Do Financial Activities Affect Stock Volatility?

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Abstract

This paper re-examines the relation of stock volatility with those of macro-finance variables using data from 1950 to 2008. While confirming the findings in previous studies, in particular, the evidence of the greater stock return variability in economic downturn, it shows that much of the volatility is attributable to financial market activities since mid-1980s. It is argued that predictors of financial market activities can help to better explain stock volatility.

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1. Introduction

Stock price behavior presents two major puzzles in financial economics. One is that the magnitude of expected excess return is much too high relative to bonds, the equity premium puzzle (Mehra and Prescott (1985), Barro(2006)). The other is aggregate stock return volatility is far too excessive to be subsequent dividends, that is, the volatility puzzle (Shiller (1981), LeRoy and Porter (1981), Keim and Stambaugh (1986), Campbell and Shiller (1988), Cochrane (1992), Hodrick (1992)).

The standard finance theory suggests an obvious linkage between the two evidences, though no formal theory exists. A casual observation of historical data indicates the linkage may not be stable (See Figure 1), as real business condition or expected stock return could not have been so volatile. Thus it is more likely that the market price for risk appears to be non-stationary. Stock volatility seems to be more puzzling since the volatilities of key macroeconomic variables have been falling substantially in recent years, so called a great moderation (See Figure 2).

Since, theoretically, a stock price is considered to be the future cash flows generated, it is natural to think of aggregate stock volatilty should reflect volatilities of macroeconomic variables. Previous studies have attemted empirically to show the linkage, but with little success. For example, an extensive research by Schwert (1989) on time-varying stock volatility found that its relation with macroeconomic volatilities is weak, but it becomes significantly high in the periods of economic downturn. The latter phenomenon has been confirmed by other researches (Officer (1973), Pindyck (1984), Poterba and Summers

(1986), Roll and Ross (1986), Barro (1990), Anderson et al (2005), Guo and Savickas (2005)).

The evidence has been given a theoretical interpretation, either by an increased uncertainty of business condition (Barro (1990), Hamilton and Lin (1996), Wachter (2008)), or by a greater risk aversion (Abel (1991)) during a recession.

However, these explanations are not consistent with the fact that volatility remains significantly high in the relatively tranquil and expansionary period since mid-1980s up until the current recession started late 2007 (See Figure 2). The data also seems to indicate an implied market risk premium has been decreased significantly in the same period (See Figure 3). It should be noted that, in this period, banking industry and financial markets have undergone dramatic changes with a spectacular growth of securitized assets, and of financial derivatives trading. Most of the increased financial activities in this period are attributed to the financial innovations initiated by investment banking sectors.

There are two potential reasons why these financial activities may contribute the stock volatility. One is the liquidity effect as they are considered to be both the cause and effect of increasingly efficient financial trading. Mortgage backed security, MBS, is a clear example. This tends to lead to more trading. The other is information effect as these financial activities tend to increase the flow of information. The two effect may reduce or increase stock volatility, as explained in more detail in section 4 below.

This paper has two major purposes. One is to re-examine the stock volatility relation with macro/finance variables, focusing on the period after mid-1980s. The other is to study if stock volatility is affected by the changes in financial market conditions. I

proceed as follows. Next section describes the data used, and discusses their properties. Section 3 analyzes the stock volatility relation, and examines if and how it is affected by financial market conditions. Section 4 shows if and how the volatility relation can better explained by including financial activities, such as trading of securitized assets. Section 5 concludes.

2. Data

I use daily and monthly S&P 500 index data for aggregate stock return, dividend yield data compiled by Professor Shiller. All other macro/finance data are obtained from the Federal Reserve data base, including the Livingston survey data compiled by Philadelphia Fed.

Using daily stock index data I compute estimates of stock volatility. The first is the standard deviation of realized daily returns, termed unconditional standard deviation, is computed by the sum of squared deviation of daily stock return from its mean

$$\widehat{\sigma}_{\mathrm{t}}^{2} = \sum_{i}^{N_{\mathrm{t}}} r_{it}^{2} \qquad (1)$$

, where N_t is the number of trading days in month *t*. The second, conditional volatility is computed from monthly stock return by the following Schwert (1989). First, monthly stock return, r_t^m , is fitted on 12-month auto regressive terms and monthly dummies, D_{kt} , to allow different monthly means

(i) $$r_t^m = \sum_{k=1}^{12} D_{kt} + \sum_{i}^{12} \beta_i r_{t-i}^m + \varepsilon_t \qquad (2a)$$

Then, absolute values of residuals $\mid \hat{\varepsilon}_t \mid$ are regressed similarly

(ii) $$\mid \hat{\varepsilon}_t \mid = \sum_{k=1}^{12} \gamma_k D_{kt} + \sum_{i=1}^{12} \rho_i \mid \hat{\varepsilon}_{t-i} \mid + u_t \qquad (2b)$$

The fitted value of residuals, the regressands can be considered as conditional volatility of monthly stock returns.[1]

For macroeconomic volatilities I compute conditional standard deviations for industrial production, producer price index, and monthly growth, applying the same procedure as in equation (2a), (2b) above to the monthly data of these series.

Stock volatility may reflect volatilities of future macroeconomic volatilities (Schwert (1989), which may be captured by diversity of market participants' forecasts. Best known of these, Livingston survey data, reports individual forecasts as well as their medians for key economic variables.[2] As a proxy for a volatility of a macro variable I construct the cross sectional standard deviation of the variable.

Table 1 summarizes characteristics of these data as well as those of derived series. Figure 3 compares the two estimators of stock volatilities, the unconditional standard deviation based on daily returns and conditional standard deviation based on monthly data appear to move in a similar way. Figure 4 shows a spectacular growth of financial activities, namely securitizing and investment banking activity.

Contrasting movements of excess stock return and stock volatility, as shown in Figure 5, deserves a special attention. The ratio of the former to the latter, which will be referred to as an implied market price for risk, changes significantly from time to time, in particular, becomes significantly lower during the period from early 1980 to early 2000. Indeed the test for the equality of the implied market price for risk is strongly rejected.

[1] See Schwert (1989) for detail.

[2] Livingston survey collects forecasts of 16 economic variables from some fifty experts representing academia, financial institutions and governments twice a year since 1947.

3. Re-examination of Stock Volatility Regressions

3.1 Stock Volatility and Future Business Condition

It is generally accepted stock market predicts future business condition. Therefore, stock volatility should reflect uncertainty in future business condition as well. Previous studies have tested the relation of stock volatility with macroeconomic volatilities. To confirm and replicate those results, the following regression equation is estimated on the data from 1950 to 2008

$$vol_t = \alpha_0 + \alpha_d d_t + \beta_{ipi} vipi_t + \beta_{mg} vmzm_t + \beta_{ipi} vppi_t + \beta_{bts} bts_t + \varepsilon_t \quad (3)$$

, where stock vol_t is regressed on recession dummy, d_t , industrial production growth volatility, $vipi_t$, money stock growth volatility, $vmzm_t$, producer price inflation volatility, $vppi_t$, leverage, bts_t .

The regression is estimated on realized volatility and on conditional volatility for the whole sample period, and for the sub-period of 1983-2008. This sub-period is characterized by unprecedented level of financial market activities that includes periods of financial market turmoil such as S&L debacle in mid-1980s and current financial crisis. Co-incidentally it is also a period of major financial deregulation, starting with Monetary Control Act of 1980 and culminating with Gram-Bliley-Leach Act of 1999.

There have been eight recession periods since 1950 according to NBER definition[3], and estimated coefficient $\alpha_0 + \alpha_d$ indicates extra volatility in recession. For money stock growth MZM measure is used instead of monetary base to better account for liquidity. Leverage variable is the ratio of debt to net worth for nonfarm, nonfinancial firms.[4] To interpolate the quarterly leverage ratio into monthly level it is multiplied by $\frac{1+r_{t+j}}{1+y_{t+j}}$, *j=1,2*, where r_t, y_t are monthly S&P return, and prime loan rate.

Regression results shown in Table 2 in general confirm those of previous researches, for example Schwert (1989).[5] Industrial production volatility does have a significant positive effect, and those of money stock growth or inflation are insignificant. The overall relation seems to be weak with relatively small R^2 value, only around 0.08-0.15.[6] Compared with those of the sub-period, overall-period models substantially lose explanatory power. Inclusion of a dummy variable appears to improve explanatory power somewhat, but the leverage variable and the recession dummy then lose power.

[3] These were 1953-1954, 1973, early 1980, 1990, and current that started late 2007. See NBER for starting and ending months for these recessions.

[4] To interpolate the quarterly leverage ratio into monthly level it is multiplied by $\frac{1+r_{t+j}}{1+y_{t+j}}$, j=1,2, where r_t, y_t are monthly S&P return, and prime loan rate.

[5] Schwert's multiple regression is log-linear except for the recession dummy. Though not reported here, the results of my log-linear model are similar to the ones reported here.

[6] The multiple regression model like equation (3) may include additional predictors like interest rates or dividend yields. Such a model has been tested, but the improvements in explanatory power is only marginal, and may suffer from endogeneity and collinearity problem. I omit those results.

These evidences strongly indicate regression models represented by equation (3) may be inadequate at lest in the period after mid-1980s.

There are two other notable differences however. One is that the coefficients for leverage remains insignificant overall, but significantly negative in the sub-period. The latter part contradicts with those predicted by Black (1976) or Christie (1982). The other is that greater volatility in recession does not seem to occur in the sub-period, thus contradicting predictions by Officer (1973) or Abel (1999). Note that the two anomalies is more evident in the sub-period[7], where a great deal of financial activities and a great moderation have been taking place at the same time. In sum the unusual behavior of stock volatility, especially in the period since mid-19080s, must be accounted for.

3.2 Stock Volatility and Business Forecasts

The validity of volatility testing hinges on the accuracy or adequacy of the predictors of future business conditions. Since explanatory variables in equation (3) for the most part conditional predictors based on the past observation, they may not reflect true uncertainty in future business condition.

Recently Campbell and Diebold (2005) explored the use of Livingston forecast data as a more direct predictor of future business condition. Using Livingston forecasts of real GDP growth rate together with dividend yield, consumption-wealth ratio, term premia and default premia, they have shown that the volatility of stock return can be better

[7] In Schwert (1989), the most comprehensive empirical study on volatility, the sub-period is only marginally overlapped.

explained. Their regression model indicates an improved explanatory power with R^2 value of 33 percent. But much of the added explanatory power comes from the forecasts of a much less volatile GDP forecast, and consumption-wealth ratio.

To test if a more direct predictors than conditional volatilities of explanatory variables in equation, I replace those volatilities in equation (3) by predictors constructed from Livingston Survey data as follows

$$vol_t = \alpha_0 + \alpha_d d_t + \beta_{ipi}\, sdipi_t + \beta_{mg}\, sdmzm_t + \beta_{ipi}\, sdcpi_t + \ + \beta_{bts}\, bts_t + \ \varepsilon_t \qquad (4)$$

, where *sdip, sdmzm, sdcpi* denote standard deviations of forecast of industrial production index, money stock growth, and producer price inflation respectively.[8]

Since Livingston survey data does not provide reliable historical data for money stock and producer price inflation, alternative model to equation (4) below is also tested

$$vol_t = \alpha_0 + \alpha_d d_t + \beta_{gdp}\, sgdp_t \ + \beta_{bts}\, bts_t + \ \varepsilon_t \qquad (5)$$

, where *sgdp* denotes standard deviation of forecast nominal GDP growth. The standard deviations of the repressors based on Both 6-month ahead forecasts and 12-month forecasts are used.

Table 4 summarizes the regression results. While overall explanatory power improves somewhat, most of improvement does not come from the inclusion of forecast standard

[8] Due to the lack of data for producer price inflation consumer price inflation is used instead in equation (4)

deviations, implying direct measure of future business condition by itself is not likely to be the cause.

4. Stock Volatility and Financial Market Activities

As observed earlier stock volatility is significantly and positively related with volatility in real sector which is captured by the volatility of industrial production. However, its magnitude is too large to be explained by the real sector volatility alone, nor can be explained by more direct predictor of the real sector volatility. Furthermore, it appears that much of the stock volatility occurred in the period since early 19080s.

Therefore it should be worthwhile to focus on the events that have happened in that period, notably a great resurgence in the financial market activities. Undoubtedly they are facilitated by financial innovations such as financial derivatives and asset backed securities, namely, ABS. In this sense they are technology-driven.

Another impetus has been abundant liquidity provided either by loose monetary policy or global imbalance. According to this theory, since late 1980s, a lax monetary policy combined with steady flow of foreign capital into U.S. market is believed to be responsible to the housing market bubble that eventually broke down financial markets in recent years. In that sense they are policy-driven.

These forces may have undoubtedly contributed to the spectacular rise in the ABS business and investment banking business. One way to capture their growth is look at

Proportion of ABS, and of and total credit owed by investment banking sector to the total credit balance of financial sector. Figure 3 clearly shows their growth since early 1980s.

As observed above these financial activities may affect the stock volatility in two ways. They may increase the overall liquidity and the flow of information. For one thing the increased liquidity tends to encourage more trading, in particular more speculative activities, leading to a higher volatility. The information effect may affect the stock volatility in opposite ways. For example, trading of derivatives make the spot market trading more informationally efficient, thus it may reduce the stock volatility. Theoretical justification for derivatives takes this view. However, more trading may lead to a higher volatility due to the higher frequency of new information (Ross (1989), Cox (1979)), or to the presence of friction in spot market (Brorsen (1991)). The determination of overall influence is an empirical matter.

To estimate their impacts on stock volatility I add the two ratios to the basic regression model of equation (3)

$$vol_t = \alpha_0 + \alpha_d d_t + \beta_{ipi} vipi_t + \beta_{mg} vmzm_t + \beta_{ipi} vppi_t + \beta_{bts} bts_t + + \beta_{abs} abs_{t_t} + \beta_{ib} ib_t + \varepsilon_t \quad (6)$$

, where abs_{t_t} , ib_t denote the ratio of ABS to the total credit balance of financial sector, and of the total credit owed by investment banking sector to the total credit balance of financial sector respectively.

Regression results are summarized in Table 5. Industrial production continues to have strong explanatory power. In addition coefficients for ABS or IB appear to be somewhat significant, though not unambiguous for at least two reasons. Seemingly improved power of the regression may be misleading to interpret the significance of financial activities for at least two reasons. One is that the two variables may not capture all the significant financial activities. The other is the two variables may have co-linearity problem as well as endogeneity problem. For a practical matter the fact that they are available as quarterly data, their use may not fully reveal their true effects on stock volatility.

Potentially useful predictors of the two variables may be default premium and term premium since much of ABS products were developed to repackage risks associated with these indicators.[9] The activities of investment banks have been closely related with these risks as well.[10] In addition these two market indicators are shown to be predictors of future business condition (Fama and French (1988), Campbell and Diebold (2005))

Abstracting from theoretical relation, I estimate VAR regression of these variables to extract associations among, leverage, ABS, IB, default premium, and term premium using quarterly data. The results are shown in Table 6, Table 7 and Figure 5. While causality is not exactly unambiguous, a significant association of ABS, IB variables with DEF, TERM appears to exist. In particular, there exist strong indications that the movements in default premium are caused by the growth of asset backed securities,

[9] For example, CDS is a product to insure against default risks, and many CBOs are repackaging products of mortgage loans.

[10] Investment banks main business has been originating and distributing ABS securities.

which in turn is influenced by activities of investment banking.[11] The VAR evidence also indicates that term premium is influenced, though weaker than the case of default premium, by the leverage. Utilizing these associations, the multiple regression equation (3) is readjusted as following.

$$vol_t = \alpha_0 + \alpha_d d_t + \beta_{ipi}\, vipi_t + \beta_{mg}\, vmzm_t + \beta_{ipi}\, vppi_t + \beta_{bts}\, bts_t +$$

$$\beta defbts + \beta termbts + \varepsilon t \qquad (7)$$

The regression estimates of above equation are reported in Table 8. Compared with original regressions I equation (3) or (4), the overall explanatory power of equation (7) is improved only slightly. However, those of individual regressor are unmistakably clear.

In all regressions the effect of industrial production volatility is significantly positive, more so in the sub-period of 1983-2008. Unlike the original regression regressors mostly associated with financial markets, namely money stock growth and leverage now have significant explanatory power. Since money stock variable MZM is closely associated with liquidity, it appears that higher money stock volatility is likely to reduce stock volatility,. On the other hand higher inflation volatility seems to indicate higher stock volatility for realized volatility in the overall period, but in other cases it shows negative effects. Therefore, it is ambiguous.

[11] See the granger causality for IDEF displayed in Table 7. A strong causality also is present for IABS, which is influenced by IIB. These two causalities suggest IDEF is a good candidate for a proxy representing these two variables. It is also can be verified in the VAR output for IDEF.

The effects of leverage also appear to be positively significant in the sub-period, but not in the overall period. Therefore, the higher leverage is, the higher will be stock volatility at least since 1980s. This is consistent with the prediction of Black (1976) and Christie (1982).

The effects of default premium are significantly positive in all cases. Since it is positively related with default risk, the higher anticipated default risk is likely to cause higher stock volatility. Combined with the evidence in the VAR estimate above, it could also be said that active financial market activities, in particular, those of asset backed securities and of investment banking.

Note that sharply different evidences for financial activities, as represented by liquidity, leverage, or default risk, only become significant in the sub-period. This may also be interested the reason why the effect of recession appears to be insignificant. As noted earlier, the tremendous growth in financial markets activities did not occur until 1980s, and there has not been major recessions during the period until the current financial crisis started in late 2007. Another clue to this reasoning can be found in the significantly lower market risk premium, as implied by the empirical observation in this period (See Figure 2). It may be argued that the great surge in financial activities are related with lower risk aversion in the period. As the findings in this paper do not provide a causality between stock volatility and financial activities, they could be considered as starting point to a further investigation.

5. Conclusion

Much of modern financial theories revolve around the idea the return-risk trade-off. While successful in analyzing and managing individual assets, they provide little economic insights to the problem of aggregate risk, for example, the problem of excessive stock volatility, leaving much to be explained in macroeconomic theories. Recent researches have shown the volatility can be explained somewhat by the volatilities in real macroeconomic variables, but the evidences are weak. Most of the studies confirm a significantly higher volatility in economic downturn, but much remains to be explained.

This paper showed that activities in financial markets may have contributed to the stock volatility at least since mid-1980s, in that the inclusion of the proxy variables representing these financial activities not only explains the stock volatility better but also, without them, the macroeconomic volatilities lose explanatory power. I argue that the clear association of the volatility with financial activities does call for a need to focus more attention to the issue of macro/finance interface.

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Table 1. Summary Statistics for Monthly Volatilty Series, Leverage, Default Premium, and Term Premium

	Mean	Median	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Sample size
Sample period: 1950:1 - 2008:12								
vol1	3.7713	2.7069	40.0674	0.0070	3.9108	3.2438	21.3293	575
vol2	3.1366	3.1427	5.9432	1.3142	0.7681	0.3196	3.1349	575
vipi	0.5485	0.5337	1.3519	0.1754	0.1798	0.7955	4.3600	575
vmzm	0.3121	0.2724	2.2166	0.0750	0.1869	3.4979	27.0286	575
vppi	0.4818	0.3886	2.3414	-0.0019	0.3233	2.3178	10.3396	575
bts	1.3403	1.4179	2.1210	0.5732	0.3837	-0.3600	1.9601	575
def	1.0045	0.8900	3.3800	0.3200	0.4436	1.5557	6.3241	575
term	1.4187	1.3600	4.4200	-2.6500	1.2518	-0.1652	2.5951	575
Sample period: 1983:1 - 2008:12								
vol1	4.2950	3.1795	40.0674	0.0070	4.4440	3.2182	19.8417	312
vol2	3.1422	3.1410	5.9432	1.3142	0.7785	0.2504	3.0573	312
vipi	0.5174	0.5088	1.3519	0.1754	0.1692	0.8112	4.8871	312
vmzm	0.3379	0.3015	2.2166	0.0847	0.2021	4.2037	32.4025	312
vppi	0.5096	0.4097	2.0954	-0.0019	0.3236	1.7235	7.0699	312
bts	1.5729	1.5655	2.1210	1.1345	0.2050	0.1790	2.3398	312
def	0.9952	0.9100	3.3800	0.5500	0.3622	2.1657	12.3769	312
term	1.8500	1.8800	3.7600	-0.5300	1.1398	-0.1568	1.8410	312

Variables used:
vol1,vol2 : realized volatility and conditional volatility of stock returns, monthly
vipi, vmzm, vppi : conditional volatilities of industrial production, money stock growth, and producer price index inflation resp., monthly
bts : debt to equity ratio
def : default premium, the difference between yields on BB corporate bond and on 3-month treasury bill
term: term premium, the difference between yields on BB corporate bond and on AA corporate bond
rec : dummy variable for period of recession (rec=1 recession, 0 otherwise)

Table 2. Regressions of Stock Return Volatility

				Realized Volatility			
vipi	vmzd	vppi	BTS	REC	dsec	R-sq	Incl. Obs.
	Sample(adjusted): 1961:02 2008:12						
3.2042*	-0.1561	1.6761	0.6724	1.1617**		0.074629	575
(2.6670)	(-0.1921)	(1.7632)	(1.7543)	(2.1177)			
2.3195**	0.8110	-0.5670	-0.8597	1.5703	1.8015*	0.064035	575
(2.4610)	(-1.2468)	(-0.2522)	(-2.6735)	(1.7028)	(2.4774)		
	Sample: 1983:01 2008:12						
5.959824*	-1.3133	-0.3711	-4.4796*	2.5074**		0.15045	312
(2.4610)	(-1.245)	(-0.2522)	(-2.6734)	(1.7028)			

				Conditional Volatility			
vipi	vmzd	vppi	BTS	REC	dsec	R-sq	Incl. Obs.
	Sample(adjusted): 1961:02 2008:12						
1.181167*	0.0391	0.1445	0.0786	0.0949		0.092347	575
(6.0410)	(0.2337)	(1.3143)	(0.9685)	(0.8399)			
1.203234*	0.5306	0.0427	0.1016	0.0952	0.0543**	0.139466	575
(3.6143)	(1.9313)	(0.2447)	(0.5602)	(0.4975)	(0.4328)		
	Sample: 1983:01 2008:12						
1.71159*	-0.0996	-0.3063	-0.5880*	0.0942		0.154657	312
(6.7071)	(-0.5623)	(-1.8343)	(-2.8000)	(0.5297)			

Variables used:

vol1,vol2 : realized volatility and conditional volatility of stock returns, monthly
vipi, vmzm, vppi : conditional volatilities of industrial production, money stock growth, and producer price index inflation resp., monthly
bts : debt to equity ratio
def : default premium, the difference between yields on BB corporate bond and on 3-month treasury bill
term: term premium, the difference between yields on BB corporate bond and on AA corporate bond
rec : dummy variable for period of recession (rec=1 recession, 0 otherwise)
dsec : dummy variable for period (dsec=1 after 1983, 0 otherwise)

Notes

*, ** indicate significance at 1 percent level, 5 percent level. Figures in parentheses are t-values.
*1: To account for heteroskedasticity and autocorrelation Newey-West correction was used.

Table 3 Correlation Matrix

	VOL1	VOL2	VIPI	VMZM	VPPI	BTS	DEF	TERM	REC
VOL1	1								
VOL2	0.201313	1							
VIPI	0.176073	0.288204	1						
VMZM	0.038703	0.048994	0.077195	1					
VPPI	0.20742	0.125595	0.171124	-0.0139	1				
BTS	0.035923	-0.00096	-0.14664	0.314059	-0.04214	1			
DEF	0.192566	0.236835	0.247451	0.452601	0.179193	0.345305	1		
TERM	-0.00024	0.057619	-0.0206	0.131392	-0.16832	0.316707	0.264651	1	
REC	0.184969	0.114585	0.1583	0.165606	0.479568	-0.0027	0.401991	-0.18609	1

Variables used:

vol1,vol2 : realized volatility and conditional volatility of stock returns, monthly
vipi, vmzm, vppi : conditional volatilities of industrial production, money stock growth, and producer price index inflation resp., monthly
bts : debt to equity ratio
def : default premium, the difference between yields on BB corporate bond and on 3-month treasury bill
term: term premium, the difference between yields on BB corporate bond and on AA corporate bond
rec : dummy variable for period of recession (rec=1 recession, 0 otherwise)

Table 4 . Stock Volatility and Business Forecasts

gdp6	gdp12	sdipi6	sdcpi6	bts	def	rec	R-squared	Obs
0.038983				-0.29133		4.38429*	0.121449	114
(0.21551)				(-0.30755)		(3.83947)		
	0.074851			-0.29776		4.38647*	0.121737	114
	(0.28731)			(-0.31667)		(3.84333)		
		-0.83696	-3.027**		3.6912*	3.34851*	0.24851	114
		(-0.8434)	(-1.6043)		(4.14884)	(2.74854)		

Variables used:

gdp6, gdp12 : standard deviation of Livingston forecast of GDP 6-month ahead, and 12-month ahead
sdipi6 : standard deviation of Livingston forecast of industrial production 6-month ahead
sdcpi6 : standard deviation of Livingston forecast of consumer price inflation 6-month ahead
bts : debt to equity ratio
def : default premium, the difference between yields on BB corporate bond and on 3-month treasury bill
term: term premium, the difference between yields on BB corporate bond and on AA corporate bond
rec : dummy variable for period of recession (rec=1 recession, 0 otherwise)

Notes

*, ** indicate significance at 1 percent level, 5 percent level. Figures in parentheses are t-values .

Table 5. Stock Return and Financial Activities, Quarterly

vipi	vmzm	vppi	bts	rec	dsec	abs	ib	R-squared	Obs.
	Realized volatility								
	1950:1-2008:4								
3.5283**	-0.0109	-0.1747	0.1834	1.0126	1.2140	-3.7903**	0.1237**	0.1800	190
(1.9071)	(-0.0070)	(-0.1714)	(0.1244)	(1.1233)	(1.0414)	(-2.4382)	(2.0061)		
	1983:1-2008:4								
5.7389**	-0.3009	2.4082	0.9564	-0.3090		-3.2980	0.1260	0.1734	109
(1.9506)	(-0.1701)	(1.4766)	(0.2054)	(-0.2411)		(-1.2427)	(0.9607)		
	Conditional volatility								
	1950:1-2008:4								
1.3735*	0.5730**	0.1717	-0.0353	0.1195	0.7001*	-0.4806	-0.0216**	0.1939	190
(4.4225)	(1.9474)	(0.9729)	(-0.1605)	(0.7267)	(3.0760)	(-1.5960)	(-1.9679)		
	1983:1-2008:4								
0.1276**	-0.0709	0.3410**	-0.0558	-0.0803		0.0123*	0.0057*	0.1497	109
(2.1822)	(-1.2957)	(2.2171)	(-1.2983)	(-1.5163)		(-2.4250)	(2.8913)		

Variables used:

vol1,vol2 : realized volatility and conditional volatility of stock returns, monthly
vipi, vmzm, vppi : conditional volatilities of industrial production, money stock growth, and producer price index inflation resp., monthly
bts : debt to equity ratio
def : default premium, the difference between yields on BB corporate bond and on 3-month treasury bill
term: term premium, the difference between yields on BB corporate bond and on AA corporate bond
rec : dummy variable for period of recession (rec=1 recession, 0 otherwise)
dsec : dummy variable for period (dsec=1 after 1983, 0 otherwise)
abs : the ratio of asset backed security to the total asset of financial sector
ib: the ratio of assets of investment banks to the total asset of financial sector

Notes

*, ** indicate significance at 1 percent level, 5 percent level. Figures in parentheses are t-values .

Table 6 Vector Autoregression Estimates of ABS, IB, Term Premium, and Default Premium, Quarterly

	IDEF	ITERM	IBTS	IABS	IIB
IDEF(-1)	-0.08266	0.47942	-0.01288	0.022909	-0.19495
	[-0.71076]	[1.22559]	[-0.67130]	[0.25292]	[-0.71679]
IDEF(-2)	-0.03017	0.197517	-0.02769	0.161333**	0.03704
	[-0.26936]	[0.52432]	[-1.49877]	[1.84954]	[0.14142]
ITERM(-1)	0.012032	0.202286	-0.01003**	0.044841**	-0.10745
	[0.36024]	[1.80056]	[-1.82072]	[1.72371]	[-1.37554]
ITERM(-2)	0.019045	0.158458	0.008615**	-0.03129	-0.02075
	[0.55683]	[1.37737]	[1.52704]	[-1.17445]	[-0.25946]
IBTS(-1)	0.860953	-1.6612	0.080537	0.542486	2.217907
	[1.33505]	[-0.76582]	[0.75714]	[1.08005]	[1.47059]
IBTS(-2)	0.056935	-4.36531**	-0.01139	0.080423	-0.21616
	[0.08741]	[-1.99235]	[-0.10604]	[0.15852]	[-0.14190]
IABS(-1)	0.590097*	0.360183	-0.00916	-0.70143	-0.37238
	[4.65307]	[0.84436]	[-0.43767]	[-7.10133]	[-1.25555]
IABS(-2)	-0.17105	0.501901	-0.0237	0.448217	-0.23902
	[-0.84491]	[0.73705]	[-0.70962]	[2.84262]	[-0.50484]
IIB(-1)	-0.07731**	0.026559	-0.00236	-0.01523	0.450643
	[-1.64631]	[0.16815]	[-0.30503]	[-0.41644]	[4.10361]
IIB(-2)	0.00299	-0.01615	0.004078	-0.0954*	0.259311
	[0.06101]	[-0.09796]	[0.50450]	[-2.49942]	[2.26251]
C	0.023212	-0.02081	-0.00271	0.047418	0.065403
	[1.17273]	[-0.31254]	[-0.83136]	[3.07584]	[1.41289]
R-squared	0.366669	0.152576	0.086522	0.552936	0.475835
F-statistic	5.036893	1.566408	0.824042	10.76032	7.897818

Variables used:

ibts = $bts_t - bts_{t-1}$, $idef_t = def_t - def_{t-1}$, *iterm* = $term_t - term_{t-1}$,

iabs = $abs_t - abs_{t-1}$, *iib* = $iib_t - iib_{t-1}$

bts: debt to equity ratio

def : default premium, the difference between yields on BB corporate bond and on 3-month treasury bill

iterm: term premium, the difference between yields on BB corporate bond and on AA corporate bond

iabs : the ratio of asset backed security to the total asset of financial sector

iib: the ratio of assets of investment banks to the total asset of financial sector

Notes

*, ** indicate significance at 1 percent level, 5 percent level. Figures in parentheses are t-values .

Table 7. Pair-wise Granger-Causality

Dependent variable: IDEF				Dependent variable: ITERM			
Exclude	Chi-sq	df	Prob.	Exclude	Chi-sq	df	Prob.
ITERM	0.574858	2	0.7502	IDEF	1.657177	2	0.4367
IBTS	1.834967	2	0.3995	IBTS	4.932228	2	0.0849
IABS	31.61945	2	0	IABS	0.884067	2	0.6427
IIB	3.596341	2	0.1656	IIB	0.028408	2	0.9859
All	49.79919	8	0	All	6.408908	8	0.6015

Dependent variable: IBTS				Dependent variable: IABS			
Exclude	Chi-sq	df	Prob.	Exclude	Chi-sq	df	Prob.
IDEF	2.50838	2	0.2853	IDEF	3.423594	2	0.1805
ITERM	4.546668	2	0.103	ITERM	3.565115	2	0.1682
IABS	0.524954	2	0.7691	IBTS	1.24151	2	0.5375
IIB	0.256802	2	0.8795	IIB	10.35486	2	0.0056
All	8.120428	8	0.4218	All	22.93366	8	0.0035

Dependent variable: IIB			
Exclude	Chi-sq	df	Prob.
IDEF	0.562348	2	0.7549
ITERM	2.276955	2	0.3203
IBTS	2.162793	2	0.3391
IABS	1.578011	2	0.4543
All	6.220944	8	0.6225

Variables used:
ibts = $bts_t - bts_{t-1}$, $idef_t = def_t - def_{t-1}$, *iterm* = $term_t - term_{t-1}$,
iabs = $abs_t - abs_{t-1}$, *iib* = $iib_t - iib_{t-1}$

Table 8. Volatility Regression with Predictors of Financial Market Activities

vipi	vmzm	vppi	bts	def	term	rec	R-sqr.	Obs.
		Realized Volatility: 1950:1-2008:12						
2.6204*	-0.92255	1.665*	0.311624	1.101**	-0.00291	0.684156	0.0837	575
(2.78939)	(-0.95424)	(2.955714)	(0.656681)	(2.281537)	(-0.02055)	(1.110625)		
		Realized Volatility: 1983:1-2008:12						
4.6141*	*-3.3158	-1.5983	*-5.2321	*3.5974	-0.28773	1.610922	0.2020	312
(3.16673)	(-2.65495)	(-1.68296)	(-3.97811)	(4.42537)	(-1.28482)	(1.481363)		
		Conditional Volatility: 1950:1-2008:12						
0.9892*	-0.20953	0.148047	*-0.0551	0.345746	0.019725	-0.04214	0.1191	575
(5.467205)	(-1.12529)	(1.364289)	(-0.60306)	(3.720381)	(0.722244)	(-0.35519)		
		Conditional Volatility: 1950:1-2008:12						
1.6149*	-0.25901	**-0.3820	*-0.6488	0.251977	-0.00511	0.021859	0.1635	312
(6.179282)	(-1.15628)	(-2.24228)	(-2.75028)	(1.728194)	(-0.12714)	(0.112069)		

Variables used:

vol1,vol2 : realized volatility and conditional volatility of stock returns, monthly
vipi, vmzm, vppi : conditional volatilities of industrial production, money stock growth, and producer price index inflation resp., monthly
bts : debt to equity ratio
def : default premium, the difference between yields on BB corporate bond and on 3-month treasury bill
term: term premium, the difference between yields on BB corporate bond and on AA corporate bond
rec : dummy variable for period of recession (rec=1 recession, 0 otherwise)

Notes

*, ** indicate significance at 1 percent level, 5 percent level. Figures in parentheses are t-values .

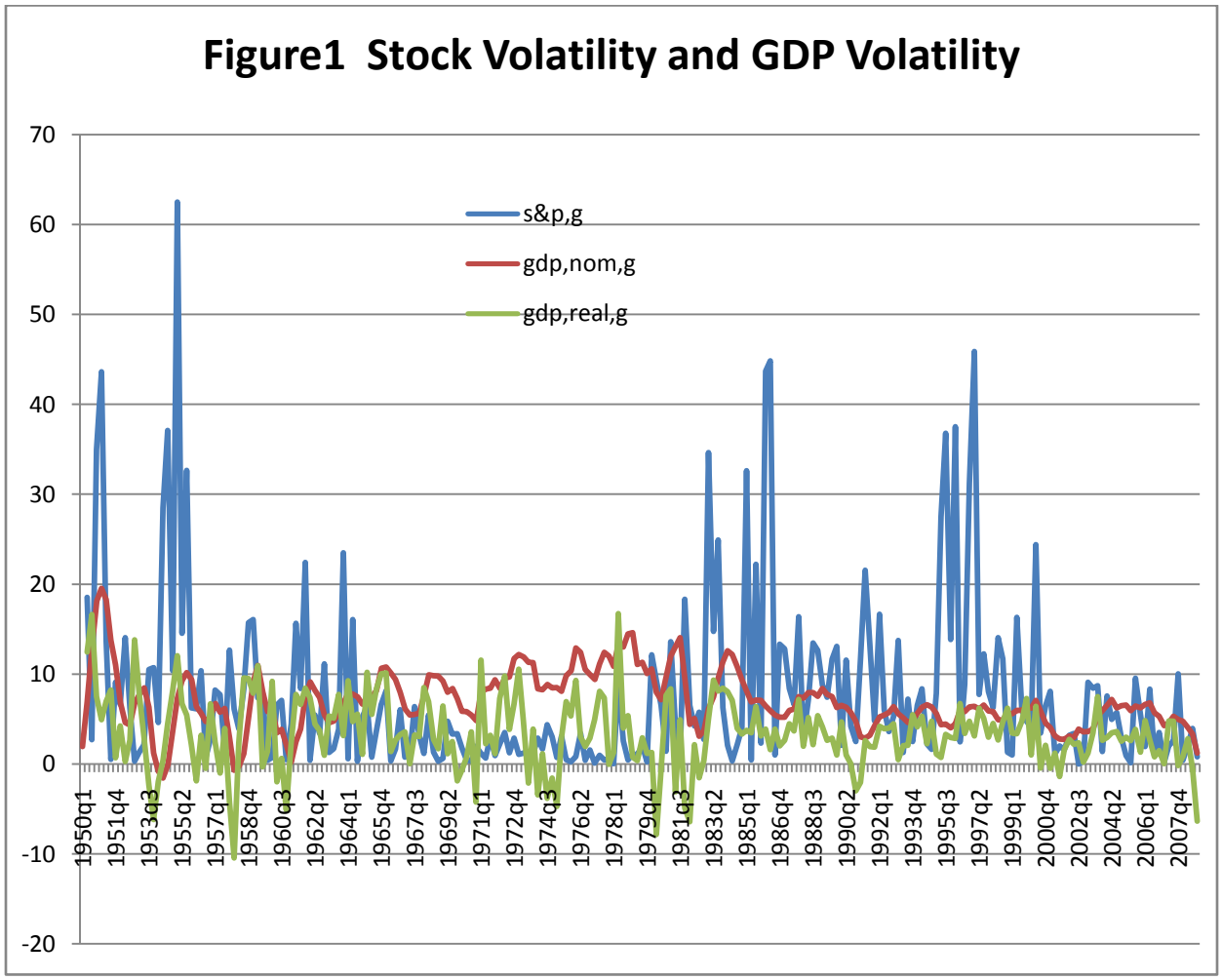
Figure1 Stock Volatility and GDP Volatility
s&p,g
gdp,nom,g
gdp,real,g
70
60
50
40
30
20
10
0
-10
-20
1950q1
1951q4
1953q3
1955q2
1957q1
1958q4
1960q3
1962q2
1964q1
1965q4
1967q3
1969q2
1971q1
1972q4
1974q3
1976q2
1978q1
1979q4
1981q3
1983q2
1985q1
1986q4
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1999q1
2000q4
2002q3
2004q2
2006q1
2007q4

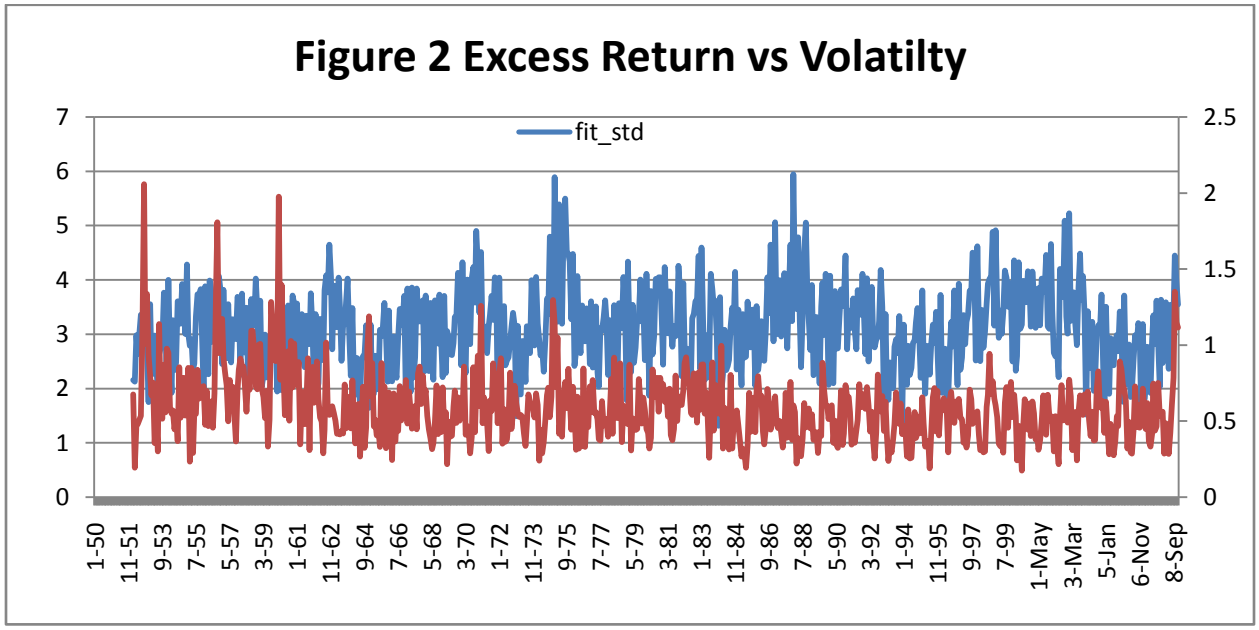
Figure 2 Excess Return vs Volatilty
fit_std
7
6
5
4
3
2
1
0
2.5
2
1.5
1
0.5
0
1-50
11-51
9-53
7-55
5-57
3-59
1-61
11-62
9-64
7-66
5-68
3-70
1-72
11-73
9-75
7-77
5-79
3-81
1-83
11-84
9-86
7-88
5-90
3-92
1-94
11-95
9-97
7-99
1-May
3-Mar
5-Jan
6-Nov
8-Sep

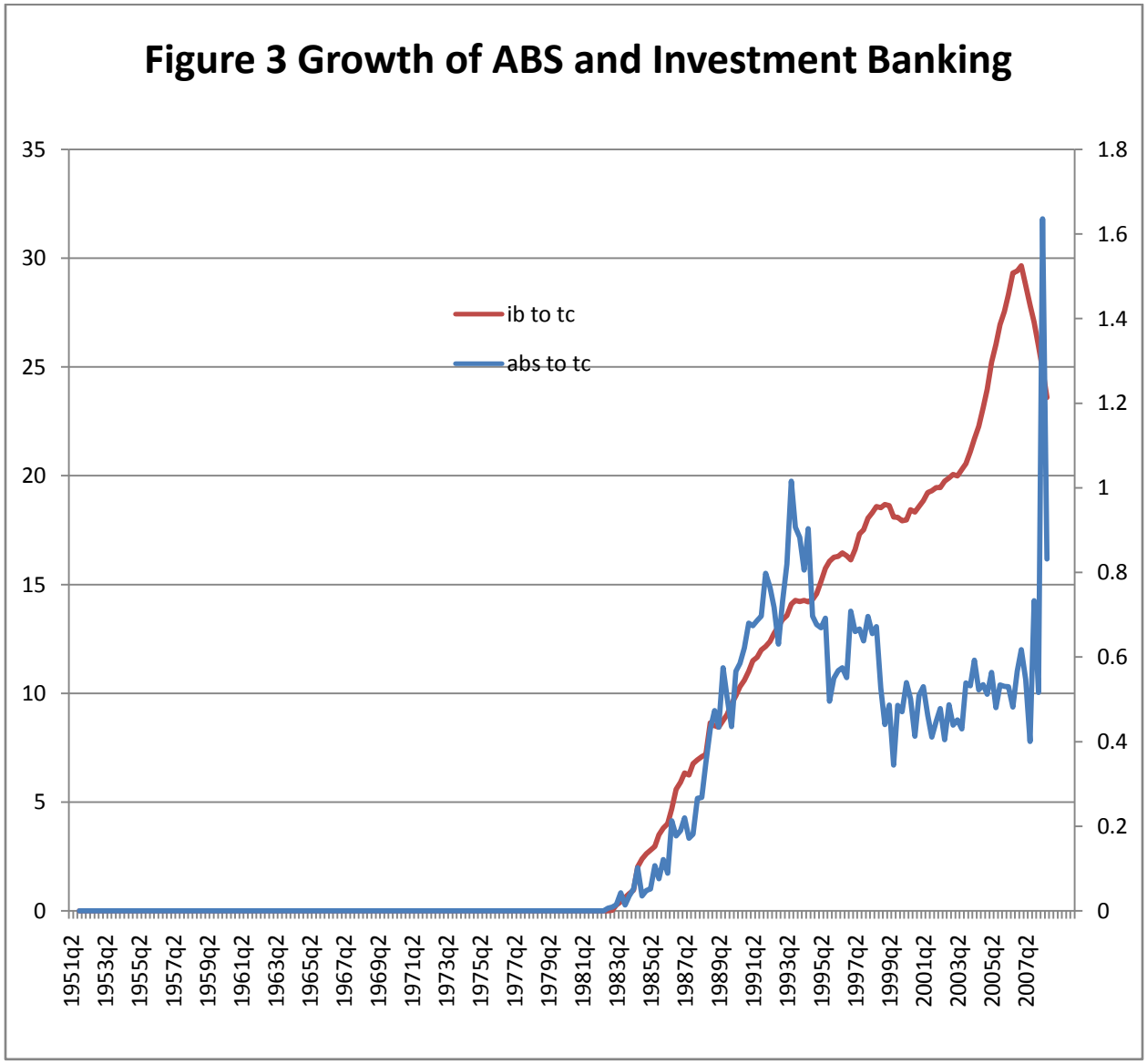
Figure 3 Growth of ABS and Investment Banking
35
30
25
20
15
10
5
0
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
ib to tc
abs to tc
1951q2
1953q2
1955q2
1957q2
1959q2
1961q2
1963q2
1965q2
1967q2
1969q2
1971q2
1973q2
1975q2
1977q2
1979q2
1981q2
1983q2
1985q2
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1989q2
1991q2
1993q2
1995q2
1997q2
1999q2
2001q2
2003q2
2005q2
2007q2

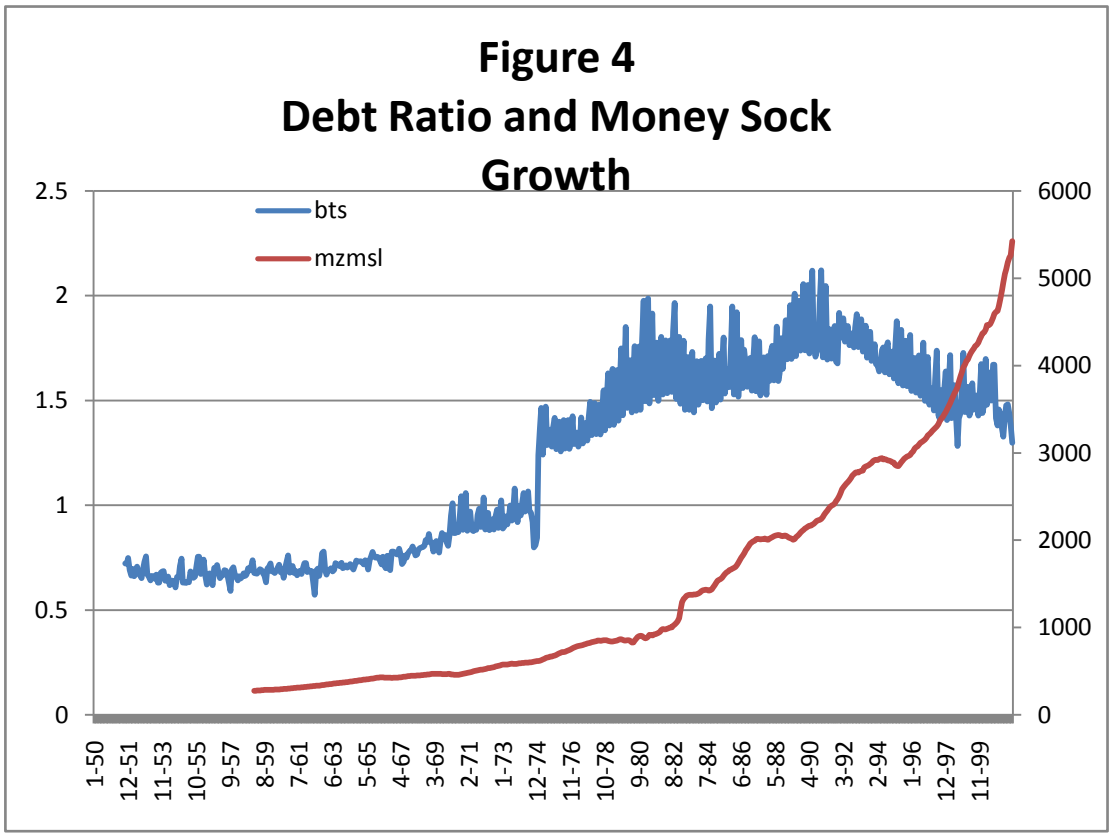
Figure 4
Debt Ratio and Money Sock Growth
bts
mzmsl
2.5
2
1.5
1
0.5
0
6000
5000
4000
3000
2000
1000
0
1-50
12-51
11-53
10-55
9-57
8-59
7-61
6-63
5-65
4-67
3-69
2-71
1-73
12-74
11-76
10-78
9-80
8-82
7-84
6-86
5-88
4-90
3-92
2-94
1-96
12-97
11-99

Figure 5 Impulse Responses of VAR estimates