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Stock Market Turmoil and Macroeconomic Disturbances in Japan**

– Lesson from the International Correlation of Stock Prices in the Summer of 2007 –

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In this paper, we investigate the effect of the subprime crisis on the Japanese economy. As estimated, subprime shocks, since the summer of 2007, may cause negative shocks in Japan through the decrease in stock prices and appreciation of the exchange rate. The fall in stock prices in the U.S. was transmitted to the Japanese market, thereby causing an appreciation in the yen/dollar exchange rates. The effect was not only on the financial markets but also on the real economy in Japan. These effects were verified by using the Structural VAR model in order to identify exogenous shocks with supply, bank lending, and demand shocks.

Keywords: International correlation of stock prices, EGARCH model, Structural VAR model, credit crunch, Yen-carry trade

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1. Introduction

In the summer of 2007, world financial markets faced serious financial turmoil. In the wake of defaulting subprime loans in the U.S., which are mortgage loans for lower-income borrowers, the stock price deteriorated rapidly, thereby resulting in the turmoil in financial markets not only in the U.S. but also in Europe and Japan. IKB Industry Bank and Sachsen State Bank (LB) in Germany, in particular, announced massive losses resulting from investment in securities that included securitized loans. Furthermore, on August 7, 2007, BNP Paribas did not comply with the withdrawal request of investors who had invested in mutual funds affiliated with the bank. This "Paribas shock" caused public fear that even a large deposit bank can incur massive losses[1]. In September, the Northern Rock, the fifth largest mortgage loan bank in the U.K., triggered a bank run[2]. A series of such financial turmoil is termed, in this paper, subprime problem or shock.

In addition, mutual and hedge funds, which invest in a variety of securities, such as securitized loans, fixed income securities and stocks, etc., rushed to sell their financial assets because of conservation of value and their cash crisis. Initially, they sold Private Label MBS (Mortgage Back Securities) and CDO (Collateralized Debt Obligation), followed closely by stocks in industrialized countries. This resulted in the appreciation of the yen/dollar exchange rates because of the dissolution of the "Yen-Carry-Trade," which involved the borrowing of funds in Yen from Japanese banks to invest in financial instruments with a higher return usually by institutional investors in the U.S.

In this paper, we examine the effects of the subprime shock on the Japanese economy. The subprime problem arose in the U.S. economy; however, other countries were also affected by it on account of the current trend of globalization. We focus on the effect of this problem only on the Japanese economy through empirical studies. Table 1 presents the accounts of major financial groups in Japan as of March 2008. It is evident from the following tables that the Japanese banking system also suffered losses related to the subprime shock, although banks in the U.S. suffered much more.

Furthermore, the stock price index of the Japanese market declined rapidly since October 2007, when the subprime crisis was worsening (Figure1-1). Moreover, the yen/dollar exchange rates were also appreciating since October 2007 (Figure1-

1) BNP Paribas did not accept the cancellation only because the fair value of stocks could not be calculated under the turmoil. However, the reaction of the public was rather sensitive.

2) On February 18, 2008, the Northern Rock Bank was nationalized by the U.K. government.

Table 1. Accounting of Major Financial Groups

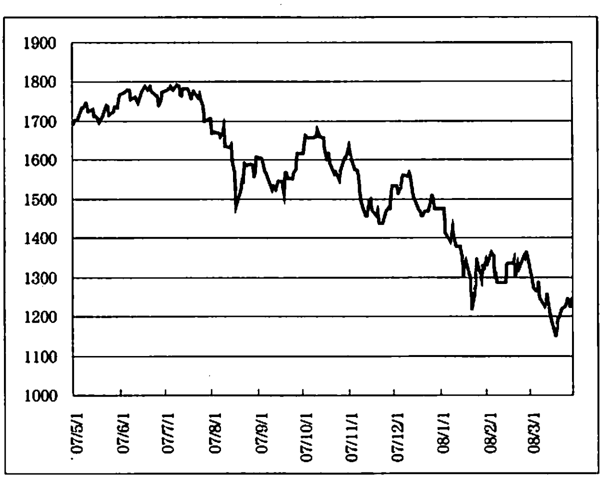
Accounting of Major Financial Groups in Japan at March 2008 (unit: 100 million Yen)

	consolidated net profit	net business profit	loss related with subprime	bad loan ratio	capital adequcy ratio	cash dividents per
Mitshubishi UFJ Group	6366	10154	1230	1.15	11.26	14
Mizuho Fiancial Group	3112	8617	6450	1.61	11.69	10000
Sumitomo Mitsui Financial Group	4615	8196	1320	1.24	10.6	12000
RESONA Holdings	3028	3378	0	2.19	over 13	1000
Sumitomo Trast and Banking	823	1738	793	0.9	11.87	17
Chuo Mitsui Trust Holdings	718	1544	52	1.7	13.84	7

Accounting of Major Financial Groups in Japan at March 2008 (rate of change) (unit: percent)

	consolidated net profit	net business profit	bad loan ratio	capital adequacy
Mitsubishi UFJ Group	-27.7	-13.5	-0.31	-1.32
Mizuho Financial Group	-49.8	2	-0.03	-0.79
Sumitomo Mitsui Financial Group	4.6	10.6	0.03	-0.76
RESONA Holdings	-54.4	-11.5	-0.27	n.a.
Sumitomo Trust and Banking	-20.7	-1.1	-0.1	0.51
Chuo Mitsui Trust Holdings	-36.3	-12.7	0	1.71

Source) Nihon Keizai Shinbun (The Nikkei newspaper) May 21, 2008

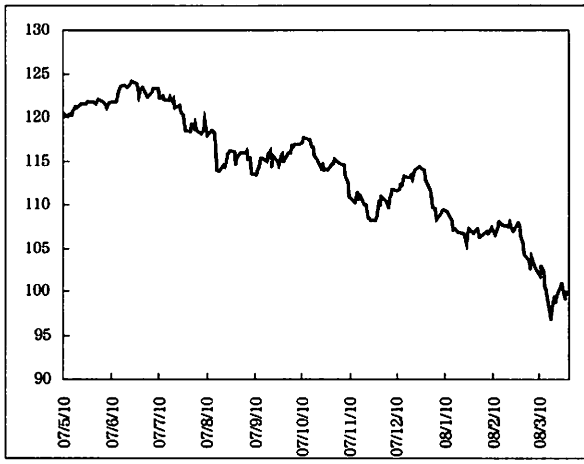


Source) Toyo Keizai Macroeconomy Databank

Figure 1-1. Stock Price Index (TOPIX) Behavior in Japan

2). The behavior of these two variables is probably the result of the subprime crisis caused by the international behavior of institutional and hedge funds. Does the behavior of these financial variables affect the real economy in Japan? We empirically investigate the answer to this question in this paper.

The remainder of the paper is organized as follows. Section 2 estimates the International Stock Price Correlation by using time series econometrics. Section 3 describes the effects of the decline in stock prices and exchange rate appreciation



Source) Toyo Keizai Macroeconomy Databank

Figure 1-2. Yen/Dollar Rate Behaviors

on the macro economy in Japan using the Structural VAR (SVAR) model. Section 4 estimates the relationship between structural shocks and behavior of financial variables using OLS. Section 5 comprises a few concluding remarks.

2. Estimation of International Stock Price Correlation

Since the summer of 2007, TOPIX, a major Japanese stock price index, declined as if copying the U.S. stock price index. Therefore, numerous economists and analysts in Japan suggested that the fall in the stock prices in the Japanese market was caused by a precipitous drop in the stock prices in New York.

In this section, first, an assessment of international stock price correlation between the U.S. and Japanese market is presented. It is believed that the financial globalization since the 1990s is responsible for the correlation, in which institutional as well as individual investors play important roles by investing in foreign financial assets.

We employ univariate EGARCH (1,1) for investigating international correlation of stock price index. Authors like Engle defend the concept that financial market volatility can be predictable. In order to forecast the volatility, several methods have been proposed in specialized literature, a large number of which are based on regression-like models. Evidently, the classical regression model is unsuitable when the residuals exhibit features that depart from the basic OLS assumptions. Non-normality, autocorrelation, and heteroskedasticity are some of the problems that are typically present in this type of data. In order to deal with the problems of autocorrelation and heteroskedasticity, autoregressive conditional heteroskedasticity (ARCH)/generalized autoregressive conditional heteroskedasticity (GARCH) specifications are usually well suited. However, these specifications assume that the conditional variance displays symmetric behavior, and thus may not fully capture the issues of non-normality. In the present context, we use the exponential GARCH (EGARCH) model specifications for assessing the extent of non-linear dynamic behavior underlying the data pertaining to stock prices of markets in the U.S. and Japan. The models used in this paper belong to special classes of non-linear models that usually generalize the more traditional ARCH models.

ARCH models have been used rather frequently in applied financial research. Among the most popular extension is the EGARCH model proposed by Nelson. Engle and Ng indicate that these latter volatility models usually outperform standard generalized ARCH (GARCH) models.

For example, there are good reasons to believe that speculative financial asset changes generally possess asymmetric behavior. As mentioned above, the leverage effect was found in numerous empirical studies that analyze the behavior of stock returns. This circumstance highlights the need for using asymmetric models when analyzing data on stock market behavior. Asymmetric behavior in financial data can be detected with relative ease, since volatility increases more for negative than for positive shocks with the same amplitude. In order to account for this phenomenon, one extension of the basic GARCH model can be used—the EGARCH model.

The equation for mean is as follows:

$$y_t = \mu + \phi X_t + u_t, u_t \sim N\left(o, \sigma_t^2\right). \tag{1}$$

The specification for conditional variance is as follows:

$$\log\left(\sigma_t^2\right) = \omega + \sum_{j=1}^{q} \beta_j \log\left(\sigma_{t-j}^2\right) + \sum_{i=1}^{p} \alpha_i \left| \frac{\varepsilon_{t-i}}{\sigma_{t-i}} - E\left(\frac{\varepsilon_{t-i}}{\sigma_{t-i}}\right) \right| + \sum_{k=1}^{p} \gamma_k \frac{\varepsilon_{t-k}}{\sigma_{t-k}}. \tag{2}$$

Since Nelson assumes that ε_t follows a Generalized Error Distribution (GED), we also assume that ε_t follows a GED.

Note that the left-hand side is the log of conditional variance. This implies that the leverage effect is exponential, rather than quadratic, and that forecasts of conditional variance are guaranteed to be non-negative. The presence of leverage effects can be tested by the hypothesis that $\gamma_i < 0$. The impact is asymmetric if $\gamma_i \neq 0$.

In this analysis, we use daily stock returns for two countries: Japan and the U.S. Daily closing price data of TOPIX in the Tokyo Stock Exchange has been obtained from the *TOYO Keizai Macroeconomy Databank*; data pertaining to SP500 in the N.Y. Stock Exchange is from *Econ Stats* (http://www.econstats.com/index.htm). Sample periods of estimation are divided into two periods: June 1, 1992 to April 14, 2008 (the number of observations is 3745) and January 6, 2003 to April 14, 2008 (the number of observations is 2491). We constructed daily data by replacing missing observations—due to various national and bank holidays—with the price of the previous day.

The exchange rate data have also been retrieved from the *TOYO Keizai Macroeconomy Databank*. Exchange rates in Tokyo (yen/dollar) are prices at 1700 hrs after March 1, 1995. The timing of these data is not perfectly aligned with the closing of the stock market (1500 hrs); however, it was the closest we were able to obtain. It must be noted, again, that the timing of these exchange rate observations is not aligned with the stock exchange closing time (1600 hrs in New York). Imprecise as they are, the exchange rates are from the same location and the time difference is rather small for, at least, the case of New York. The rates of change in exchange rates are computed as log differences.

We, at first, examined whether the data have unit roots by ADF (Augmented Dickey- Fuller) Test and KPSS (Kwiatkowski, Phillips, Schmidt, and Shin) Test. From Table 2, the data are stationary.

The results of the EGARCH model are reported in Table 3. Table 3 indicates that the decrease in the stock price index of the U.S. positively affects the index of Japan. In particular, the fluctuation of the SP500 index—a coefficient of SPCHANGE—in the recent sub-sample increased strongly as compared to that in the entire sample period. This indicates that recent financial globalization, lead by institutional investors, causes both stock prices to become correlated. Furthermore, γ_i is significantly negative. It implies, as we noted, the presence of a leverage effect on fluctuations of Japanese stock price index.

Table 2. Unit Root Test

variable	SPCHANGE		TXCHANGE		DYENDOL	
Method	ADF	KPSS	ADF	KPSS	ADF	KPSS
test statitic	-62.19021***	0.304038	-56.95727***	0.059972	-59.78264***	0.088291
option	No trend No constant	No trend	No trend No constant	No trend	No trend No constant	No trend
lag	0		0		0	
Bandwidth		30		15		5

Notes 1) SPCHANGE denotes rate of change of SP500.
2) TXCHANGE denotes rate of change of TOPIX.
3) DYENDOL denotes rate of change of yen/doller rates.

Table 3.

Dependent Variable: TXCHANGE
Sample: 1992/6/12-2008/4/14

Variable	Coefficient	Std. Error	z-Statistic	Prob.
intercept	-0.0209	0.0156	-1.3457	0.1784
SPCHANGE(-1)	0.3926	0.0153	25.6636	0.0000
	Variance Equation			
ω	-0.1506	0.0109	-13.7738	0.0000
α_1	0.2003	0.0141	14.1599	0.0000
γ_1	-0.0647	0.0066	-9.7602	0.0000
β_1	0.9683	0.0044	220.4028	0.0000
R-squared	0.1174	Mean dependent var	0.0048	
Adjusted R-squared	0.1165	S.D. dependent var	1.2437	
S.E. of regression	1.1690	Akaike info criterion	2.9960	
Sum squared resid	5109.6550	Schwarz criterion	3.0044	
Log likelihood	-5603.5880	Hannan-Quinn criter.	2.9990	
Durbin-Watson stat	1.9083			
GED PARAMETER	1.5471	0.0448	34.5652	0.0000

Dependent Variable: TXCHANGE
Sample: 2003/1/6-2008/4/14

Variable	Coefficient	Std. Error	z-Statistic	Prob.
intercept	0.0205	0.0260	0.7892	0.4300
SPCHANGE(-1)	0.5254	0.0296	17.7475	0.0000
	Variance Equation			
ω	-0.1725	0.0243	-7.0978	0.0000
α_1	0.2220	0.0302	7.3473	0.0000
γ_1	-0.0868	0.0130	-6.6682	0.0000
β_1	0.9560	0.0090	105.8719	0.0000
R-squared	0.1820	Mean dependent var	0.0391	
Adjusted R-squared	0.1794	S.D. dependent var	1.2098	
S.E. of regression	1.0959	Akaike info criterion	2.8588	
Sum squared resid	1501.2890	Schwarz criterion	2.8793	
Log likelihood	-1788.9150	Hannan-Quinn criter.	2.8665	
Durbin-Watson stat	2.0417			
GED PARAMETER	1.7068	0.0875	19.5159	0.0000

However, since September 2007 the yen/dollar exchange rate appreciated, coinciding with the fall in stock prices in Japan. Such fluctuation was due to the alleged "Yen-Carry-trading," that was utilized by numerous hedge funds and institutional investors for the low-cost funds supplied by Japanese financial institutions, thereby enabling them to invest in financial products with higher return. Since they faced loss of asset values, including stocks and bonds issued in the U.S. and other countries, these investors were willing to make a repayment to Japanese banks. On this occasion, the investors sold dollars and bought yen. This caused a rapid appreciation of the yen in late 2007.

We will estimate the relationship between the yen/dollar exchange rate and the New York stock price index in order to confirm "Yen-Carry-trading" using the EGARCH model, same as the above estimation. However, in this case we use the rate of daily change, not intra-daily change, in yen/dollar rate as the fluctuation in yen/dollar rates, and the rate of daily change in SP500 as stock price fluctuation.

Table 4 indicates that the coefficient of SPCHANGE, the daily rate of change

Table 4.

Dependent Variable: DYENDOL

Sample: 1992/6/12-2008/4/14

Variable	Coefficient	Std. Error	z-Statistic	Prob.
intercept	0.0000	0.0001	0.5050	0.6136
SPCHANGE	0.0768	0.0110	6.9543	0.0000
	Variance Equation			
ω	-0.2816	0.0552	-5.1027	0.0000
α_1	0.1152	0.0150	7.6842	0.0000
γ_1	-0.0269	0.0083	-3.2472	0.0012
β_1	0.9805	0.0049	198.6127	0.0000
R-squared	0.0152	Mean dependent var		0.0000
Adjusted R-squared	0.0141	S.D. dependent var		0.0070
S.E. of regression	0.0070	Akaike info criterion		-7.2133
Sum squared resid	0.1817	Schwarz criterion		-7.2049
Log likelihood	13461.3500	Hannan-Quinn criter.		-7.2103
Durbin-Watson stat	1.9527			
GED PARAMETER	1.2721	0.0338	37.6898	0.0000

Dependent Variable: DYENDOL

Sample: 2003/1/6-2008/4/14

Variable	Coefficient	Std. Error	z-Statistic	Prob.
intercept	-0.0001	0.0001	-0.4702	0.6382
SPCHANGE	0.1590	0.0231	6.8926	0.0000
	Variance Equation			
ω	-0.4328	0.1448	-2.9894	0.0028
α_1	0.0918	0.0242	3.7941	0.0001
γ_1	-0.0301	0.0120	-2.5091	0.0121
β_1	0.9646	0.0127	76.1585	0.0000
R-squared	0.0375	Mean dependent var		-0.0001
Adjusted R-squared	0.0336	S.D. dependent var		0.0060
S.E. of regression	0.0059	Akaike info criterion		-7.4573
Sum squared resid	0.0337	Schwarz criterion		-7.4322
Log likelihood	3636.7050	Hannan-Quinn criter.		-7.4478
Durbin-Watson stat	1.9536			
GED PARAMETER	1.3345	0.0548	24.3619	0.0000

in SP500, is significantly positive. Furthermore, the coefficient value in the recent sub-sample is larger than that in the entire sample period. This suggests that a large number of investors with global portfolios aggressively conducted "Yen-Carry-trading" throughout the 21st century.

In this section, we present the correlations between both stock prices, and between the yen/dollar rate and New York stock price index. Furthermore, we indicate the effect of financial variables on the real economy in Japan because there is concern that the "subprime problem" may cause a depression again. We empirically investigate this issue through the SVAR model.

3. Effects of Decline in Stock Prices and Exchange Rate Appreciation on the Macroeconomy in Japan

Here, we employ the SVAR model for the identification of shocks. The VAR model, without restraint, explains the dynamic behavior of endogenous variables by the past variable, in the following manner:

$$x_t = k + B(L)x_{t-1} + u_t, \tag{3}$$

where x_t denotes the vector of endogenous variables, k is the intercept, B a coefficient matrix, u_t a disturbance term, and L the lag-operator. SVAR poses a restraint to the VAR model in order to identify shocks. By this restraint, SVAR ascribes an economic structure to the VAR model.

SVAR is expressed as follows:

$$A_0 x_t = c + A(L)x_t + \varepsilon_t, \;\; \varepsilon_t \sim i.i.d.(0, D). \tag{4}$$

A_0 is a simultaneous coefficient matrix that represents the economic structure, where the endogenous variables determine each other.

We construct a simple AD-AS macroeconomy model with bank lending in the following manner:

$$y_t = y(p_t) + \varepsilon'_{s,t} \;\; \Leftrightarrow \;\; p_t = p(y_t) + \varepsilon_{s,t}, \;\; y'_p > 0 \tag{5}$$

$$y_t = y(B_t) + \varepsilon_{d,t}, \; y'_B > 0 \tag{6}$$

$$B_t = B(y_t, p_t) + \varepsilon_{B,t}, \;\; B'_y > 0, B'_p > 0. \tag{7}$$

Here, y denotes the real national income, p the consumer prices, $\varepsilon'_{s,t}$ supply shock, B real bank lending, ε_d demand shock, and ε_L lending shock. Equation (1) is the aggregate supply function; equation (2) is the demand function. Although an usual demand function depends on the real interest rate through investment behavior, equation (2) is assumed to positively depend on real bank lending through investment. Equation (3) is the real bank lending function, which is assumed to positively depend on real income and prices.

We use SVAR estimation for identifying shocks based on the above model. The main purpose of the SVAR estimation is to obtain non-recursive orthogonalization of the error terms for impulse response analysis. This alternative to the recursive Cholesky orthogonalization is required in order to impose appropriate restrictions for identifying the structural components of the error terms.

For the sake of deriving the SVAR model and adding a dynamic component without a constraint, we make our AD-AS model reflect the simultaneous coefficient matrix A_0. The economic system represented by equations (5)–(7) can be represented in the following manner:

$$\begin{pmatrix} 1 & 0 & -y_L \\ -p_y & 1 & 0 \\ -L_y & -L_p & 1 \end{pmatrix}\begin{pmatrix} y_t \\ p_t \\ B_t \end{pmatrix} = c + A(L)\begin{pmatrix} y_t \\ p_t \\ L_t \end{pmatrix} + \begin{pmatrix} \varepsilon_{d,t} \\ \varepsilon_{s,t} \\ \varepsilon_{L,t} \end{pmatrix}. \tag{8}$$

Equation (8) indicates that matrix A_0 has two zero constraints. However, three zero constraints are required for identification of shocks. Thus, A_0 becomes a lower triangular matrix if we assume that investment does not respond to bank lending simultaneously ($y_L = 0$). By the assumption, we can apply the Cholesky decomposition to the estimation.

For the estimation of SVAR, industrial production is denoted by y and consumer price index by p, both of which are derived from IMF, *International Financial Statistics* CD-ROM. The growth rate of bank loans to private sector is denoted by B, which has been obtained from the *TOYO Keizai Macroeconomy Databank*.

We estimate SVAR with short-run and long-run restrictions. Table 5 presents the coefficient matrix with short-run restriction, which indicates that coefficient conditions are sufficient. Thus, equation (8) is appropriately identified.

We execute impulse response of shocks to output, bank lending, and prices. These results are presented in Figure 2 as impulse response and accumulated impulse response to structural shocks. As indicated in the figure, supply shock has

Table 5. Coefficient Matrix by Structural VAR estimation

Restriction Type: Short-run pattern matrix

0.013**	0.000	0.000
0.006	0.002**	0.000
0.035	-0.714*	0.005**

**denotes significant at the 1% level.
* denotes significant at the 5% level.

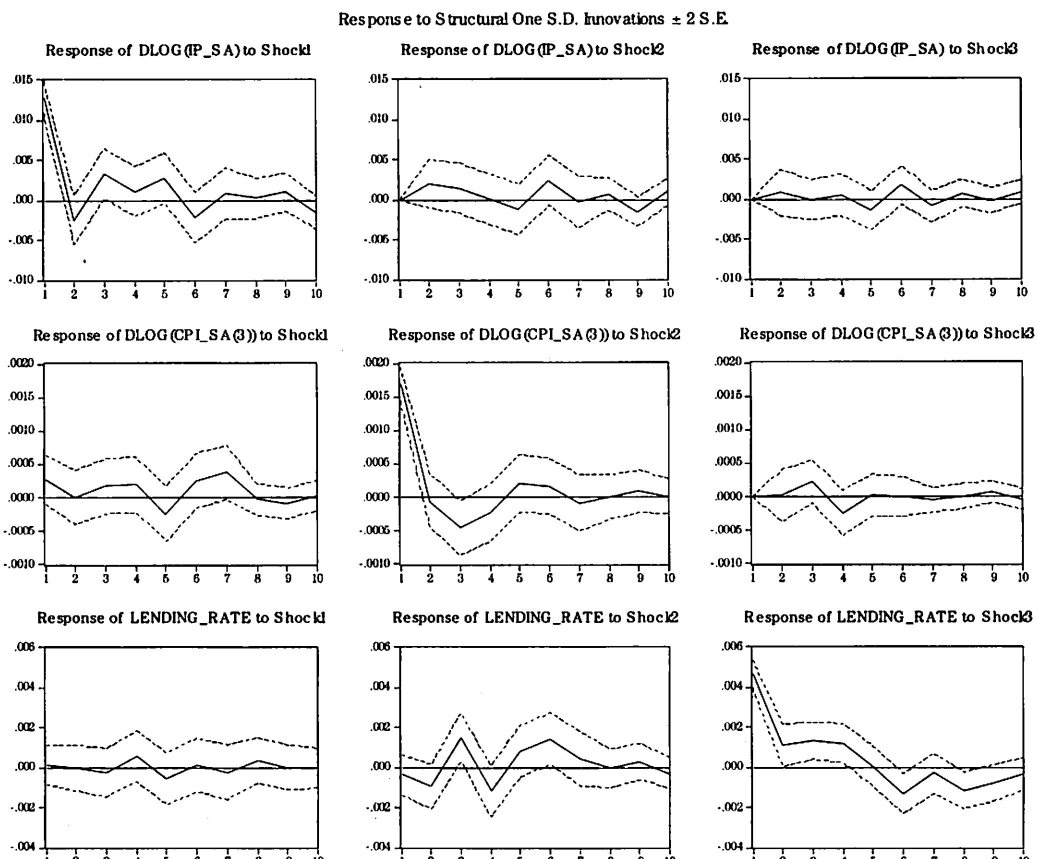


Figure 2. Impulse Response to Structural Shocks with short-run restrictions

positive effects on industrial production and prices, and no effect on lending rate. Demand shock has positive effects on income and prices as well as bank lending rate. Bank lending shock has positive effects on income and prices, although the magnitudes are not very large.

From these effects in the Japanese economy, industrial production is exposed to supply, demand, and bank lending shocks. Prices in Japan are affected mainly by supply and demand shocks, and slightly by bank lending shock. Bank lending faces demand and bank lending shocks. It is barely affected by supply shock.

It is possible that the Japanese economy possesses the structure of shocks that is indicated by our estimation. However, our main interest is the relationship between the real economy and financial variables, stock prices and exchange rates. Therefore, in the next section, we will execute regression of these shocks with the stock price index and yen/dollar rate fluctuations.

4. Relationship between Structural Shocks and Behavior of Financial Variables

We estimate the effects of exchange rate behavior on the supply and demand shocks in order to examine whether the Japanese macroeconomy—affected by the stock market turmoil caused by the subprime problem in the U.S.—is actually disturbed.

The supply, demand, and bank lending shocks derived in the previous section are regressed on the rates of change in stock price index, TOPIX, and yen/dollar rate. The following are the estimated equations:

$$\varepsilon_{i,t} = C + a_1\sigma_{S,t} + a_2\sigma_{D,t} + u_t, \quad i = S,B,D \tag{9}$$

where ε_i denotes shocks estimated in the previous section; ε_S is the supply shock, ε_B the bank lending shock, and ε_D the demand shock. C denotes the intercept, σ_S rates of change in TOPIX, σ_D rates of change in yen/dollar rate, and u disturbance. We regress equation (10) by the OLS method.

Table 6 presents the results of the regression of supply shocks on the rates of change in TOPIX and exchange rates. As indicated in the table, supply shock is significantly affected by changes in stock prices and exchange rates. The fall in the stock price index and appreciation of exchange rates may cause a negative supply shock. Bank lending shocks are significantly affected by changes in the stock price index. In other words, decrease in the exchange rates causes reduction in bank lending. Demand shock is significantly affected by changes in both variables. The fall in stock prices and appreciation of yen/dollar rates may cause decrease in demand shock. Further, all intercepts are shown as insignificant.

Thus, the fall in TOPIX may cause negative supply, bank lending, and demand shocks. If the magnitude of shocks is sufficiently large, they will cause recession in Japan. Furthermore, for the Japanese economy, fluctuations in the yen/dollar rates will be an important factor. The appreciation in the yen/dollar exchange rate, since

Table 6. Estimation of shocks to stock price and exchange rate fluctuations

Dependent Variable: ε_S

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.016	0.087	0.183	0.855
σ_s	4.749	2.095	2.267	0.026
σ_D	-9.896	3.885	-2.548	0.013
Adjusted R-squared	0.091	Durbin-Watson stat		1.965
Sum squared resid	63.103	F-statistic		5.633
Log likelihood	-113.927			

Dependent Variable: ε_B

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.012	0.086	-0.135	0.893
σ_s	7.838	3.141	2.496	0.014
σ_D	-1.401	1.910	-0.734	0.465
Adjusted R-squared	0.022	Durbin-Watson stat		2.071
Sum squared resid	68.495	F-statistic		2.043
Log likelihood	-117.740			

Dependent Variable: ε_D

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.011	0.090	0.122	0.467
σ_s	1.585	2.167	-0.731	0.045
σ_D	8.161	4.020	-2.030	0.000
Adjusted R-squared	0.029	Durbin-Watson stat		1.921
Sum squared resid	67.565	F-statistic		2.379
Log likelihood	-117.104			

the summer of 2007, may cause negative aggregate demands through decline in exports, although the appreciation causes the import prices to go down, thereby militating for the purchase of materials from abroad like crude oil. After the oil crisis in the 1970s, the Japanese economy struggled against a reduction of resources and energy consumption with high ecological technologies. As a result, the effect of decrease in demand shocks by the appreciation of the exchange rate may be larger than that of supply shocks in Japan. Thus, the appreciation of exchange rates caused by the subprime problem will seriously affect the Japanese economy.

5. Conclusion

In this paper, we explored the effect of the subprime crisis on the Japanese economy. As estimated, subprime shocks, since the summer of 2007, may cause negative shocks in the Japanese economy through the decrease in stock prices and appreciation of exchange rates. A fall in the U.S. stock prices was transmitted to the Japanese economy, thereby causing an appreciation of the yen/dollar exchange rates. This affected not only the financial markets but also the real economy in Japan. We verified these effects by using the SVAR model in order to identify exogenous shocks with supply, bank lending, and demand shocks.

Finally, we regressed structural shocks with change of rates in the Japanese stock price index, TOPIX, and the yen/dollar rate. From these estimations, we obtained the result that decrease in the stock price index and appreciation of yen/dollar rates may cause a recession in the Japanese economy through negative supply, bank lending, and demand shocks. Thus, it is possible that the Japanese economy will face a serious depression, transmitted from the fall in the U.S. stock prices resulting from the subprime problem.

However, our analysis focused only on the relationship between financial variables and the real economy in Japan. In order to focus on the effect of decreased demand in the U.S. for Japanese imports, a two-country model—U.S.-Japan—using the SVAR model must be constructed. This remains a topic for further research.

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