

THE ROLE OF CREDIT IN THE 2007-09 GREAT RECESSION

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For presentation at the 8th OxMetrics User Conference, The George Washington University
Washington, DC, March 18-19, 2010.

Abstract:

This paper examines the financial crisis of 2007/9 and the accompanying downturn in the US. We argue that a skewed income distribution could not sustain effective demand and that over the 2001-2006 expansion demand was maintained through massive amounts of credit. The role of credit in a Vector Error Correction Model and Granger-causality between aggregate spending, credit, disposable income and profits are examined. The results raise new hypotheses about the crucial relationships in macroeconomics that sustain aggregate spending. We then compute the generalized impulse responses in the VECM; for example the actual shock in 2007/9 in credit is four times the estimated shock from the impulse response function. This demonstrates the severity of the 2007/09 downturn. Next we consider in detail the role of finance and credit in the 2007/09 contraction. We show that legislative changes that dismantled the restrictions placed on the financial sector after the crash of 1929 and the consequent structural changes in the financial sector after 1980 enabled the growth of new debt instruments and credit. But overexpansion of credit when profits and house prices were declining in 2005/06 led to a nonlinear shift due to a new realization of the poor quality of some of this debt, namely mortgage backed securities.

INTRODUCTION

A number of researchers have attempted to analyze the causes and policy lessons of the Great Recession of 2007-2009, which has been compared to the Great Depression in a number of respects. This paper contributes to that literature. In this section we begin with a brief methodological introduction as well as a selective review of the relevant literature on the financial crisis and the accompanying recession.

The analysis of macroeconomic data has often suffered from the fact that a pre-conceived "theory" is presumed to be "true", and the statistical task is merely to confirm the preconceived theory (Campos, et al.2005). This has often been the practice among the macroeconomists who had adopted Real Business Cycle (RBC) to be the underlying "reality". RBC was later christened "stochastic dynamic general equilibrium" (SDGE). The SDGE approach also dominated a number of the regional Federal Reserve research departments, including the research divisions of other central banks such as the Bank of Canada. Recently it has become apparent that such representative equilibrium models have no "room" for central bank intervention. The successor models to the SDGE models are called "New Consensus Macroeconomics" which appeared in the aftermath of Woodford (2003) (But also see Woodford, 2009). In the "New Consensus" some form of a Taylor Rule is incorporated as an explicit equation of the model. But the basic New Consensus model remains an untested "theory," and the econometric estimation of it is just "clothing." (in the sense used in Campos et al, op cit.) The inadequacy of empirical macro econometrics has led a number of researchers to go back to some of the guiding principles of econometric practice articulated some time ago by Haavelmo (1944). Subsequently a rich literature now serves applied econometric practitioners. This literature includes some influential papers, such as those by Davidson et al (1978), Hendry and Richard (1983), Hendry (1987), and others too numerous to mention (see Campos et al. 2005 for a full bibliography). The point here is not to try to retrace the history of sound econometric practice for macroeconomics, which is now well known, but to provide a brief methodological justification for the macro hypotheses tested and the approach taken in this paper which is the cointegrated VAR approach.

The central topic of this paper is: what key variables should be used to account for the business cycle downturn that occurred in the US in 2007-8, which led to reverberations across the global economy? For such a task no

overarching economic "theory" is proposed in this paper and no such model is imposed. Instead we have chosen the cointegrated VAR approach because it offers a potentially richer way of trying to capture short-run and long-run relationships, interactions and feedbacks which we *might* expect and wish to test for statistically. The fecundity of the VAR as an investigative technique has been adequately demonstrated by now, but has been eloquently restated by Juselius (2006). Secondly the VAR approach is less pretentious about a prior role of a theoretical model; it enables one to take a time series of some chosen data (after careful sifting using statistical methods) and use VAR to search for structures in the data for not one but for a number of possible relevant theories. The approach could then lead to empirical support for some hypotheses, say about the causal directions of a small number of variables, some not previously shown to be relevant in the published macro literature. Thus we hope to generate some new hypotheses about the integral macroeconomic relationships among the variables chosen here. These new hypotheses can then be tested against new data to test for either their generality or to narrow down the domain of validity of these hypotheses. For example, the relationships uncovered in this paper between disposable income, revolving credit, profits and aggregate spending in the US data can be and should be tested on data from the UK, Canada and other developed countries who have all been affected to a great extent by the international transmission of the financial crisis in the US as shown in IMF, (2008).

It is not surprising that there are already a number of research papers that have begun the task of examining the major financial crisis that started in the US in August 2007, which led to severe reverberations throughout the world, second only to the impact of the Great Depression. Naturally some researchers have attempted to explain the crisis, or draw parallels with the Great Depression or offer macroeconomic policy lessons. It might be instructive to begin with one (only one) example of the SDGE type of approach, in which an implied but untested "theory" provides a straight-jacket which is then dressed in econometrics. This is the attempt by Barrell et al. (2008) who use "a stochastic dynamic general equilibrium model" of the UK National Institute of Economic and Social Research, to which a financial sector is grafted in order to elicit the impact of future financial controls on economic growth. Since an SDGE Model is a representative agent model which is by definition a convex model, it is unclear how informational asymmetries (which played a major role in the financial

crisis) or any other externalities can be incorporated in the model without violating the fundamentals of the model itself. Not surprisingly no interesting results were obtained *from* the model. Their main conclusion for tighter bank regulation in this paper seems completely unconnected to the SDGE model.

But there is a more interesting literature that does have something useful to say about the financial crisis and its consequences. Reinhart and Rogoff (2008) amass data for six centuries (spanning 66 countries) of banking crises and debt defaults and see very little that is new in the 2007-09 crisis. Michael Bordo (2008) also puts the 2007-09 crisis in historical perspective of earlier big international financial crises which were triggered by events in the U.S. financial system. He sites examples of the crises of 1857, 1893 1907 and 1929-33. The 2007-09 crisis has many similarities to those of the past but also some important differences. But he does mention one important institutional feature, namely the repeal in 1998 of the Glass- Steagall Act which had separated commercial from investment banking. Following the repeal of the Act, competition between commercial banking and investment banking led to a race to achieve comparable profitability through comparable leveraging. Gorton (2008) and Geanakoplos (2009) get nearer to the heart of the problem as they identify informational asymmetries between buyers and sellers on the newly securitized assets. This asymmetry is of course an externality, which points to the failure of the standard Chicago School assumptions of convex environments, continuous and complete, rational and efficient markets and complete information. In such a convex environment, failures and crises are impossible. The identification of informational asymmetries is a clear recognition of a form or market failure, or more generally the existence of an externality that the Chicago school fails to understand or chooses to ignore.

On the other hand, Steven Cecchetti (2008) asks some important questions on how to deal with such externalities even though he acknowledges that we do not as yet have clear answers. His questions are pertinent to developing future macro coordination policies. He asks: What should policymakers do when prices of leveraged assets boom? How should central banks respond to declines in the price of risky assets, and the associated increase in risk premia? Should monetary policymakers react to illiquidity in the market for specific assets, and if so how? When a highly leveraged and complex financial institution experiences losses, what is the central bank's responsibility? Should a central bank take credit risk in its lending operations, or should this function belong to the U.S. Treasury? While these are good policy questions, they do not go anywhere close to a structural explanation

as what went wrong and how the financial crisis became so severe as to engulf the whole world. Finally, like Edward Leamer (2007), John Taylor (2009) see the crisis as being caused by too loose a money supply and a failure on the part of the Federal Reserve to follow the Taylor rule in setting interest rates. Taylor also produces a counterfactual argument that had the Fed followed the Taylor rule in setting interest rate policy, the housing boom and bust would not have occurred. Leamer (2007) goes further in arguing that housing *is* the business cycle and some version of the Taylor rule would have avoided it.

While this literature throws light on important aspects of the financial crisis and business cycle downturn, a fuller account of the institutional features that accompanied the downturn and the role of leveraging, (which is in fact credit plus collateral) is needed to increase our understanding of what happened. This paper is an attempt to extend that literature. We do this by selecting a few key variables and attempt to capture short-run and long-run relationships, interactions and feedbacks which we might expect and wish to test for statistically. We carry this task out by fitting a Vector Error Correction model to US data for the period 1975 to 2007. We believe that the paper generates some new inter-relationships and interesting hypotheses which should be tested on the data for other developed countries.

Section 1 The Role of Credit in a Dynamic Model

The slow but gradual process of repealing legislative acts (such as the Glass Steagall Act of 1933) which were designed in the first place to monitor and maintain checks and balances in the financial markets can be seen as a factor behind the financial crisis. This process of financial de-regulation began in 1980 with the Depository Institution Deregulation and Monetary Control Act, followed by the Tax Reform Act of 1986, and The Gramm-Leach-Bliley Act of 1999, all of which relaxed controls on in the financial markets. These and other legislative acts encouraged innovation in debt instruments and new financial tools which were high risk and eventually proved costly to the US economy. Real income growth over the period 2000 to 2007 was highly skewed with the result that aggregate spending was maintained largely through cheap credit. The cheap credit was made possible by the Federal Reserve maintaining liquidity in the markets by adopting the interest rate rule in 1995 and effective demand was maintained mainly through the growth of credit. Even large reductions in corporate and capital gains

taxes and income tax cuts under the Bush Administration¹ were not enough to maintain the expansionary phase, once credit collapsed.

The exponential growth of credit as the main engine of prosperity was made possible by adding new forms of debt instruments in financial markets. Dore and Singh (2009) and Singh (2008) have shown that disposable income for the bottom 80% of the U.S. population had been declining since 1984; only the top 20% had increasing disposable income. In fact, more than 60% of household earned less than \$50,000 in 2007 compared to less than 10% earning over \$200,000 (Dore and Singh, 2008). From 1984 to 2007, only households from the top quintile had more current disposable income than their current expenditure. Consumption for the majority of the population was therefore maintained and encouraged through the availability of credit from banking and financial institutions. Dore and Singh (2009) highlighted the importance of credit in maintaining retail sales from 1992 to 2007 in a maximum likelihood regression estimation where retail sales was regressed on revolving credit, non revolving credit and disposable income. The authors found that revolving credit and non revolving credit together accounted for approximately 50% of retail sales while disposable income only influenced 2% of sales. The MLE result referred to above is further analyzed in a dynamic model: consider the role of credit in the following Vector Error Correction Model:

$$\Delta y_t = a_0 + \Gamma(L)\Delta y_{t-1} + \Pi y_{t-k} + \Psi_y w_t + \mu_t$$

y_t is a vector of K observable endogenous variables which are corporate profit, revolving credit, disposable income and retail sales, as a proxy for aggregate spending. Γ represents a matrix of coefficients on the endogenous variables, L is its lag operator and Ψ_y is a vector of observable exogenous variables denoted by w_t ; in this case there is only one exogenous variable which is a dummy equalling 1 when an economic expansion is observed and 0 otherwise. a_0 is an unrestricted constant, Π is the matrix of cointegrating vectors and μ_t is a K -dimensional unobservable zero mean white noise process. All variables are in billions of US current dollars. This

¹ See Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA) and The Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA)

model examines the interaction among four key variables in the US economy which played a role in the US economic downturn. The vector autoregression allows us to examine dynamics while the dummy variable captures the asymmetric nature of expansions and contractions of the US business cycles; in effect this provision makes the VECM model nonlinear. The error correction term is used since the Johansen procedure failed to reject the hypothesis that the variables are cointegrated up to rank 4². This shows that a long term (dynamic) relationship exists among the variables over time.

We used quarterly data for the above endogenous variables for the period 1975 to 2007. The large number of observations enabled us to select the optimal lag under the AIC criteria and also allowed us to observe a longer time frame for the dynamic interaction among the variables; a 6 period lag was found to be optimal. Table 1 and 2 below shows the Granger causalities among variables:

Table 1: Granger Causality testing for VECM model

	Variable in Column A Granger Causes (with p-value)			
Column A	Corporate Profits	Aggregate Spending	Disposable Income	Revolving Credit
Corporate Profits	NA	0.5979	0.0866*	0.4152
Spending	0.0371**	NA	0.0878*	0.2195
Disposable Income	0.4446	0.0013***	NA	0.0748*
Revolving Credit	0.0215	0.0185**	0.3479	NA

*p < .10 **p < .05 ***p < .01

Table 2: Granger Causality up to 10% level of significance

	Variable in Column A Granger Causes			
	Granger Causes Corporate Profits?	Granger Causes Aggregate Spending?	Granger Causes Disposable Income?	Granger Causes Revolving Credit?
Corporate Profits	NA	No	Yes	No
Spending	Yes	NA	Yes	No

² From the trace test. Mixed results were obtained for lamda max test

Disposable Income	No	Yes	NA	Yes
Revolving Credit	No	Yes	No	NA

Taking retail sales as a proxy for aggregate spending, Table 1 indicates that disposable income and revolving credit Granger cause aggregate spending. Spending in turn Granger causes corporate profits. There is however some feedback effect as spending Granger causes disposable income. Disposable income Granger causes revolving credit and corporate profits Granger causes disposable income. All these results are consistent with Keynesian macroeconomics except that they now highlight the special role of credit in the circular flow of income. The following directed graph (Figure 1) shows the above causal relationships between variables over time while Figure 2 summarizes (jn a static format) the probabilistic causalities:

Figure 1: Temporal Granger-Causality

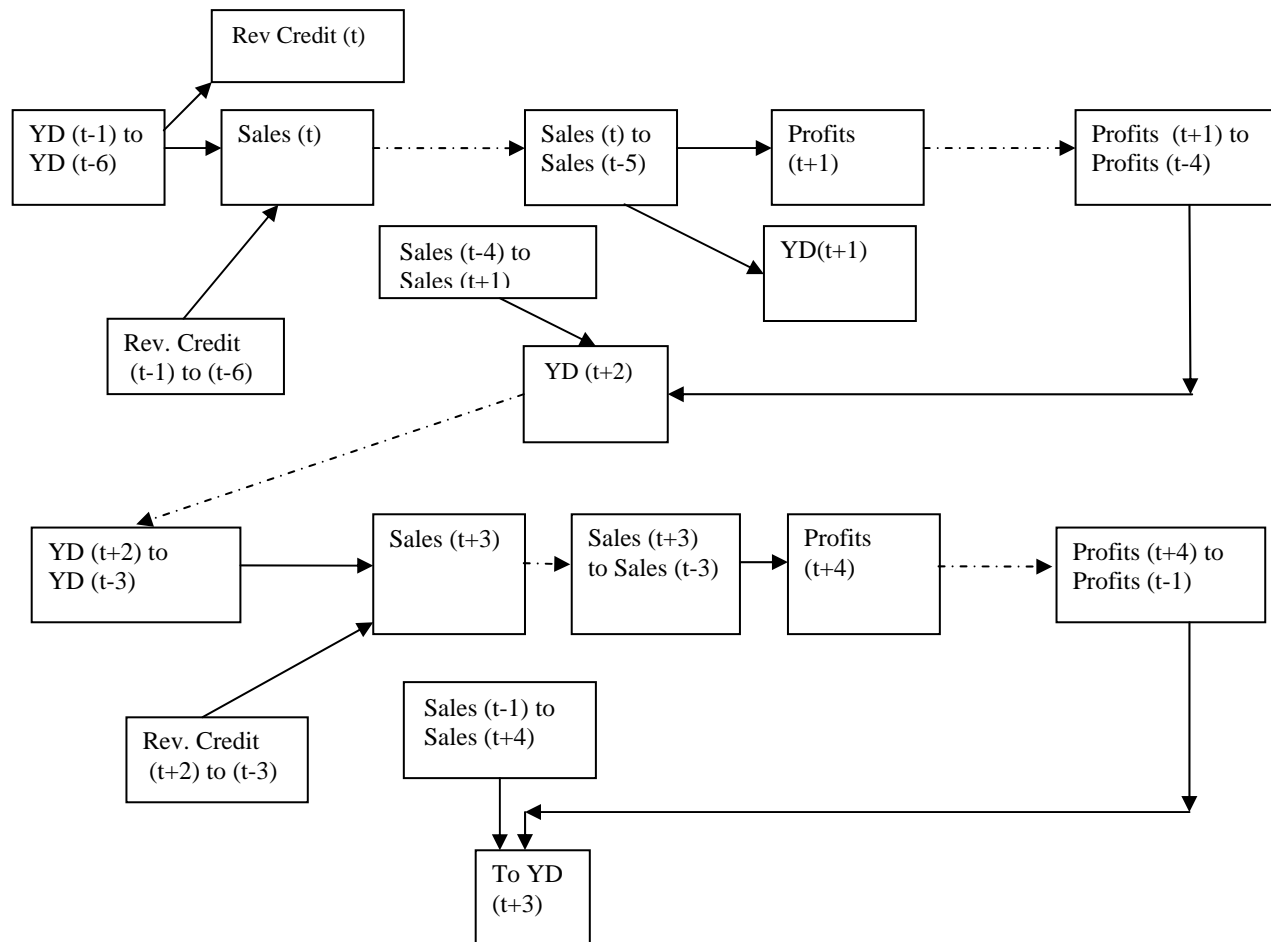
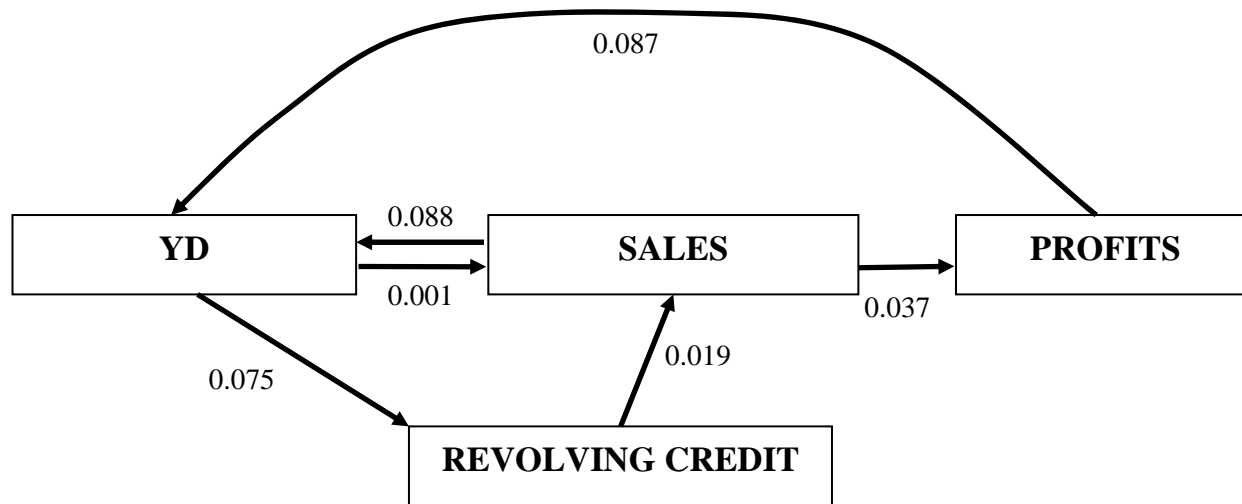


Figure 2: Probabilistic Causalities (with associated p-values)



Next we obtained Generalized Impulse response functions for the above VECM model using Microfit 4.1 developed by Pesaran and Pesaran (1997). With Generalized Impulse response the ordering of the variables does not matter as opposed to orthogonalized impulse response functions in a VAR model (Pesaran and Shin, 1997). Table 3 shows the effect of shocks equivalent to one standard error and the associated effects on selected variables:

Table 3: Generalized Impulse response functions for estimated VECM (Current US \$bn)

Response of variables to a one Std Error shock in Spending:

Horizon	SPENDING	PROFITS	YD	REVCRED
0	5.98	0.11	4.25	0.32
1	4.65	1.11	4.63	0.18
2	4.71	5.13	8.65	0.54
3	5.61	-1.81	6.60	1.32
4	4.85	-4.67	14.25	1.86
5	5.35	-8.09	18.02	2.37
6	4.96	-3.07	8.41	2.89
7	3.58	-3.61	10.03	3.00
8	3.10	-9.09	4.95	3.07
9	2.66	-9.82	7.21	2.81
10	2.56	-9.22	8.11	2.31

11	1.85	-6.98	7.47	2.14
12	1.27	-4.87	5.39	1.82

Response of variables to a one Std Error shock in Revolving Credit:

Horizon	SPENDING	PROFITS	YD	REVCRED
0	0.49	0.36	-5.05	3.89
1	-0.16	2.27	-1.56	4.30
2	-0.86	7.60	-10.85	5.48
3	0.04	2.57	-10.26	6.28
4	-0.63	0.59	-13.08	6.55
5	-1.36	1.65	-6.58	6.89
6	-1.09	0.71	-7.79	7.20
7	-1.60	1.07	-6.70	7.39
8	-1.73	-1.17	-6.92	7.51
9	-1.68	-1.52	-9.19	7.52
10	-1.48	-0.70	-8.93	7.23
11	-1.01	-0.72	-9.54	6.86
12	-0.55	-0.50	-9.23	6.54

Response of variables to a one Std Error shock in YD:

Horizon	SPENDING	PROFITS	YD	REVCRED
0	0.62	-4.57	41.12	-0.48
1	2.53	-4.44	24.25	-0.42
2	1.96	-3.18	32.59	-0.31
3	1.08	-6.52	22.52	0.17
4	0.42	-5.00	23.09	0.23
5	2.39	-8.93	19.08	-0.61
6	2.61	-8.43	20.94	-1.11
7	2.61	-5.61	21.17	-1.30
8	2.58	-5.55	21.67	-1.35
9	2.46	-8.51	25.42	-1.02
10	2.87	-9.27	27.04	-0.77
11	2.84	-6.38	24.19	-0.46
12	2.49	-4.41	22.37	-0.28

Response of variables to a one Std Error shock in Profits:

Horizon	SPENDING	PROFITS	YD	REVCRED
0	0.02	34.31	-5.47	0.04
1	-0.89	35.28	-8.75	-0.54
2	0.01	22.40	-7.07	-0.67
3	-0.07	31.21	2.24	-0.98
4	0.02	41.74	7.46	-1.19
5	0.14	42.69	8.68	-0.74
6	-0.59	48.28	3.33	-0.64
7	-0.98	43.84	6.82	-0.55
8	-0.21	38.17	9.38	-0.37
9	-0.07	44.42	11.72	-0.55
10	-0.04	44.60	10.97	-0.51
11	-0.18	36.87	11.92	-0.05
12	-0.19	31.71	14.49	0.28

Table 3 shows the importance of credit and how credit affects corporate profits and disposable income. Negative shocks such as those which occurred in 2007 would translate into negative outcomes. For instance, if there is a negative one standard error shock in revolving credit, then this would result in corporate losses for up to 7 periods. The Generalized Impulse functions show that negative credit shocks affect spending, disposable income and profits. The VECM model produced an initial one standard deviation shock of \$3.8bn in revolving credit. In the actual downturn in 2007, credit declined by about \$17bn in the first quarter (or over five times the shock obtained from the VECM model) and on average by \$5.57bn until 3rd quarter of 2009 (see Table 4).

Table 4: Actual vs Estimated shocks from the VECM model (Current US \$bn)

(in \$bn of current dollars)	Spending	Disposable Income	Revolving Credit	Corporate Profits
Estimated initial one S.D. Shock from VECM model	- 5.98	- 41.12	- 3.89	- 34.31
Size of actual initial Shock (after 4 th Quarter, 2007)	- 5.83	-117.40	- 17.82	- 39.70
Average quarterly Shock from 2007 Q 4 to 2009 Q3	- 11.64	52.42	- 5.57	- 17.56
Largest Actual Shock between 2007 Q 4 to 2009 Q3	- 76.33	- 117.40	- 23.08	- 331.00
Timing of largest Shock	2008 Q3- Q4	2008 Q3- Q4	2008 Q4 – 2009 Q1	2008 Q2- Q3

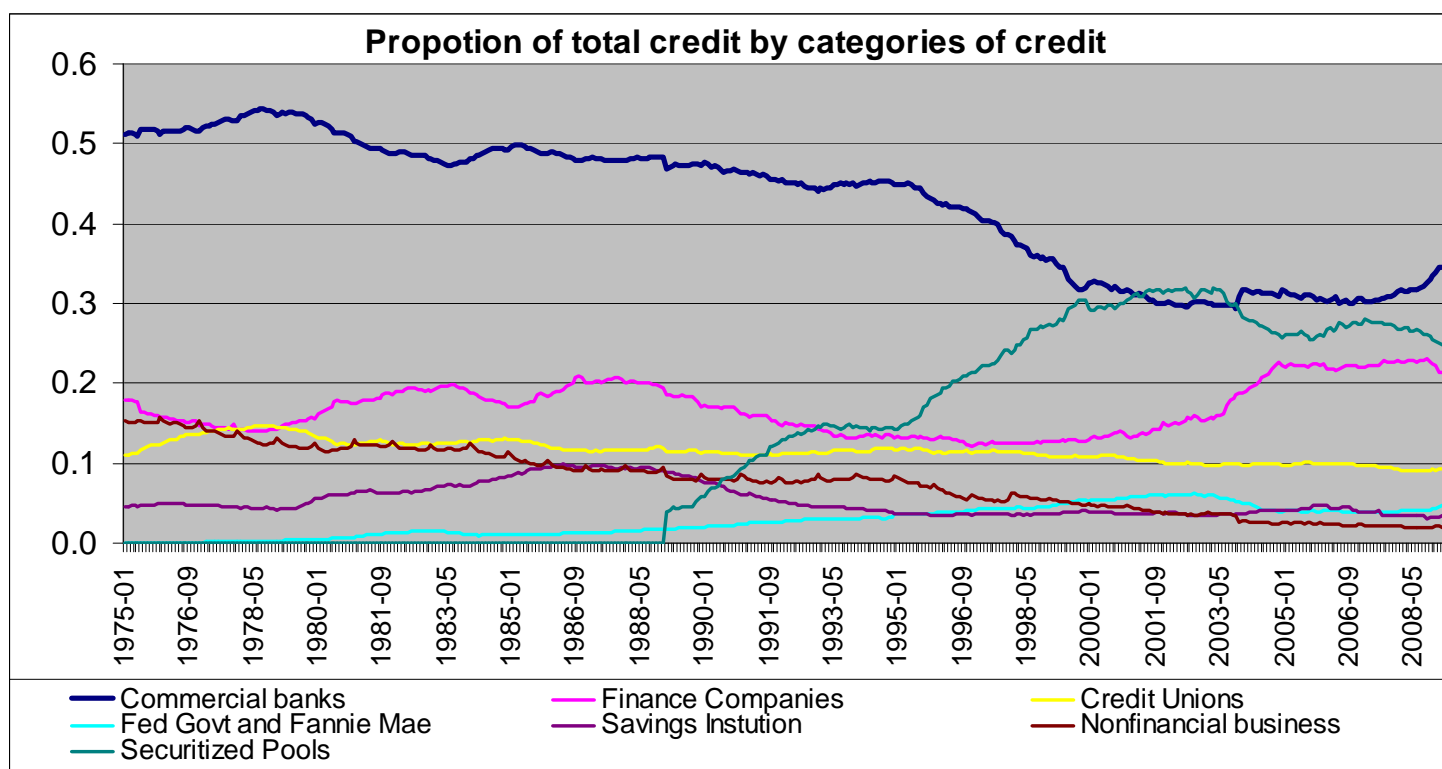
The VECM model shows an initial shock in spending of \$5.98 bn, compared to the size of the actual (initial) shock (\$5.83) being quite close. However, on average over 8 periods from 2007 4th quarter to 3rd quarter 2009, spending declined on average by \$11.64 bn. The largest shock experienced in revolving credit was \$23.08bn and \$331bn for corporate profits both of which exceed the model’s initial shocks. *Table 4 thus highlights the actual magnitude of the business cycle downturn in 2007, now labeled “The Great Recession.”*

Section 2: Role of Finance and Credit In 2007/09 Contraction:

The emergence of a wave of new debt instruments over time can be credited to the dismantling of regulations which began in the 1980s; these controls had been placed on the financial sector in the aftermath of the crash of 1929. In particular the Depository Institution Deregulation and Monetary Control Act of 1980 and the Tax Reform Act of 1986 allowed for the emergence of sub-prime mortgages and securitized pools. Assets which are securitized are generally those which can generate steady flows of income over time. For instance securitized mortgages are called mortgage backed securities (MBS) while assets which are non-mortgage loans but still provide a steady stream of income (e.g. credit card receivables, auto loans, student loans, lease payments) can be securitized to form asset backed commercial paper (ABCP). Securitization made it possible for firms and financial institutions to realize immediately the value of the income generating asset instead of having to wait long periods

of time to access the full amount of the debt. The first set of ABCP originated in 1985 by the Sperry Lease Finance Corporation which backed its computer equipment leases³. Prior to 1980 securitized pools were virtually non-existent (see Figure 3) as a form of credit but it has grown considerably since its inception. Along with this commercial banks gradually lost its position as being the major supplier of credit as the amount of credit supplied in the economy originating from finance companies grew as a result of the deregulation (see Figure 3).

Figure 3: Proportion of total credit by categories



Source: Federal Reserve, 2009

Dore and Singh (2008) used the Bai-Perron procedure to obtain the best five endogenous structural breaks in: (1) total debt, (2) sum of mortgage and total consumer credit outstanding and (3) the annual average credit outstanding from 1943 to 2007 (see Table 4). The results show the year in which innovations in the financial

³ According to *Statement of Cameron L. Cowan before the Subcommittee on Housing and Community Opportunity Subcommittee on Financial Institutions and Consumer Credit, United States House of Representatives, 2003.*

market took place. Indeed the timing of the structural breaks coincided with major legislative acts after allowing for delay or lagged effect which is common with policy implementation.

Table 4: Bai-Perron structural break tests from Dore and Singh (2009)

	Total Debt	Sum of mortgage debt and consumer credit	Annual average credit outstanding
	Best 5 break points	Best 5 break points	Best 5 break points
ARIMA Model	(3,2,0)	(3,2,0)	(3,2,0)
Year	1983	1983	1983
	1989	1988/89	1987
	1993	1992/93	1991
	1997	1999	1999
	2002/03	2003	2003

Dore and Singh (2008) cited the following acts as the major ones which contributed to the expansion of credit via new debt instruments and other financial innovations:

- ***The Depository Institution Deregulation and Monetary Control Act of 1980***: This Act phased out most provisions of Regulation Q which was put in place under the Glass Steagall Act of 1933. Regulation Q had placed a limit on interest rates banks could charge and allowed the Federal Reserve to regulate interest rates for savings accounts; this was phased out. The Depository Institution Deregulation and Monetary Control Act also allowed for the merger of financial institutions and allowed institutions to charge any interest rates of their choice.
- ***The Tax Reform Act of 1986***: This act initiated new low income housing tax credit and allowed interest deductions on mortgage debt but eliminated interest deduction on consumer and auto loans. This encouraged the innovation of instruments which lenders can deliver risk adjusted pricing mechanisms instead of having to deny loans to high-risk borrowers. Hence, this act made it easier for innovations in sub-prime mortgages to take place.

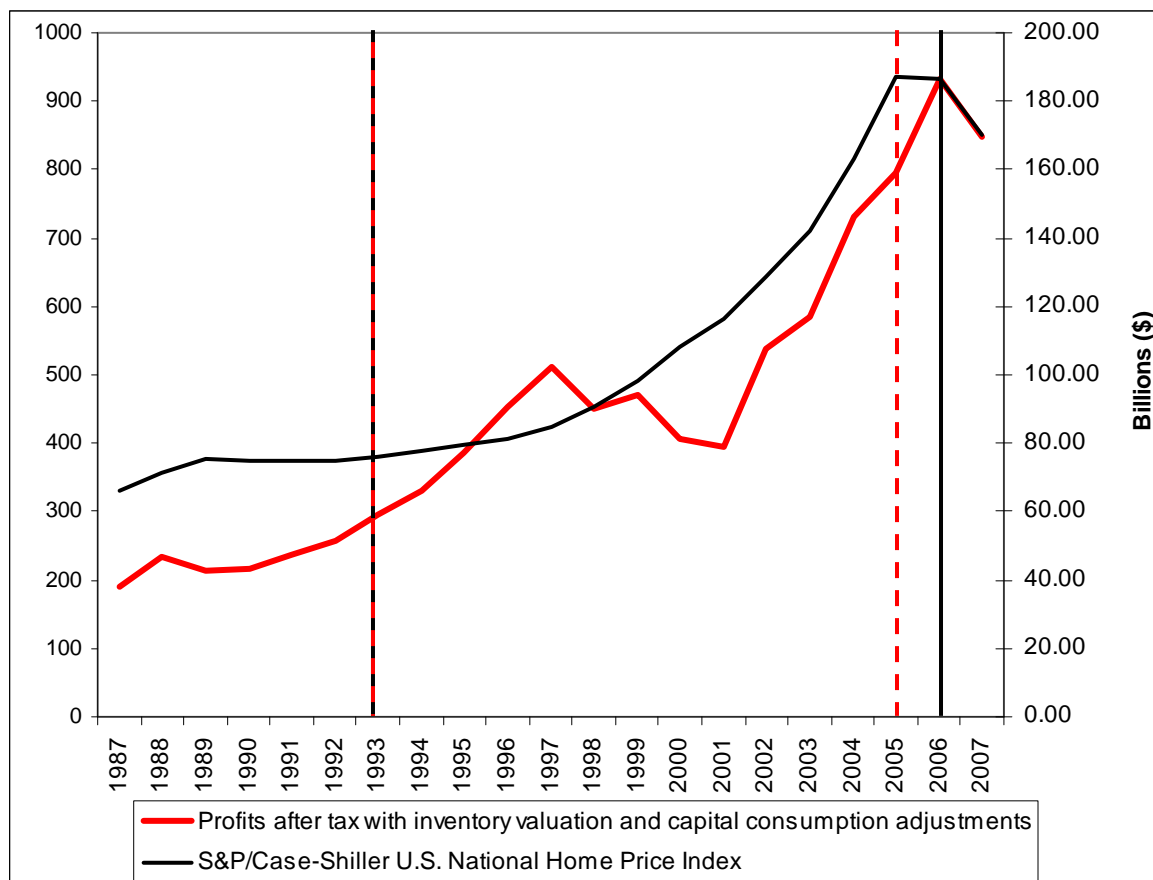
- ***The Gramm-Leach-Bliley Act of 1999 (GLBA)***: This act repealed parts of the Glass-Steagall act which originally had allowed the Federal reserve to regulate interest rates on savings accounts and prevented commercial banks from trading securities. The Gramm Leach Bliley act repealed parts of the Bank Holding Company Act of 1956 which prohibited the merger of commercial banking and insurance institutions. The GLBA allowed commercial entities and investments groups to merge and as a result, institutions provided both banking and insurance underwriting services under one name e.g. Citigroup. In the process “broad banking” developed; many banking centres offered commercial banking as well as trading securities, investment and insurance activities – conditions which only occurred in the market prior to the Great Depression. The Glass Steagall Act and Bank holding Company Act severely limited the ability of banks to enter into insurance and securities markets directly or through subsidiaries (Barth et al. 2000).

The above three acts possibly accounted for the structural shifts in the data generating processes for total debt, (sum of) mortgage and total consumer credit outstanding and annual average credit for the years 1983, 1988 and 1999. These acts gave birth to other (endogenous) innovations in the financial markets after 1980. In 1987 a new product called Collateralized Debt Obligation (CDO) was issued; CDOs are a type of asset-backed security. CDOs emerged as the fastest growing sector of the asset-backed securities market, and CDOs became popular with asset managers and investors, which now include insurance companies, mutual fund companies, unit trusts, investment trusts, commercial banks, investment banks, pension fund managers, and private banking organizations. In a low interest rate regime, bonds lost their traditional appeal and the market for derivatives grew dramatically, although derivatives had been around since the 1970s. Derivatives offered investors the incentive to speculate on the movement of the value of the underlying asset over time. These financial instruments tended to be highly leveraged; hence small movements in the in the assets value tended to magnify the speculated value and hence magnify the value of the derivative. Hedge funds grew in popularity as a result of deregulation which allowed innovations to swaps, options, over-the-counter, futures contracts and derivative products. A highly liquid market which occurred as a result of Federal Reserve moving from inflation targeting to interest rate targeting in 1995

provided the environment for the growth and sustenance of these new financial instruments. The Federal Reserve increased the money supply in order to maintain liquidity in the financial markets time and time again. For example, the Federal Reserve reduced its Federal Funds Rate from 6 % in January 2001 to 1% in June 2003 and the Federal Discount Rate from 5.75% to 2.00% for the same period and low interest rates meant high risk high yielding assets continued to thrive until the downturn. Even during the downturn the Federal maintained its stance on interest rate targeting; the Federal Funds Rate was reduced from 5.25% in June 2006 to 0.25% in December 2008 and the Federal Discount Rate from 6.25% to 0.50% for the same period.

A highly liquid market and the innovation of high-yield, high-risk instruments in the financial market increased profitability in the financial sector at the start of the decade. Coupled with the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA) and The Jobs and Growth Tax Relief Reconciliation Act of 2003 (JGTRRA) which reduced corporate taxes and personal income taxes for the uppermost quintile, unprecedented corporate profits were reaped in the US economy prior to the downturn. Figure 4 highlights the movement of both house prices (Case-Shiller Index used as proxy) and corporate profits after tax with the best two structural breaks based on ARIMA models (Singh and Dore, 2009). The structural breaks in corporate profits occur in 1993 due to tax *decreases* and again in 2005. However, the 2005 structural break reflects signs of an impending recession, as profits fell soon after. The structural break in the S&P/Case-Shiller Index of house prices in the US in 2006 reflects the downturn in profits and a weakening economy (see Figure 4).

Figure 4: S&P/Case-Shiller U.S. National Home Price Index (1987 to 2007) with best two structural breaks (solid black line) and corporate profit after tax with inventory valuation and capital consumption adjustments with best two structural breaks (red-dashed lines)



Source: *Economic Report of the President 2008*

For details of these structural break tests see THE APPENDIX.

One could ask how could there be an economic downturn under the Bush administration, when there was such favorable treatment of corporate profits, capital gains, personal income as well as large government budget deficits, two major fiscal acts designed to stimulate the economy and an expansion in credit. In other words why did the 2001-2007 expansion come to a sudden end?

Part of the answer lies in the inability to maintain effective demand due to a skewed income distribution. Singh (2008) has shown that for 80% of US households, income share had declined or remained stagnant in real terms since the start of the decade. Furthermore, current expenditure has exceeded current income for the bottom 4

quintiles since the 1990s and since most of the population had not seen an increase in their incomes, spending was sustained with credit. Two measures which show the effect of credit on the economy: the Annual Financial Obligations Ratio and the ratio of household debt to GDP have both risen by approximately 5% since 1980 (Dore and Singh, 2009). Non-revolving credit and revolving credit have also grown significantly since 1993. Revolving credit in particular sustained a large portion of the effective demand since consumers were able to borrow repeatedly even in cases where they didn't need to. As a result, over 50 percent of sales can be attributed to credit and only 2% due to disposable income. Hence, when credit dried up aggregate spending also declined sharply. Upon realizing that much of the securitized debt was of poor quality, financial market valuations around the world began to fall. With rising risk premia, banks were hesitant to provide credit for investment and even for meeting payroll purposes. This curtailment of credit was unexpected and large in magnitude; the actual decline in credit was over five times the one standard deviation shock produced from the VECM. With the curtailment of credit, commerce came to a grinding halt- the recession had begun and because the exposure to securitized debt was global in character, the recession was also global in scope. It affected all the major countries whose capital markets were well integrated with the New York capital market.

Conclusion:

We began with a purely "statistical" model, and no a priori economic assumptions were made. We also demonstrate that *institutional change* can be analyzed in a quantitative way; we did this by showing structural breaks that reflected deregulation of the financial markets. Our VECM model clearly established the causal dynamic and long term relationships among some key macroeconomic variables, such as aggregate spending, disposable income, credit, and corporate profits. The novel feature in the VECM was the demonstration of the role of credit in the circular flow of income. Without imposing a theoretical model, the VECM identifies the key variables and their dynamic interactions: we showed that aggregate spending depends on disposable income and that the latter also depends on spending. Next it was shown that disposable income increased the availability of credit which then increases spending. Aggregate spending also raises profits which in turn raises disposable income. These dynamic interactions provide new hypotheses about the dynamic interactions of macroeconomic

variables. Some of these dynamic interactions bear an affinity to Keynesian macrodynamics. However the important element here is the generation of new hypotheses about macrodynamics. It is these new hypotheses presented here that need to be verified or refuted. In this way one can determine if the dynamic interactions found here can also be found in the data of other developed countries. In particular it is important to determine how general is the crucial role of credit, demonstrated in this VECM, in maintaining aggregate spending. Finally we show that the decline in credit played a decisive role in the financial downturn and the ensuing Great Recession of 2007/09.

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