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## TO THE ABYSS AND BEYOND

**Abstract.** Life cycle hypothesis and Solow neo-classical growth concepts are used to construct and estimate VAR models of USA's GDP dynamics. Conditional forecasts are then made for those two variables for the next two years, using different assumptions regarding the future dynamics of the household's net worth. Results show that under all assumptions the US GDP growth remains sluggish. The historical peak GDP level (achieved in Q2 from 2008) is not achieved by the Q1 of 2011.

**Key words:** Life Cycle Hypothesis, VAR models, conditional forecasts, GDP growth.

### 1. INTRODUCTION

The goal of this paper is to construct a simple model which a) will explain the basic dynamics of the US economy in the last decade; and b) will facilitate the construction of forecasting alternatives for the next 2 years.

The underlying intellectual premise is the Lifecycle Hypothesis (LCH) – that is that individuals choose their consumption-savings behavior by maximizing their intertemporal utility from the lifetime consumption. They live in two periods – work and retirement. During the work period they generate income. Part of this income is consumed and part is saved in the form of assets (wealth) accumulation. In the retirement period (when they have no income) they finance their consumption by dis-accumulating their assets (wealth). (Jalappelli and Modigliani, 1998).

Obviously, there is a trade-off between the current (working) and future (retirement) consumption. In a stable economy (the standard rational expectations model) an asset accumulation is the function of savings (i.e. the savings rate). An increase in the current consumption would imply lower savings, a lower asset accumulation and hence a lower future consumption – and indeed vice versa. The implication is that in the long run (when economy tends toward an equilibrium) both the consumption as the share of GDP and the personal savings rate should be stable, reflecting the equalization of marginal utilities of current and future consumptions.

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The logic of the “rational expectations” LCH remains basically unchanged if an additional assumption is introduced, namely that individuals have a “target value” for their wealth (asset accumulation) at the point of retirement. (This follows from sociological and biological considerations affecting consumption behavior of ageing populations). That is, as long as individuals can predict the future path of their income and assets accumulations (that is the “rational expectations” hypothesis), their relative consumption-savings decisions (propensities to consume and save – stemming from intertemporal utility maximizations ) will remain stable over time.

This approach is behind the basic assumption of the macroeconomic modeling, namely that private consumption is the function of the income and wealth (which itself is the function of savings – i.e. the past income dynamics). In a dynamic sense, dynamics of income determines the dynamics of consumption and asset accumulation, with at best a limited feedback.

## **2. THE IMPACT OF GLOBALIZATION AND FINANCIAL INNOVATIONS**

The dynamics of LCH changes if we allow for a possibility of an exogenous dynamics in individual wealth (i.e. the market value of individual assets). If the asset values start to increase exogenously over and above the previously expected path given by the original consumption-savings decisions, the marginal utility of a future consumption (which depends on the accumulated assets) decreases (because with higher wealth, the future consumption can increase). To maintain the individually rational equilibrium (the equality between the marginal utility of current and future consumptions), the marginal utility of the current consumption has to decline as well, i.e. the current consumption increases. Hence the share of the current consumption in GDP increases and the personal savings rate declines. But that implies that the dynamics of a consumption becomes largely exogenous with respect to a current income.

## **3. THE GROWTH IMPLICATIONS**

The exogenously rising consumption increases the current aggregate demand. If this can be matched by increases in aggregate supply (say, due to rising productivity), this will result in an economic growth over and above the rate implied by the standard economic model. And this growth is caused by an exogenously rising consumption. I.e., in contrast to standard macroeconomic assumptions, consumption causes income (and growth).

The problem arises if (or when) the process reverses itself. An exogenous negative shock to an individual wealth *ceteris paribus* reduces the expected future consumption, hence increasing the marginal utility of a future consumption. To maintain the equilibrium, the marginal utility of the current consumption has to rise – i.e. the current consumption has to be reduced. That is, the share of consumption in GDP declines and the personal savings rate increases. (The latter, indeed, will mitigate the negative wealth shock, but it cannot eliminate it. The savings sufficient to increase wealth to its pre-shock levels – and hence to resume the original level of consumption – would violate individual budget constraint.)

Because the consumption still remains exogenous of GDP – but not vice versa – the reduction in consumption reduces the GDP growth.

#### 4. EMPIRICAL ANALYSIS

Does the discussion above reflect the reality? And if it does, what does it say about the future?

To answer the first question, a simple VAR model was constructed and applied to the available data. The discussion above assumes that an exogenous dynamics in individual wealth affects consumption (see enclosed graphs) which in turn affects the GDP. Hence, the VAR model includes the GDP, Individual Consumption (from national accounts) and Households Net Worth (from the Federal Reserve Flow of Funds Tables) as the variable representing the sum of individuals' wealth.

The model was estimated using the data from 1998:4 to 2009:1, with 3 lags on each variable. (The number of lags was determined by the VARLAG Rats program, the estimation period reflects the availability of data for Households Net Worth.)

The results are reported in Tables 1, 2 and 3. These do not reject the discussion above. They show that a) consumption causes growth, but not vice versa; b) wealth (weakly) causes consumption and income, but not vice versa. (In evaluating the results it is useful to keep in mind that the variable used to represent the individuals' wealth – the Households Net Worth – is at best the approximation. But it is the only variable available up to date and in quarterly frequency. More realistic census based observations are only annual and do not go beyond 2004.)

Estimates of the model are then used to forecast possible future dynamics of GDP. These are in Table 4. Forecasts are quarterly, over the period 2009:2 to 2011:1 (i.e. covering the next 2 years). The unconditional forecast stemming from the model estimation is in columns Forecast. However, given the structural shift assumed in the above analysis and in fact observable in the last 3 quarters, the “expert judgment” was imputed to the model for the values of consumption and Households Net Worth for the current (2009:2) and the next quarter (2009:3).

Three different short term scenarios are then considered. Forecast1 (probably a very optimistic one) assumes that in 2009:2 and 2009:3 both the consumption and the Households Net Worth remain unchanged at their 2009:1 levels. Forecast2 then assumes that in 2009:2 the Consumption and the Households Net Worth both declines by 1% compared to 2009:1. In 2009:3 this decline of the Consumption and the Households Net Worth is then modeled to be 2% compared to 2009:1. Finally, in Forecast3 the respective declines are modeled to be 2% in 2009:2 and 4% in 2009:3 – compared to 2009:1.

Results are in Tables 4 and 5. Forecast and Forecast1 are rather optimistic, predicting that that the current decline bottoms in 2009:2 and the economy resumes the growth afterwards. However, in both cases the growth remains anemic and in 2011:1 economy still remains below its historic peak from 2008:2 (0.43% below in case of Forecast and 0.75% below in the case of Forecast1.) In contrast, Forecast2 and Forecast3 the economy bottoms in 2009:4 and only restores the growth afterwards. In these two cases the recovery appears to be less anemic than in the first two, however, given the deeper decline the output in 2011:1 is still below its 2008:2 peak – 2.6% in the case of Forecast2 and 4.45% in the case of Forecast 3. Indeed, these differences in forecasted economic dynamics will then have significant implications for variables not analyzed here, like unemployment, government finance etc.

The inspection and comparison of results in Tables 4 and 5 then indicate the forecasted differences stem from the different path of assumed and forecasted dynamics in the household net worth. (The share of consumption in GDP remains stable, even if rather unpleasantly high given historical standards.)

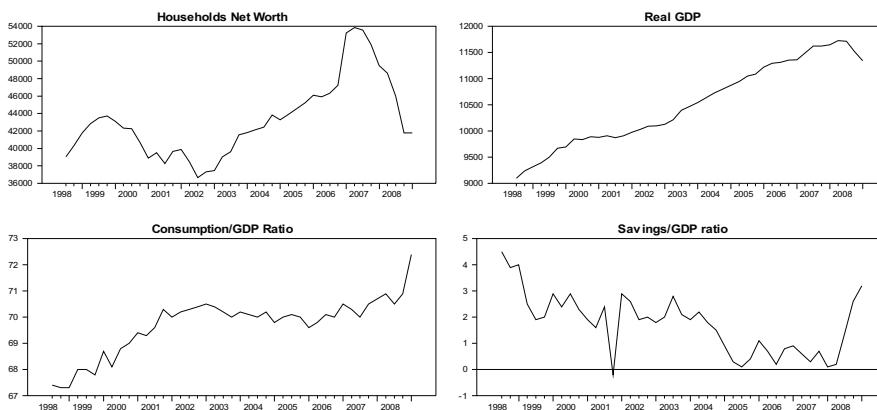


Figure 1. Real GDP, Households Net Worth, Consumption/GDP Ratio, Savings/GDP Ratio

Table 1. Interactions of Consumption, Household Wealth and GDP Growth  
(from the estimated VAR model)

F-Tests, Dependent Variable NWHOUSQR		
Variable	F-Statistic	Signif
NWHOUSQR	23.9447	0.0000000
CONR	2.4082	0.0853118
GDPR	1.5932	0.2102775
F-Tests, Dependent Variable CONR		
Variable	F-Statistic	Signif
NWHOUSQR	2.5337	0.0743882
CONR	22.4151	0.0000001
GDPR	0.6911	0.5641986
F-Tests, Dependent Variable GDPR		
Variable	F-Statistic	Signif
NWHOUSQR	1.9315	0.1443238
CONR	5.4519	0.0038328
GDPR	6.8986	0.0010330
Variables: GDPR - real GDP		
CONR - real consumption		
NWHOUSQR - real households net worth		
All variables are quarterly. Model was estimated with 3 lags over the period 1998:4 - 2009:1, i.e. the total of 42 observations		

Table 2. Interactions of Consumption Household Wealth and GDP Growth  
(Decomposition of Variance from the estimated VAR model)

Decomposition of Variance for Series NWHOUSQR				
Step	Std Error	NWHOUSQR	CONR	GDPR
1	1204.60303	100.000	0.000	0.000
2	1970.98900	95.647	4.300	0.053
3	2564.43798	95.897	4.072	0.031
4	2891.05772	93.989	3.953	2.058
5	3079.98942	89.326	4.498	6.177
6	3227.26425	82.664	5.601	11.734
7	3358.77598	76.472	6.863	16.665
8	3464.34984	71.945	8.318	19.737
9	3536.50360	69.228	9.759	21.013
10	3583.86435	67.833	10.840	21.327
11	3614.14798	67.185	11.500	21.314
12	3630.68932	66.845	11.868	21.288
Decomposition of Variance for Series CONR				
Step	Std Error	NWHOUSQR	CONR	GDPR
1	29.88169	31.976	68.024	0.000
2	46.13666	37.120	62.528	0.352
3	59.45945	47.036	52.466	0.498
4	71.14445	48.556	50.422	1.023

5	80.06478	46.801	51.442	1.757
6	86.48649	43.361	53.161	3.479
7	91.87418	39.395	55.226	5.379
8	96.70987	35.795	57.525	6.680
9	100.81181	33.025	59.698	7.278
10	104.18322	30.990	61.650	7.361
11	106.92648	29.493	63.339	7.168
12	109.11739	28.371	64.708	6.921
Decomposition of Variance for Series GDPR				
Step	Std Error	NWHOUSQR	CONR	GDPR
1	41.28550	0.516	17.138	82.346
2	66.57540	19.045	38.674	42.282
3	98.41524	38.029	40.299	21.673
4	126.23304	49.727	36.108	14.165
5	147.65254	54.357	34.051	11.592
6	161.46418	53.997	34.411	11.592
7	170.46374	51.035	35.642	13.323
8	177.69482	47.312	37.089	15.599
9	184.01840	44.118	38.681	17.201
10	189.08390	41.794	40.380	17.826
11	192.77704	40.208	42.022	17.770
12	195.41805	39.155	43.401	17.444
Variables: GDPR - real GDP				
CONR - real consumption				
NWHOUSQR - real households net worth				
All variables are quarterly. Model was estimated with 3 lags over the period 1998:4 - 2009:1, i.e. the total of 42 observations				

Table 3. Interactions of Consumption Household Wealth and GDP Growth  
(Impulse responses from the estimated VAR model)

Responses to Shock in NWHOUSQR			
Entry	NWHOUSQR	CONR	GDPR
1	1204.6030	16.897382	2.966585
2	1504.8668	22.463464	28.901882
3	1609.6059	29.543040	53.283753
4	1244.7073	28.191127	65.119680
5	786.0853	23.290934	62.663599
6	368.6783	15.595568	47.188468
7	131.9926	9.053758	27.429734
8	87.1336	4.746180	10.455815
9	153.5023	2.912003	0.800703
10	233.0248	2.712074	-1.634164
11	251.4938	2.882016	0.400919
12	188.6576	2.467434	3.166476
Responses to Shock in CONR			
Entry	NWHOUSQR	CONR	GDPR
1	0.0000	24.645368	17.091179
2	408.7286	26.899231	37.709654
3	317.3285	22.889584	46.786939
4	250.3124	26.404789	43.018043

5	310.2313	27.304431	40.862598
6	395.9036	26.052483	39.340844
7	436.8786	26.175631	37.223103
8	473.3040	26.807683	36.799640
9	471.5084	26.208610	37.247533
10	414.4024	24.988916	36.587637
11	331.4263	23.455728	34.345168
12	249.4422	21.513574	30.946407
Responses to Shock in GDPR			
Entry	NWHOUSR	CONR	GDPR
1	0.0000	0.000000	37.464426
2	-45.2328	-2.738648	21.689985
3	4.0042	3.179665	15.003290
4	412.2136	5.844091	12.573612
5	643.3868	7.799822	16.432090
6	797.6442	12.148684	22.247615
7	811.0836	13.921818	29.141999
8	699.0957	13.067371	32.465757
9	509.1706	10.716889	29.988386
10	333.4607	7.701930	23.422685
11	211.8713	4.544611	15.182727
12	148.4124	2.099716	7.584194
Variables: GDPR - real GDP			
CONR - real consumption			
NWHOUSR - real households net worth			
All variables are quarterly. Model was estimated with 3 lags over the period 1998:4 - 2009:1, i.e. the total of 42 observations			

Table 4. GDP Growth – Actual (2007:1 – 2009:1) and Forecast (2009:2 – 2011:1)

A) Actual Real GDP - 2007:1 - 2009:1				
ENTRY	GDP	Annualized GDP Growth	Quarterly GDP Growth	
2007:01	11357.8	1.252	0.012	
2007:02	11491.4	1.768	1.176	
2007:03	11625.7	2.754	1.168	
2007:04	11620.7	2.327	-0.043	
2008:01	11646.0	2.537	0.217	
2008:02	11727.4	2.053	0.698	
2008:03	11712.4	0.745	-0.127	
2008:04	11522.1	-0.848	-1.624	
2009:01	11340.9	-2.619	-1.572	
B) Forecasted Real GDP - Levels 2009:2 2011:1				
ENTRY	Forecast	Forecast1	Forecast2	Forecast3
2009:02	11315.5	11317.8	11274.0	11230.1
2009:03	11373.9	11331.1	11152.0	10974.6
2009:04	11463.4	11344.8	11077.0	10809.3
2010:01	11568.1	11394.2	11121.2	10848.2

2010:02	11645.6	11462.2	11218.3	10976.5
2010:03	11677.4	11524.3	11299.6	11075.0
2010:04	11679.8	11583.9	11367.5	11151.0
2011:01	11677.0	11639.1	11422.3	11205.5
C) Forecasted Real GDP - Annualized Growth Rates 2009:2 2011:1				
ENTRY	Forecast	Forecast1	Forecast2	Forecast3
2009:02	-3.512	-3.492	-3.866	-4.240
2009:03	-2.899	-3.255	-4.784	-6.299
2009:04	-0.509	-1.538	-3.863	-6.186
2010:01	2.003	0.469	-1.937	-4.344
2010:02	2.917	1.275	-0.494	-2.258
2010:03	2.668	1.705	1.323	0.914
2010:04	1.887	2.107	2.622	3.161
2011:01	0.941	2.149	2.707	3.293
D) Forecasted Real GDP - Quarterly Growth Rates 2009:2 2011:1				
ENTRY	Forecast	Forecast1	Forecast2	Forecast3
2009:02	-0.223	-0.203	-0.589	-0.976
2009:03	0.516	0.117	-1.082	-2.275
2009:04	0.786	0.120	-0.672	-1.506
2010:01	0.913	0.435	0.399	0.359
2010:02	0.669	0.596	0.873	1.182
2010:03	0.273	0.541	0.724	0.897
2010:04	0.020	0.517	0.600	0.686
2011:01	-0.023	0.476	0.482	0.488

Table 5. Forecasted Consumption and Households Net Worth (2009:2 – 2011:1)

A) Forecasted Real Consumption - Levels 2009:2 2011:1				
ENTRY	Forecast	Forecast1	Forecast2	Forecast3
2009:02	8237.2	8214.2	8132.1	8049.9
2009:03	8267.4	8214.2	8049.9	7885.6
2009:04	8320.8	8245.7	8089.6	7933.4
2010:01	8366.0	8285.4	8139.2	7993.0
2010:02	8388.6	8319.8	8159.7	7999.6
2010:03	8404.4	8356.5	8197.0	8037.6
2010:04	8420.1	8394.7	8235.9	8077.0
2011:01	8438.2	8429.8	8264.5	8099.3
B) Forecasted Real Household Net Worth - Levels 2009:2 2011:1				
ENTRY	Forecast	Forecast1	Forecast2	Forecast3
2009:02	44071.9	41768.0	41350.3	40932.6
2009:03	46058.4	41768.0	40932.6	40097.3
2009:04	46858.3	41972.8	40210.8	38448.8
2010:01	46944.7	42607.3	41691.5	40775.6
2010:02	46253.6	43731.6	42356.9	40544.7
2010:03	45253.3	43731.6	42138.2	40544.7
2010:04	44664.4	44159.2	41891.6	39624.1
2011:01	44724.0	44623.6	41896.4	39169.3



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## 5. IN LIEU OF CONCLUSION

Field Marshall Helmuth von Moltke Sr. said that “every plan has to change after the first encounter with reality”. The discussion, model estimates and forecasts in this writing reflect the perception of reality in May 2009. It will certainly change as the new information arrives. But the basic outlines will remain – they even may be too optimistic. However, the one important question not answered here is the dynamics of employment and its feedback on both consumption and assets dynamics. US labor force growth is about 1% a year. Assuming even a sluggish 1% annual growth of productivity, it would imply the need of 2% annual GDP growth to maintain the full employment. Above given forecasts are nowhere near this – i.e. the unemployment will keep increasing. Where to? 10%? 12%?

Well, only future will tell. Caveat Consules!

## REFERENCES

- Gordon, Robert J. (2009), *Green Shots or Dead Twig: Can Unemployment Claims Predict the End of American Recession?* VoxEU, May 1<sup>st</sup> .
- Global Financial Stability Report (2009), *Responding to the Financial Crisis And Measuring Systemic Risk*. IMF, Washinhton D.C., April.
- Jappelli, Tullio; Modigliani, Franco (1998), *The Age-Saving Profile and the Lifecycle Hypothesis*. Center for Studies in Economics and Finance, University of Naples, Italy, No. 09, November.
- World Economic Outlook (2009), *Crisis and Recovery*. IMF, Washinhton D.C., April.