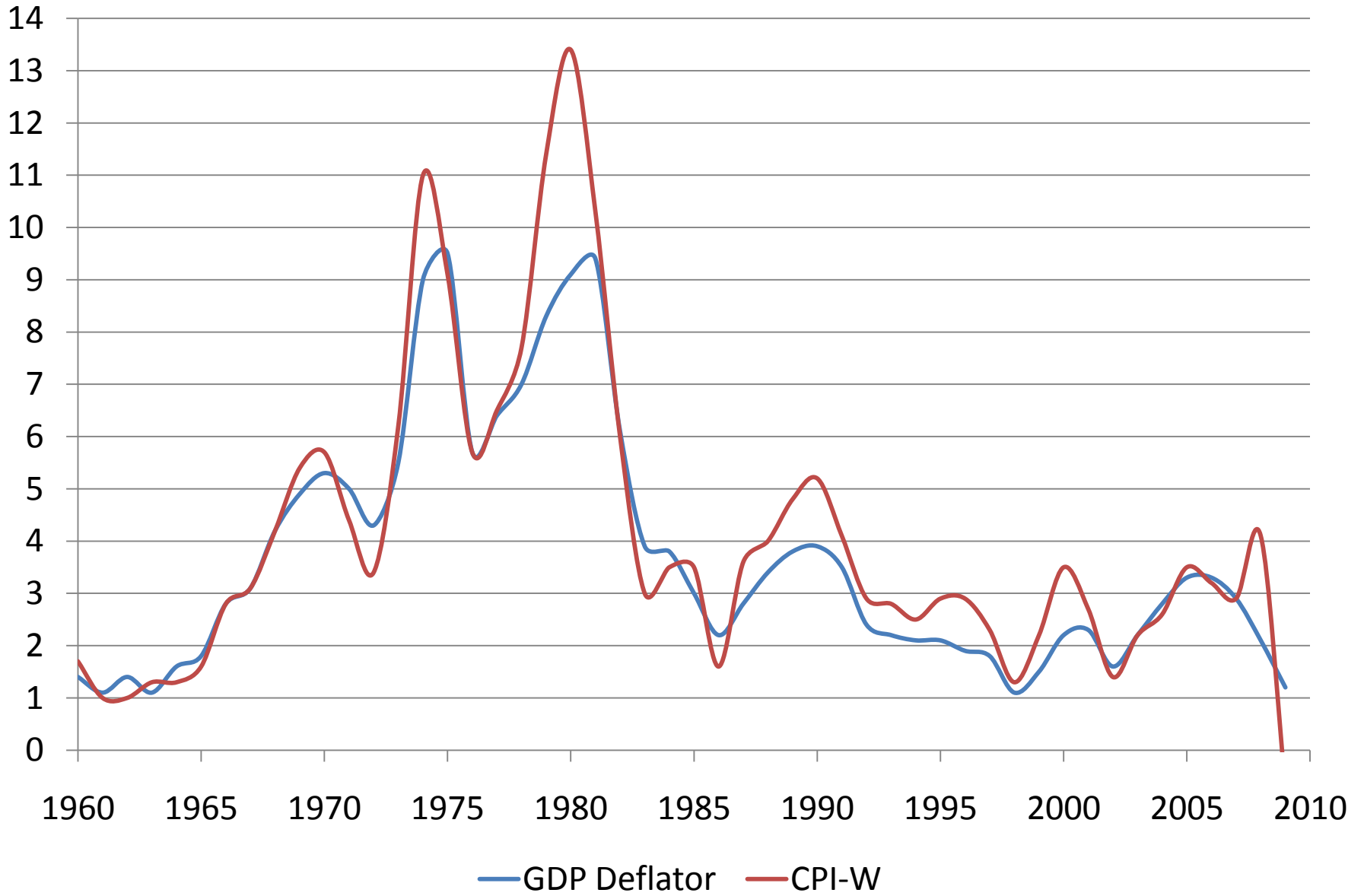
Price Differential – Background

- The differential is relevant because wages grow with PGDP but benefits grow with CPI-W.
- Why Is There a Differential?
 - CPI-W is just consumption, while PGDP is the whole economy. Sensitivity to energy price spikes is an important source of CPI-W volatility.
 - Even within consumption, CPI-W has different weights than the Consumption deflator in PGDP.
 - But most economists think that these differences are likely to be smaller going forward than the -0.4 percent that the Trustees continue to use.

Price Differential – Projection History

	Low Cost	Intermediate	High Cost
2010 TR	-0.30%	-0.40%	-0.50%
2009 TR	-0.30%	-0.40%	-0.50%
2008 TR	-0.40%	-0.40%	-0.40%
2007 TPAM	-0.20%	-0.20%	-0.20%
2007 TR	-0.40%	-0.40%	-0.40%
2006 TR	-0.40%	-0.40%	-0.40%
2005 TR	-0.30%	-0.30%	-0.30%
2004 TR	-0.30%	-0.30%	-0.30%
2003 TPAM	-0.30%	-0.30%	-0.30%
2003 TR	-0.30%	-0.30%	-0.30%

Inflation Comparison -- PGDP vs CPI-W



Price Differential – Issues

- Three of the higher peaks in CPI-W relative to PGDP have been due to energy price shocks.
- Over the last decade, since improvements have been made to CPI-W, the two series have tracked each other well.
- Absent a better argument, I am inclined to agree with prior TPAMs recommending a smaller (i.e. more positive) differential.

Price Inflation – A Separate Issue

- In addition to a smaller differential, past TPAMs have recommended lower levels of inflation.
- There are some forward-looking measures of inflation. A quick look at the spread between nominal Treasury and TIPS yields suggests lower inflation expectations may be warranted.

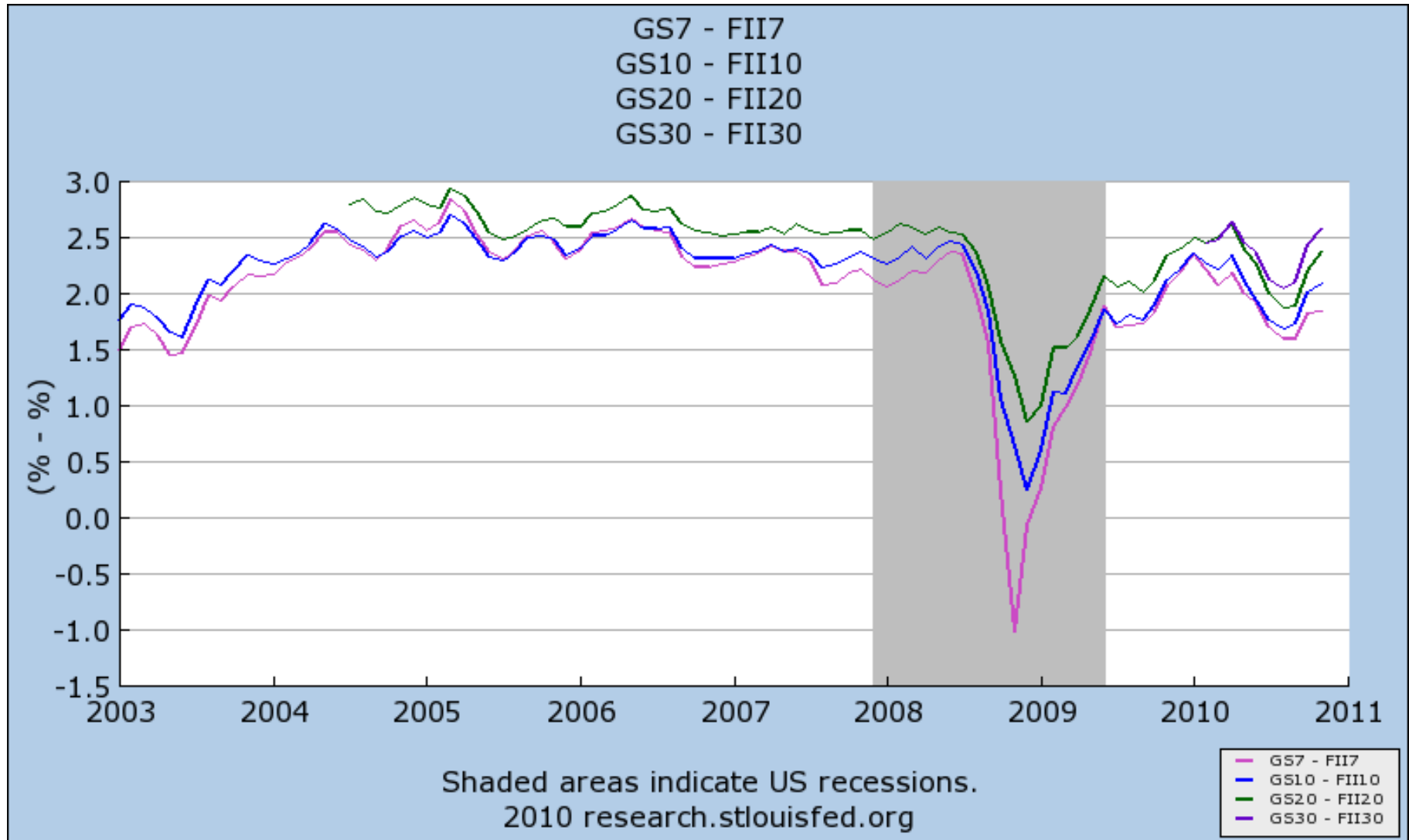
Inflation (CPI-W) – Projection History

	Low Cost	Intermediate	High Cost
2010 TR	1.80%	2.80%	3.80%
2009 TR	1.80%	2.80%	3.80%
2008 TR	1.80%	2.80%	3.80%
2007 TPAM	1.50%	2.50%	3.50%
2007 TR	1.80%	2.80%	3.80%
2006 TR	1.80%	2.80%	3.80%
2005 TR	1.80%	2.80%	3.80%
2004 TR	1.80%	2.80%	3.80%
2003 TPAM	2.00%	2.50%	3.00%
2003 TR	2.00%	3.00%	4.00%

Inflation (PGDP) – Projection History

	Low Cost	Intermediate	High Cost
2010 TR	1.50%	2.40%	3.30%
2009 TR	1.50%	2.40%	3.30%
2008 TR	1.40%	2.40%	3.40%
2007 TPAM	1.30%	2.30%	3.30%
2007 TR	1.40%	2.40%	3.40%
2006 TR	1.40%	2.40%	3.40%
2005 TR	1.50%	2.50%	3.50%
2004 TR	1.50%	2.50%	3.50%
2003 TPAM	1.70%	2.20%	2.70%
2003 TR	1.70%	2.70%	3.70%

Expected Inflation from TIPS Spreads



Price Inflation – Issues

- The TIPS market allows investors to reveal their beliefs about CPI inflation.
- Those beliefs currently put 7-year (30-year) inflation at 1.85% (2.58%), which is much lower than CPI inflation in the TR but comparable to the recommendation from TPAM 2007.
- The TIPS market is not as large or liquid as the market for nominal Treasury bonds.
- But other than the financial crisis, these expectations have been fairly stable.

Price Inflation – Sensitivity

Table VI.D5.—Sensitivity to Varying CPI-Increase Assumptions
 [As a percentage of taxable payroll]

Valuation period	Ultimate percentage increase in wages-CPI ^{a b}		
	3.0-1.8	4.0-2.8	5.0-3.8
Summarized income rate:			
25-year: 2010-34	15.03	14.99	14.94
50-year: 2010-59	14.27	14.23	14.20
75-year: 2010-84	14.04	14.01	13.98
Summarized cost rate:			
25-year: 2010-34	15.39	15.23	15.06
50-year: 2010-59	15.89	15.68	15.46
75-year: 2010-84	16.15	15.93	15.68
Actuarial balance:			
25-year: 2010-34	-.36	-.25	-.12
50-year: 2010-59	-1.62	-1.45	-1.26
75-year: 2010-84	-2.12	-1.92	-1.71
Annual balance for 2084	-4.39	-4.12	-3.82
Year of combined trust fund exhaustion	2036	2037	2039

Real Interest Rate – Projection History

	Low Cost	Intermediate	High Cost
2010 TR	3.60%	2.90%	2.10%
2009 TR	3.60%	2.90%	2.10%
2008 TR	3.60%	2.90%	2.10%
2007 TPAM	3.30%	2.60%	1.80%
2007 TR	3.60%	2.90%	2.10%
2006 TR	3.60%	2.90%	2.10%
2005 TR	3.70%	3.00%	2.20%
2004 TR	3.70%	3.00%	2.20%
2003 TPAM	3.70%	3.00%	2.50%
2003 TR	3.70%	3.00%	2.20%

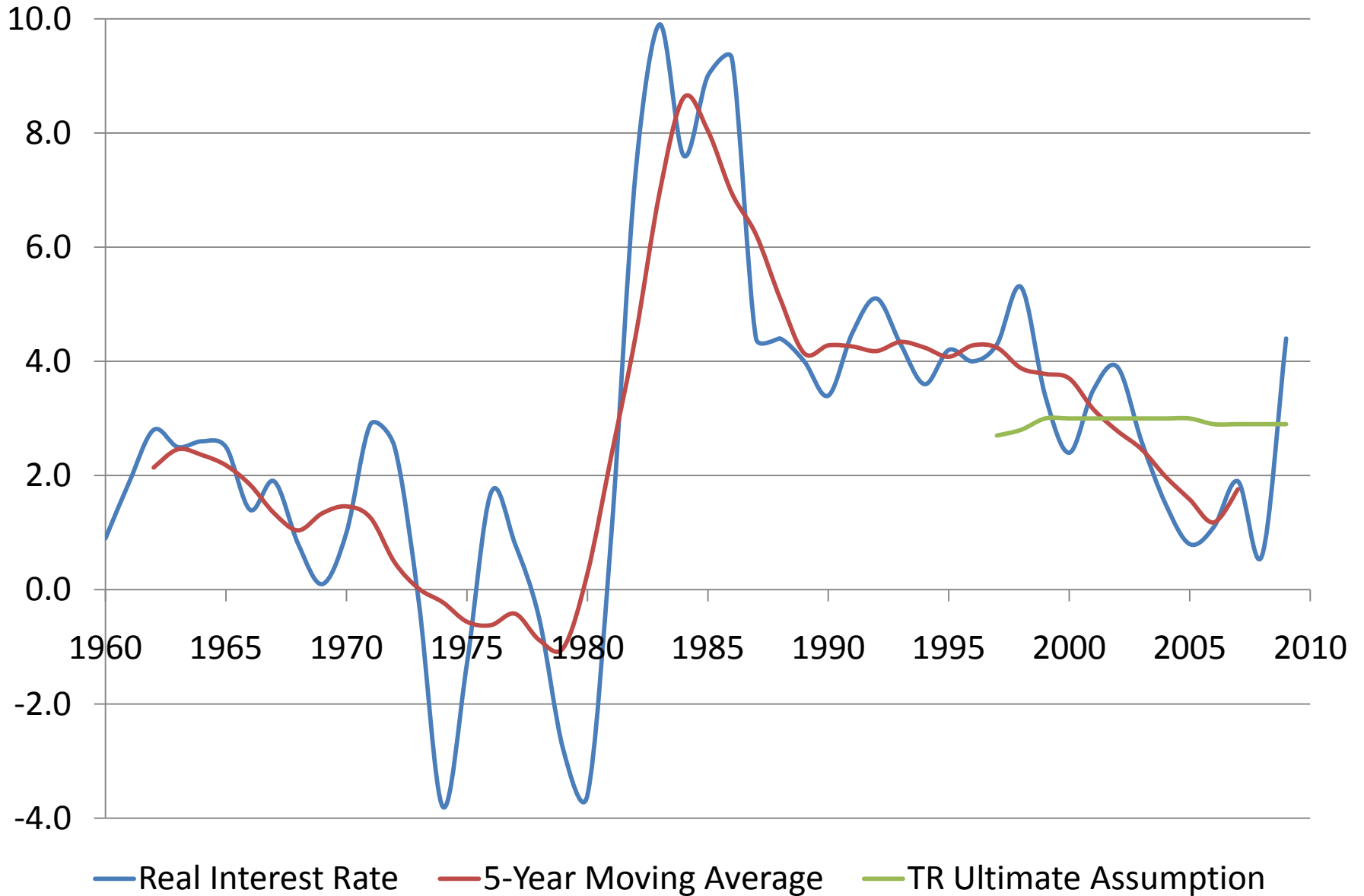
TPAM 2007 recommended lower interest rates.

Real Interest Rate – Sensitivity

Table VI.D6.—Sensitivity to Varying Real-Interest Assumptions
 [As a percentage of taxable payroll]

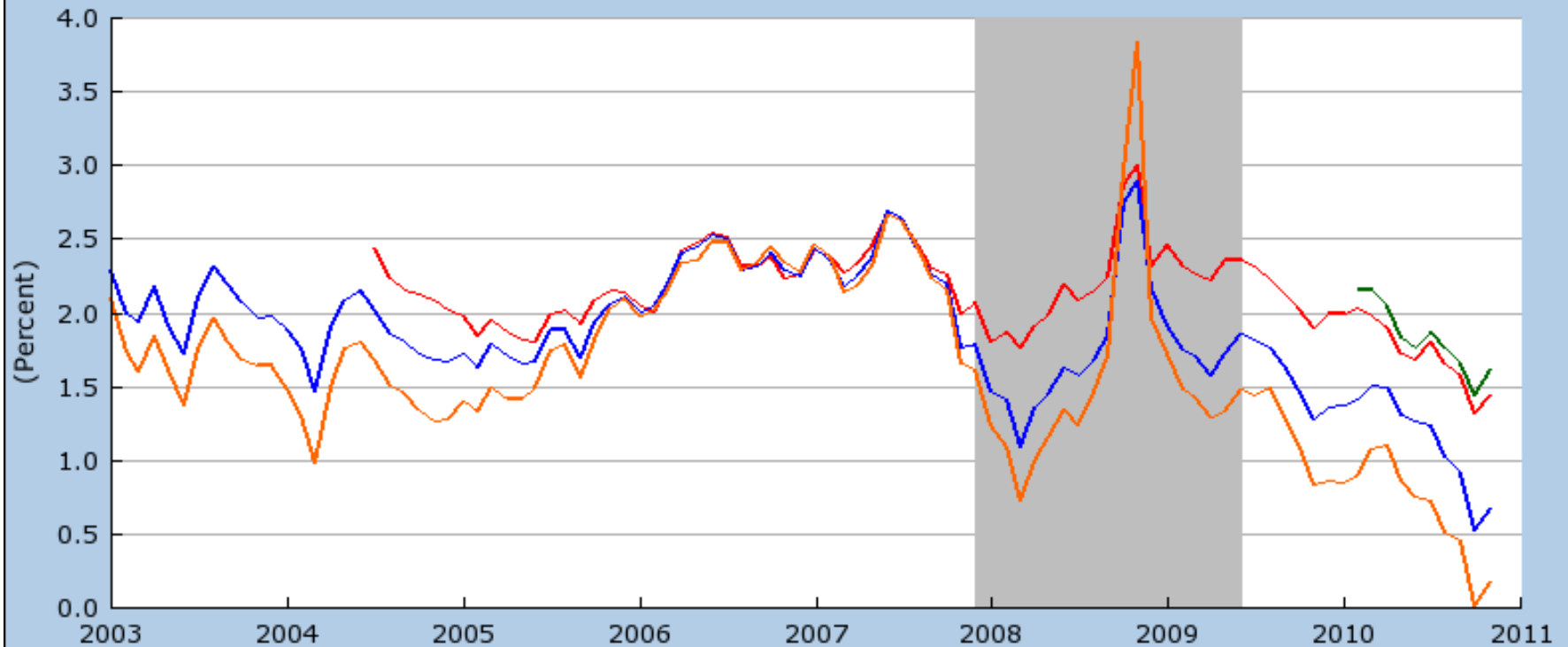
Valuation period	Ultimate annual real interest rate ^{a b}		
	2.1 percent	2.9 percent	3.6 percent
Summarized income rate:			
25-year: 2010-34	14.87	14.99	15.08
50-year: 2010-59	14.09	14.23	14.36
75-year: 2010-84	13.85	14.01	14.15
Summarized cost rate:			
25-year: 2010-34	15.36	15.23	15.12
50-year: 2010-59	15.86	15.68	15.53
75-year: 2010-84	16.16	15.93	15.74
Actuarial balance:			
25-year: 2010-34	-.49	-.25	-.04
50-year: 2010-59	-1.77	-1.45	-1.17
75-year: 2010-84	-2.30	-1.92	-1.58
Annual balance for 2084	-4.12	-4.12	-4.12
Year of combined trust fund exhaustion	2036	2037	2039

Annual Trust Fund Real Interest Rate



TIPS Yields

30-Year Treasury Inflation-Indexed Security, Constant Maturity (FII30)
20-Year Treasury Inflation-Indexed Security, Constant Maturity (FII20)
10-Year Treasury Inflation-Indexed Security, Constant Maturity (FII10)
7-Year Treasury Inflation-Indexed Security, Constant Maturity (FII7)



Shaded areas indicate US recessions.
2010 research.stlouisfed.org



Real Interest Rate – Issues

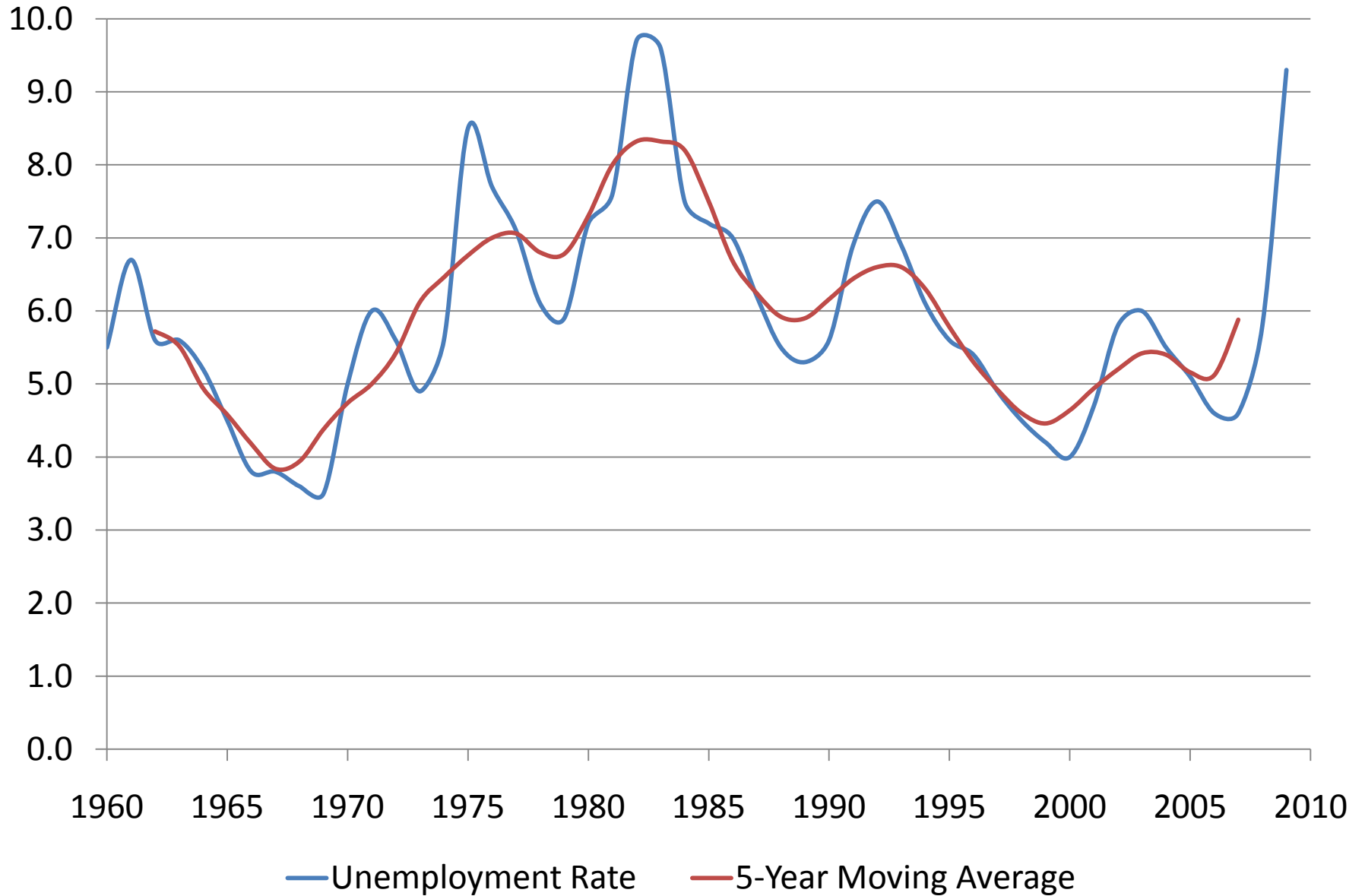
- As with the TIPS spread and expected inflation, TIPS yields suggest much lower interest rates over the next 3 decades.
- Absent a better argument, I am inclined to agree with prior TPAMs recommending a lower real interest rate (e.g., TPAM 2007's 2.6%).

Unemployment – Projection History

	Low Cost	Intermediate	High Cost
2010 TR	4.50%	5.50%	6.50%
2009 TR	4.50%	5.50%	6.50%
2008 TR	4.50%	5.50%	6.50%
2007 TPAM	4.50%	5.50%	6.50%
2007 TR	4.50%	5.50%	6.50%
2006 TR	4.50%	5.50%	6.50%
2005 TR	4.50%	5.50%	6.50%
2004 TR	4.50%	5.50%	6.50%
2003 TPAM	4.50%	5.50%	6.50%
2003 TR	4.50%	5.50%	6.50%

Trustees and TPAMs don't disagree.

Unemployment Rate



Unemployment Rate – Issues

- The ultimate assumption has not changed at all.
- The risk is that 5.5% is too low.
 - It is lower than the historical average but higher than the recent average.
 - It will be driven up in the future if the labor force starts to include more marginally attached people (possibly, older workers not dependent on ER sponsored health insurance).
 - We might revisit this when we discuss LFP.
- We should also discuss the way the UR operates in the stochastic model.

Conclusions

- On the Real Wage Differential, I could see:
 - Productivity staying the same.
 - The Earnings Ratio decreasing by 0.1%.
 - Hours Worked decreasing by 0.1%.
 - The Price Differential increasing by 0.2%.
 - So possibly no change to the RWD.
- I believe that real interest rates and both inflation measures should be lower.
- We can revisit Hours and Unemployment when we consider Labor Force participation.