Macroeconomic modeling and policy analysis after the financial crisis: A Proposal

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What's right with macroeconomics?

Much Criticism of Modern Macroeconomics

- Media & other commentators criticize macroeconomists
  - for failing to predict the crisis and great recession, or for failing to provide adequate warning of the risk of such a receession.

- A particular modeling paradigm popular in academia, central banks and international institutions is often blamed:
  - Dynamic stochastic general equilibrium modeling.

ft.com/maverecon

Willem Buiter's Blog: March 3, 2009

… the typical graduate macroeconomics and monetary economics training received at Anglo-American universities during the past 30 years or so, may have set back by decades serious investigations of aggregate economic behaviour and economic policy-relevant understanding. It was a privately and socially costly waste of time and other resources.

From Buiter's blog to Krugman's lecture


Paul Krugman's London lectures

Dismal science

The Nobel laureate speaks on the crisis in the economy and in economics

Jun 11th 2009

… if zero interest rates cannot get consumers to spend, then governments must spend instead. That remedy comes from economics so the discipline is not without merit. The trouble is, "the analysis we're using is decades old". It dates back to Keynes, one of the few economists whose reputation has been burnished by the crisis.

Most work in macro-economics in the past 30 years has been useless at best and harmful at worst, said Mr **Krugman**.
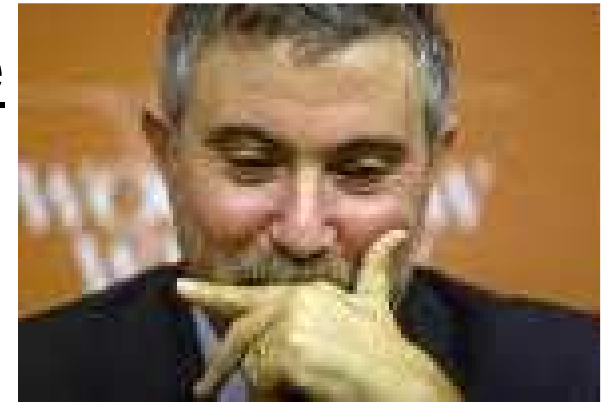
This Paper

… a more constructive proposal:

    1. Systematic comparative approach to macroeconomic modeling.

    2. Model competition with regard to fitting empirical benchmarks

    3. Aim to identify policy recommendations that are robust to model uncertainty

..in the spirit of ..

AER 1992:

> … leading economists – among them Nobel prize winners Paul Samuelson and Franco Modigliani – warned of the danger of an ‚intellectual monopoly´ in economics and demanded a `pluralistic spirit in economic science that respects different approaches and encourages critical and tolerant dialogue´,

The model comparison approach is open to new entrants i.e. non-mainstream models, …

1. Systematic approach to model comparison

- Many models, few comparisons, why?
  - The standard approach to model comparison is cumbersome and requires a lot of resources, multiple researcher teams, each working only with its own model, multiple meetings, limited set of exercises.
    - Brookings Institution: 1988-89-93, Bryant, Currie, Frenkel, Masson, Portes, (eds.) (1989), Bryant, Hooper, Mann (eds) (1993). (Taylor rule!)
    - NBER: Taylor (ed.) (1999)
    - IMF: Coenen et al (2010), 17 authors, 7 models.

New approach to model comparison

Wieland, Cwik, Müller, Schmidt, Wolters (2010).

1. Formal exposition of comparative approach (augment models with common policy rules and common, comparative variables).

2. A macroeconomic model archive. http://www.macromodelbase.com.

3. A computational platform (Matlab,Dynare) that allows individual researchers to conduct comparisons relatively easily, frequently and on a large scale.

Macroeconomic Model Database

1. SMALL CALIBRATED MODELS

1.1	NK_RW97	Rotemberg and Woodford (1997)
1.2	NK_LWW03	Levin et al. (2003)
1.3	NK_CGG99	Clarida et al. (1999)
1.4	NK_CGG02	Clarida et al. (2002)
1.5	NK_MCN99cr	McCallum and Nelson (1999), (Calvo-Rotemberg model)
1.6	NK_IR04	Ireland (2004)
1.7	NK_BGG99	Bernanke et al. (1999)
1.8	NK_GM05	Gali and Monacelli (2005)

2. ESTIMATED US MODELS

2.1	US_FM95	Fuhrer and Moore (1995)
2.2	US_OW98	Orphanides and Wieland (1998) equivalent to MSR model in Levin et al. (20(
2.3	US_FRB03	Federal Reserve Board model linearized as in Levin et al. (2003)
2.4	US_FRB08	linearized by Laubach (2008)
2.5	US_FRB08mx	linearized by Laubach (2008), (mixed expectations)
2.6	US_SW07	Smets and Wouters (2007)
2.7	US_ACELm	Altig et al. (2005), (monetary policy shock)
	US_ACELt	Altig et al. (2005), (technology shocks)
	US_ACELswm	no cost channel as in Taylor and Wieland (2009) (mon. pol. shock)
	US_ACELswt	no cost channel as in Taylor and Wieland (2009) (tech. shocks)
2.8	US_NFED08	based on Edge et al. (2007), version used for estimation in
		Wieland and Wolters (2010)
2.9	US_RS99	Rudebusch and Svensson (1999)
2.10	US_OR03	Orphanides (2003)

2.11	US_PM08	IMF projection model US, Carabenciov et al. (2008)
2.12	US_PM08fl	IMF projection model US (financial linkages), Carabenciov et al. (2008)
2.13	US_DG08	DeGraeve (2008)
2.14	US_CD08	Christensen and Dib (2008)
2.15	US_IAC05	Iacoviello (2005)
2.16	US_MR07	Mankiw and Reis (2007)

3. ESTIMATED EURO AREA MODELS

3.1	EA_CW05ta	Coenen and Wieland (2005), (Taylor-staggered contracts)
3.2	EA_CW05fm	Coenen and Wieland (2005), (Fuhrer-Moore-staggered contracts)
3.3	EA_AWM05	ECB's area-wide model linearized as in Dieppe et al. (2005)
3.4	EA_SW03	Smets and Wouters (2003)
3.5	EA_SR07	Sveriges Riksbank euro area model of Adolfson et al. (2007)
3.6	EA_QUEST3	QUEST III Euro Area Model of the DG-ECFIN EU, Ratto et al. (2009)

4. Estimated/Calibrated Multi-Country Models

4.1	G7_TAY93	Taylor (1993b) model of G7 economies
4.2	G3_CW03	Coenen and Wieland (2002) model of USA, Euro Area and Japan
4.3	EACZ_GEM03	Laxton and Pesenti (2003) model calibrated to Euro Area and Czech r
4.4	G2_SIGMA08	The Federal Reserve's SIGMA model from Erceg et al. (2008) calibrated to the U.S. economy and a symmetric twin.
4.5	EAUS_NAWM08	Coenen et al. (2008), New Area Wide model of Euro Area and USA

5. Estimated Models of Small Open Economies

5.1	CL_MS07	Medina and Soto (2007), model of the Chilean economy
5.2	CA_ToTEM10	ToTEM model of Canada, based on Murchison and Rennison (2006), 2010 vintage
5.3	BRA_SAMBA08	Gouvea et al. (2008), model of the Brazilian economy

Trichet, Nov 18, 2010: We need macroeconomic and financial models …

… to discipline and structure our judgemental analysis.

- Policymakers need to have input from various theoretical perspectives and from a range of empirical approaches.

- Open debate and a diversity of views must be cultivated - admittedly not always an easy task in an institution such as a central bank.

- We do not need to throw out our DSGE and asset-pricing models: rather we need to develop complementary tools to improve the robustness of our overall framework.

New entrants for model comparison

1. DSGE models with fragile banking and financial sector.

2. Deviations from rational expectations:
   – learning, heterogeneous beliefs.

3. Deviations from optimizing behavior:
   – behavioral macro-models incorporating lessons from psychology,
   – Agent-based models.

2. Model competition and empirical benchmarks: An example

- Wieland&Wolters (2010),
  - Systematic evaluation of forecasting performance of 5 macro models, a Bayesian VAR and the experts from the Survey of Professional Forecasters.
  - Focus on last 5 U.S. recession and recovery periods.
  - Models are re-estimated every quarter based on historical, real-time data vintages to ensure comparability to experts in real time.
  - Nowcast is identical across models and experts.

Models

4 models using output, inflation and interest rates:

    BVAR-WW: Bayesian VAR

    NK-WW, NK-DS: 2 versions of simple New-Keynesian DSGE model a la Rotemberg-Woodford

    NK-Fu: earlier-vintage New-Keynesian model of Fuhrer (1997).

2 larger New-Keynesian DSGE models (7 and 11 variables).

    CEE-SW: medium-size DSGE model a la Christiano, Eichenbaum, Evans – Smets-Wouters.

    FRB-EDO: Federal Reserve's new U.S. DSGE model.

Figure 1: Real output growth forecasts during the 2007-2009 recession
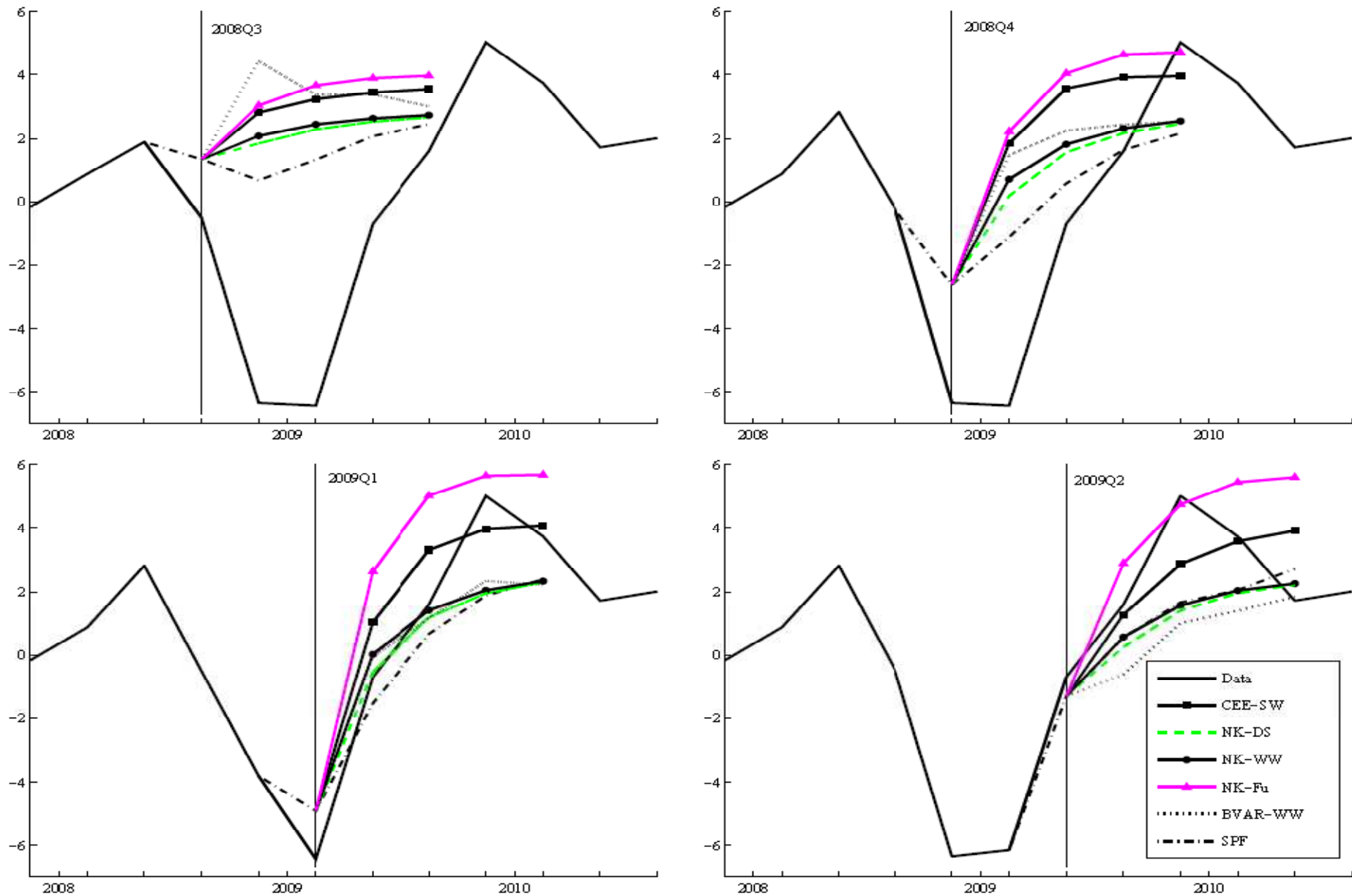
Figure 1: Real output growth forecasts during the 2007-2009 recession

Table 2: RMSEs of Output Growth Forecasts Initialized with Expert Nowcasts

Sample / Horizon	NK-DS	NK-WW	CEE-SW	FRB-EDO	NK-Fu	BVAR-WW	Mean	GB	SPF
1980:1 - 1981:3									
0	5.05	5.05	5.05	5.05	5.05	5.05	5.05	5.05	–
1	8.14	8.13	6.33	6.06	7.18	6.69	5.83	6.65	–
2	6.34	6.36	4.80	5.60	6.48	6.48	4.83	5.54	–
3	5.50	5.74	5.20	5.37	6.49	7.74	5.20	6.11	–
4	5.56	5.75	4.23	4.24	4.12	5.50	4.05	5.32	–
1981:4 - 1983:4									
0	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.14
1	4.28	4.50	3.74	3.27	3.80	3.23	3.54	3.58	3.88
2	3.99	4.05	4.22	4.09	3.98	4.09	3.86	3.93	4.11
3	4.14	4.23	4.05	4.52	4.64	4.87	4.25	3.91	4.41
4	4.08	4.11	4.07	4.67	4.73	4.89	4.28	3.84	4.02
1990:1 - 1992:1									
0	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.12
1	2.64	2.87	3.22	1.70	3.11	2.00	2.47	2.09	1.45
2	2.95	3.04	3.80	1.92	3.68	2.28	2.82	2.34	2.06
3	3.08	3.13	3.78	2.42	3.67	2.55	2.94	2.31	2.54
4	2.71	2.76	3.65	2.16	3.48	2.29	2.69	2.18	2.37

Table 2: RMSEs of Output Growth Forecasts Initialized with Expert Nowcasts

Sample / Horizon	NK-DS	NK-WW	CEE-SW	FRB-EDO	NK-Fu	BVAR-WW	Mean	GB	SPF
1990:1 - 1992:1									
0	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.12
1	2.64	2.87	3.22	1.70	3.11	2.00	2.47	2.09	1.45
2	2.95	3.04	3.80	1.92	3.68	2.28	2.82	2.34	2.06
3	3.08	3.13	3.78	2.42	3.67	2.55	2.94	2.31	2.54
4	2.71	2.76	3.65	2.16	3.48	2.29	2.69	2.18	2.37
2000:4 - 2002:4									
0	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.28	2.22
1	2.17	2.15	2.31	2.84	2.06	2.48	2.23	2.20	2.30
2	2.09	2.10	2.11	2.61	2.35	1.98	2.11	2.34	2.21
3	2.74	2.72	2.68	2.98	2.51	2.66	2.65	2.76	2.65
4	2.25	2.26	2.08	2.40	2.24	2.30	2.19	2.18	2.13
2007:4 - 2009:3									
0	1.94	1.94	1.94	–	1.94	1.94	1.94	–	1.94
1	3.74	3.90	4.24	–	4.54	4.85	4.21	–	3.30
2	4.52	4.62	4.94	–	5.48	5.10	4.89	–	4.11
3	5.05	5.11	5.39	–	5.83	5.27	5.32	–	4.80
4	5.50	5.52	5.86	–	6.07	5.57	5.70	–	5.39

Summary

- Models <u>and</u> experts miss the onset of recessions (models treat them as shocks), and have difficulty predicting their duration.

- Reasonably useful performance regarding the speed of the return to normality, once it has started.

- Models beat mean SPF forecast at several occasions. Mean-model forecast compares well to mean SPF at 3-4 quarter horizon.

3. Policy robustness under model uncertainty: Fiscal stimulus

- **Romer-Bernstein (January 2009)**
  - Use average of models from business consultancies and a version of the Fed's model and project …
  - the American Recovery and Reinvestment Act (ARRA) will generate **3.6 percent more GDP by 2010Q4** (over baseline forecast without ARRA).

Robustness checks based on model comparison:
  - Cogan, Cwik, Taylor, Wieland (Feb 2009). (CCTW)
  - Cwik, Wieland (Aug 2009) on euro area stimulus. (CW)
  - Coenen et al (2010), IMF, U.S. and euro area models. (COE-AL).

Robustness checks

CCTW:

– Taylor (1993) multi-country model (earlier vintage New-Keynesian model).

– Smets-Wouters' (2007) U.S. version of Christiano-Eichenbaum-Evans (2005) style DSGE model.

– DSGE model with liquidity-constrained households (breaks strict permanent-income hypothesis and Ricardian equivalence, estimate: 26.5 percent).

– Anticipation of 1 to 2 years of constant rates at the zero bound because central bank has a negative notional target for the funds rate.

Robustness Check

- CCTW: around 1/6 to 1/4 of the GDP effect projected by Romer-Bernstein.

  – Crowding-out of private sector consumption and investment due to higher expected taxes and higher expected interest rates in the future.

- CW: Euro area stimulus.

  – 5 models: Taylor (1993), Smets-Wouters (2003), IMF-GEM-Laxton-Pesenti (2003), EU Commission QUEST model for fiscal policy, ECB's area-wide model.

GDP Effect of Gov. Spending CCTW and CW:

US ARRA   €-Zone Recovery Plan
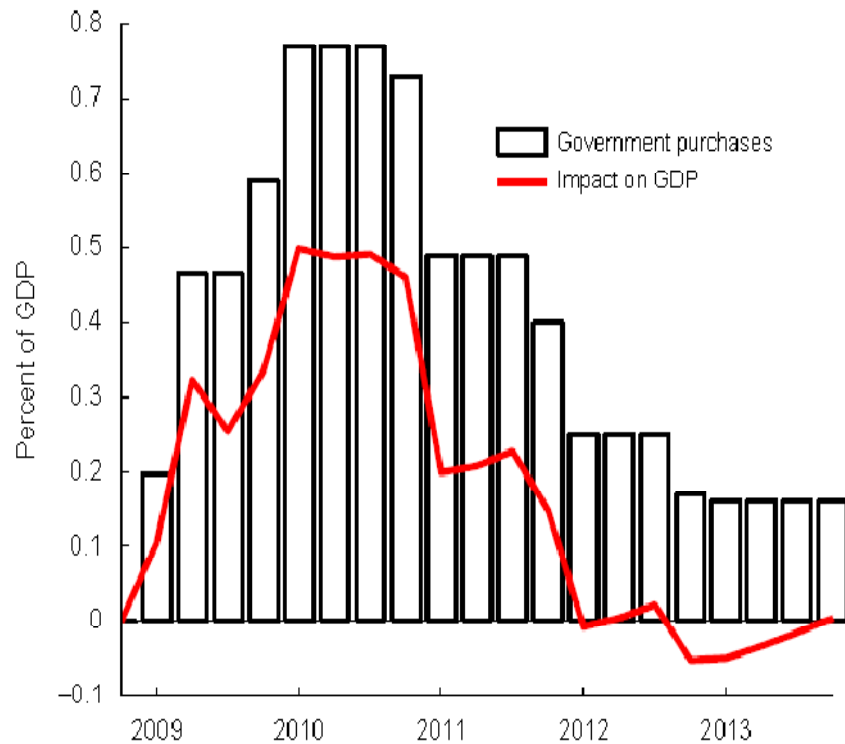
CCTW, (Feb 09 WP, JEDC, March 2010), SW Modell.
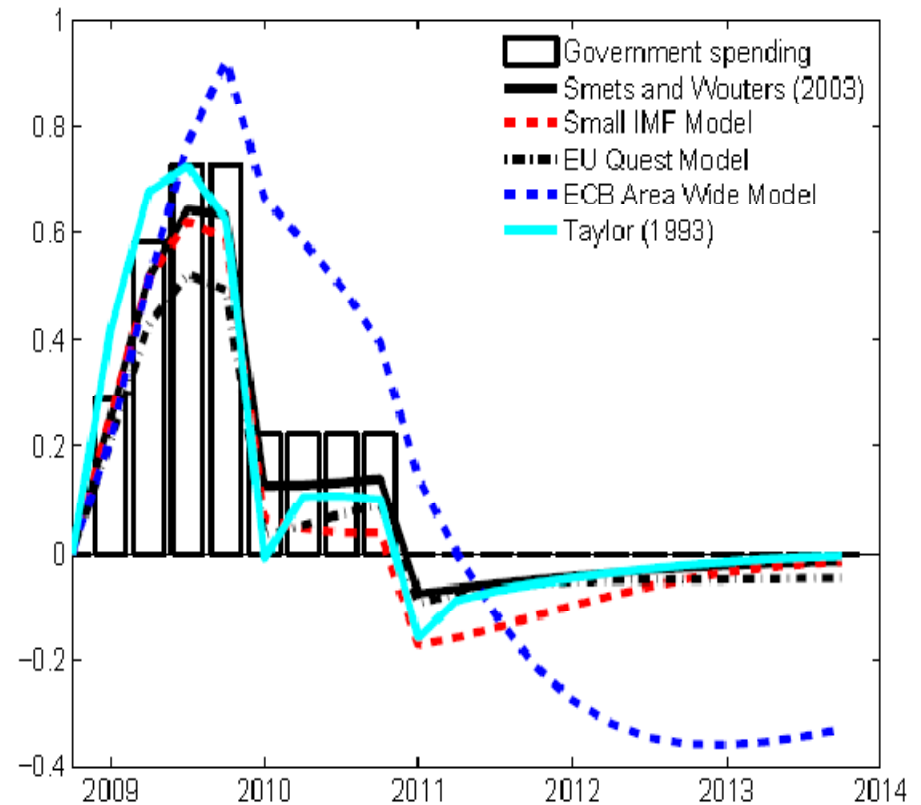
CW (8/09 WP), 4 Neu-Keynes'iansche Modelle + 1 traditionelles.

CCTW: ARRA (extension with liquidity-constrained households)
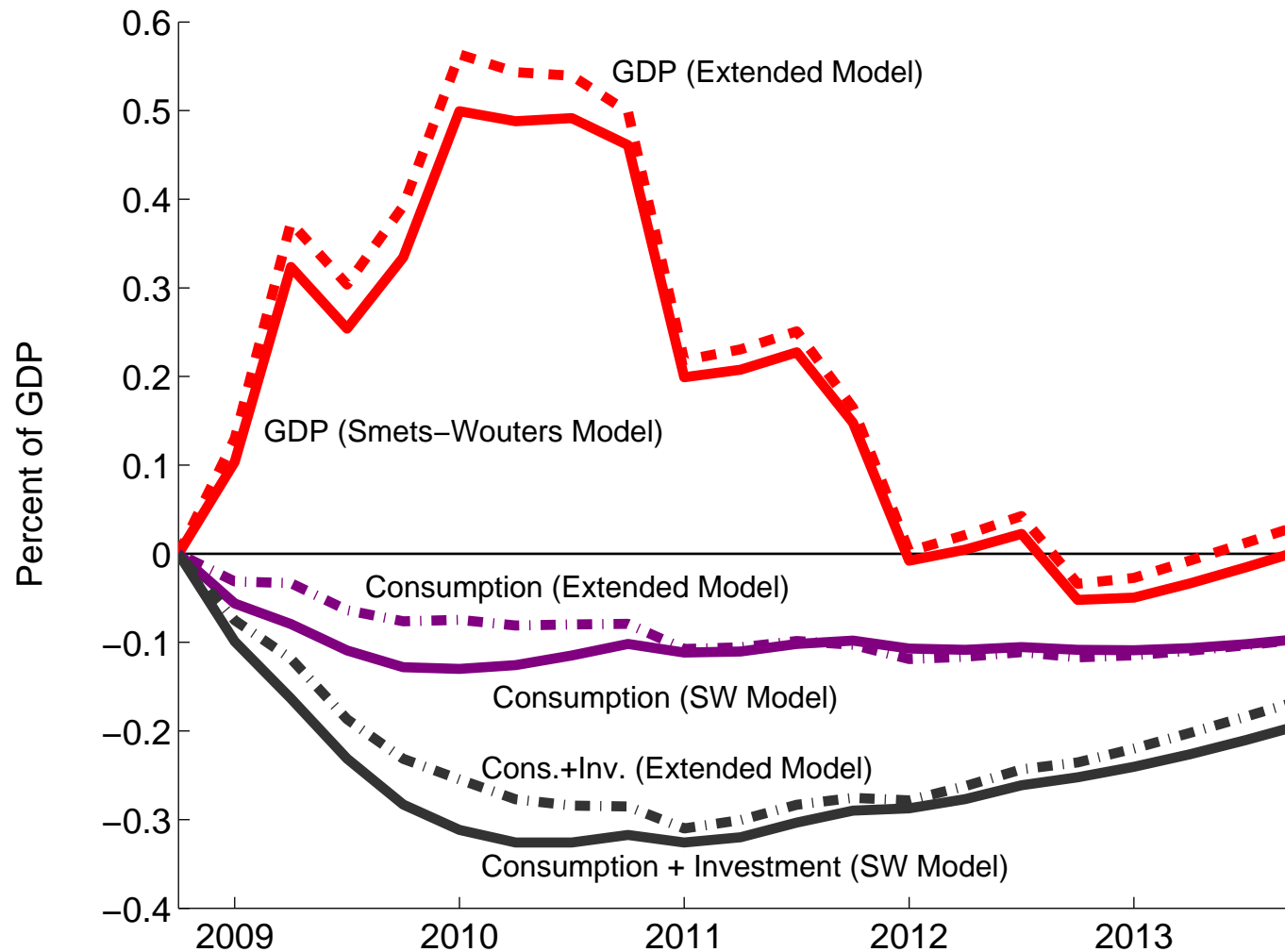
CW: Zero Bound Effects

Constant rates in 2009
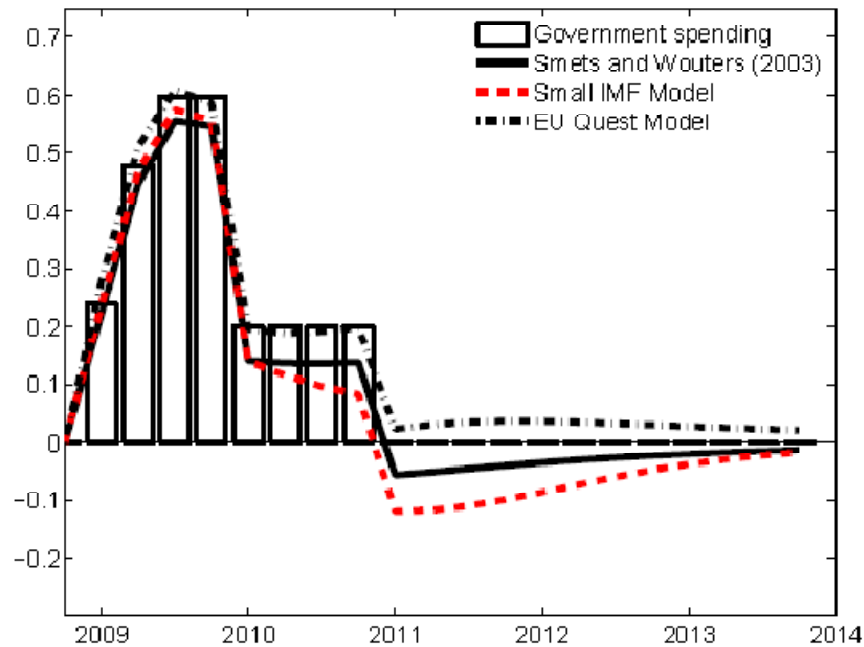
Constant rates in 2009 and 2010
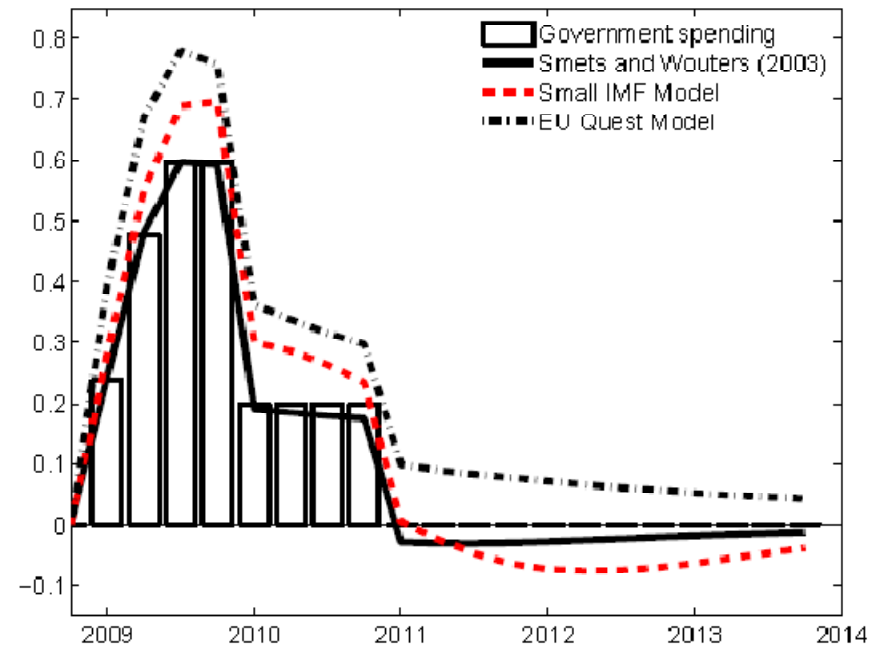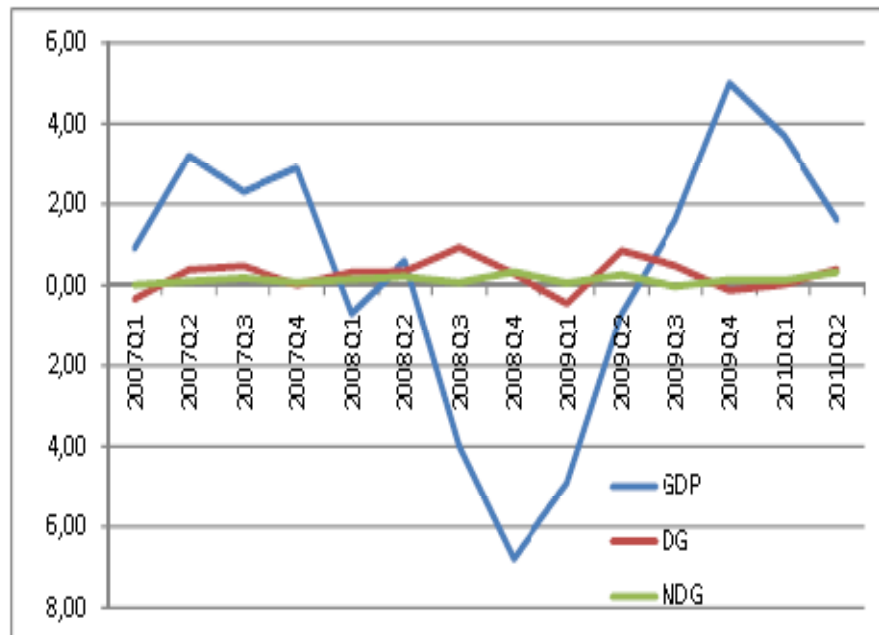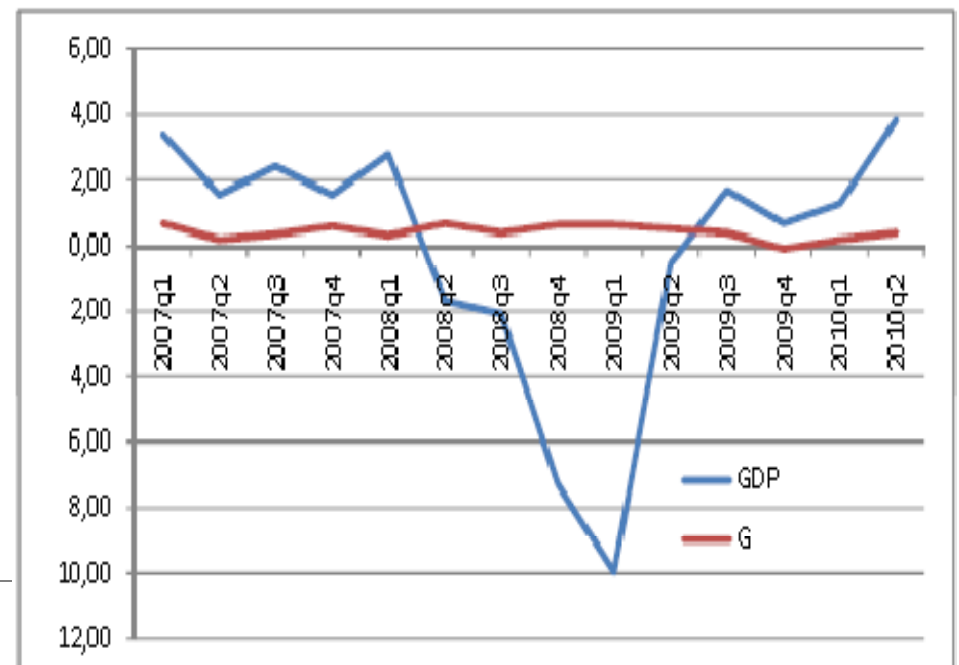
CW: Implementation lags and anticipation effects
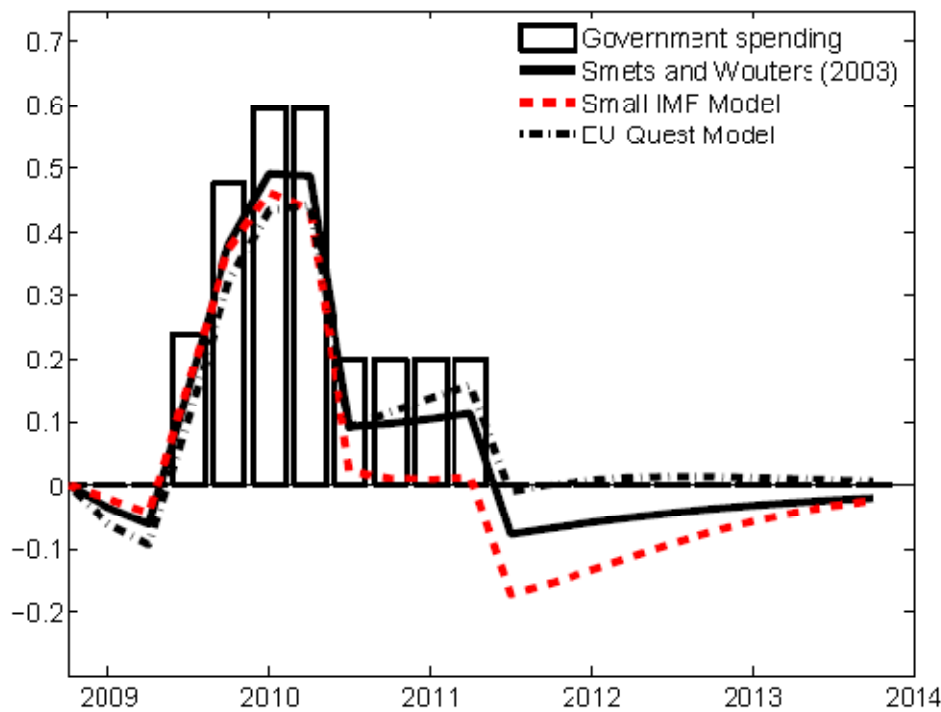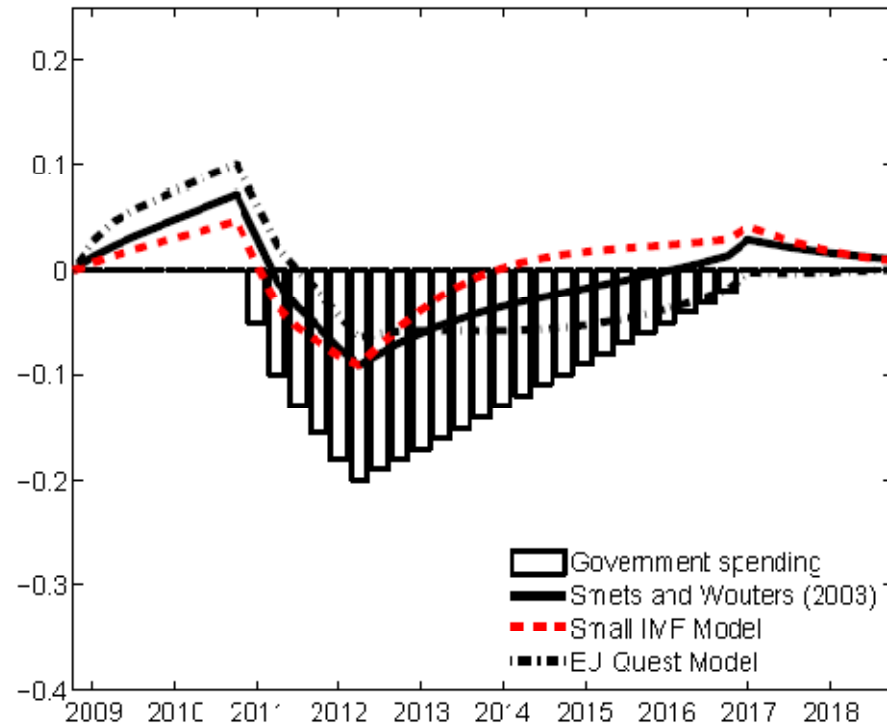
Gov. Spending: What Happened?

- ARRA: According to Cogan-Taylor (2010) only 2% went to spending. Funds transfered to states were used for transfers or borrowing reduction.

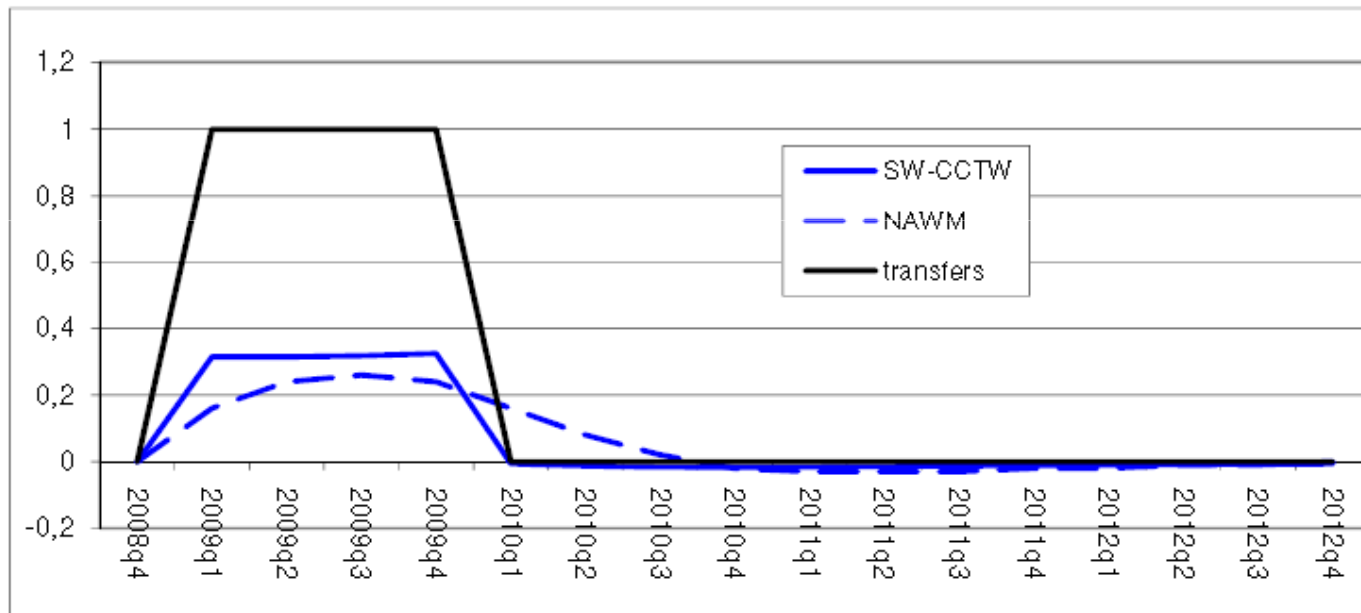- What can be seen from aggregate data?

U.S. Gov. spending vs GDP

Euro area Gov. Spending vs GDP

GDP effect of transfers

- 1 Percent of GDP increase in transfers for 1 year
  - SW-CCTW: 26.5 % l.c. households,
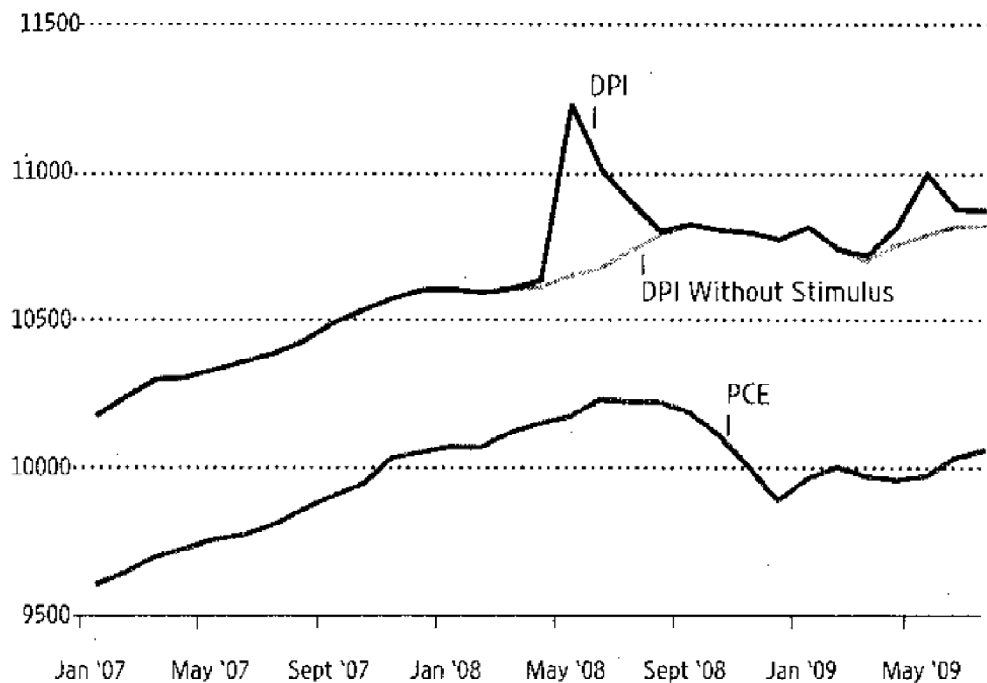 - NAWM , 25% l.c. households

- Coenen et al (2010) greater effects, 40-50% l.c. households.

U.S. Tax Rebates and Consumption: „PIH?"

Rebates Fail to Jump-Start Consumption

(DPI = disposable personal income; PCE = personal consumption expenditures)

Source: The authors

- Source: Cogan, Taylor, Wieland (2009)

- Survey evidence from Sahm, Shapiro, Slemrod (2010): 25% (2008) and 13% (2009) of households spent the funds.

- Also supportive German survey evidence.

Conclusions

… a more constructive proposal:

1. Systematic comparative approach to macroeconomic modeling.

2. Model competition with regard to fitting empirical benchmarks

3. Aim to identify policy recommendations that are robust to model uncertainty