

Investigating the Effect of Stock Market Demand Side Shock on a Selection of Macroeconomic Variables in a Randomized Dynamic General Equilibrium Model

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Abstract

The purpose of this paper is to investigate the effect of stock market demand side shock on a selection of macroeconomic variables with the approach of stochastic dynamic equilibrium (DSGE) models. For this purpose, data from the period of 1368-98 with seasonal frequency have been used. In general, capital market shocks can affect macroeconomic variables in two ways. The first route is household consumption expenditures and the second route is corporate investment expenditures. Therefore, the direct effects of stock price fluctuations on total expenditures have made the stock market known as a leading indicator in the economy and therefore have been considered in experimental studies. In this study, the shock from the capital market area is considered based on the market demand segment, in which the tendency of households to keep their assets in the form of stocks increases. The results show that private investment, production, inflation and consumption expenditures increase and interest rates decrease with the shock of a measure deviation from the demand side of the stock market.

Keyword: Stock Market, Financial Assets, Shock, Stochastic Dynamic General Equilibrium Model (DSGE).

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1. Introduction

Recent economic events, beginning with the crisis of 2007, show that the financial sector plays an important role in the economy as a source of fluctuations in business cycles.

Financial markets, and especially the stock market, affect the behavior of businesses and consumers through the effect of consumption and investment. Fluctuations in the total stock price index through the channel of the effect of wealth and the effect on the level of investment affect the real activities of the economy. In the stock market, financial transactions are related to the consumption and investment decisions of individuals and firms through the supply and demand of securities (Komijani and Soheili Ahmadi, 2012). Companies raise the funds they need to invest through the sale of securities. On the other hand, by investing in corporate securities, individuals obtain salaries and receivables in the real markets of companies, which causes people's assets to shift from consumption to investment. Since individuals' decisions about consumption or investment reflect the total demand for securities, and companies' decisions about investment, which reflects the total supply of securities, are affected by the price and return of securities; Individuals and companies can make their own consumption and investment decisions based on supply and demand and the price of securities (Copeland et al., 2005). Therefore, whether the shock in the stock market is due to market demand or supply side, can have different effects on economic variables.

2. Theoretical literature

Regarding the relationship between the financial sector and the real sector of the economy, Bernanke and Gertler (1989) conducted the first study. Kyotaki and Moore (1997) offer another approach to adding financial transactions to a macroeconomic model. In this literature, three possible channels of interaction between the real sector of the economy and the financial sector are identified:

From the real economy to the financial markets: recessions impact the lending/borrowing behaviour of banks (mostly in terms of risk taking);

Amplification (by financial frictions): when financial frictions (i.e. imperfections) are prevalent, financial markets do not work smoothly, and the magnitude of the feedback loop between the real sector and the financial sector gains importance;

Financial shocks (which impact the real economy): because of disruptions in financial markets, fewer funds can be channelled from lenders to borrowers, and the real economy is impacted.

On the demand side, stock price fluctuations, which reflect household expectations about future wealth, affect the alternation between consumption periods and decisions through household financial wealth. An increase in household financial wealth indicates an increase in purchasing power and the creation of more financial wealth. On the supply side, stock price fluctuations, which reflect expectations about future market investment, affect corporate investment, production, and dividends through credit constraints, physical capital accumulation, and firm budgets (Jin et al., 2020).

3. Methodology

The purpose of this paper is to investigate the effect of stock market demand side shock on a selection of macroeconomic variables with the approach of stochastic dynamic equilibrium (DSGE) models. For this purpose, data from the period of 1368-98 with seasonal frequency have been used.

Households

Households choose their decision variables by maximizing their convenience with limited time budgets. The utility function for this group of households is considered as MIU (money in utility function) which is a function of consumption, labor supply and maintenance of financial assets. The utility function of this group of households is as follows:

$$(1) \quad \sum_{t=0}^{\infty} \beta^t E_t \left[\frac{(c_t)^{1-\sigma_c}}{1-\sigma_c} - \frac{l_t^{1+\sigma_n}}{1+\sigma_n} + \vartheta_x \log \left(\frac{X_t^h}{P_t} \right) \right] \cdot \lambda_t$$

Where E_t is the operator of expectations, $0 \leq \beta \leq 1$ is the discount factor, c_t is the actual consumption of the household, l_t is the supply of labor power for use in the production process of intermediate goods, σ_c is the inverse elasticity of inter-time substitution, σ_n is the inverse elasticity of inter-time labor, X_t^h , The index is a combination of the geometric average of monetary assets $M_t^{c,p}$, types of bank deposits (D_t) and stocks (Z_t) in the hands of households. ϑ_x is the elasticity of interest on demand for assets, and h is the elasticity of demand for monetary assets, and x is all financial assets held by households. The composite index of monetary assets based on the approach of Agner et al. (2014) is considered as follows:

$$(2) \quad x_t = (m_t^c)^{\mu_1} (z_t)^{\mu_2} (d_t)^{1-\mu_1-\mu_2}$$

Saving household

This group of households has more choices than consuming and holding cash, such as depositing, buying bonds, holding stocks, and investing in them, due to access to financial markets as well as earning higher incomes than consumption needs. The household budget constraint in terms of real variables will be in the form of relation (3).

$$(3) \quad c_t^p + \frac{p_t^i}{p_t} i_t + m_t^{c,p} + d_t + b_t = w_t l_t^p + (1 + R_{t-1}^d) \frac{d_{t-1}}{\pi_t} + (1 + R_{t-1}^b) \frac{b_{t-1}}{\pi_t} + \frac{m_{t-1}^{c,p}}{\pi_t} + R_t^k k_{t-1} + Q_t^\psi z_t^R - T_t^p + Div_t$$

Economic relationships are extracted for consumption, money holdings, stocks, deposits, bonds, labor supply, investment, and price dynamics.

$$c_t^{p-\sigma_c} = \beta_p E_t \left[\frac{c_{t+1}^{p-\sigma_c} (1 + R_t^b)}{\pi_{t+1}} \right]$$

$$m_t^{c,p} = \psi_x(\mu) c_t^{p\sigma_c} \frac{1 + R_t^b}{R_t^b}$$

$$d_t = \psi_x(1 - \mu) c_t^{p\sigma_c} \frac{1 + R_t^b}{R_t^b - R_t^d}$$

$$n_t^{p\sigma_c} = \frac{1}{c_t^{p\sigma_c}} w_t$$

$$\frac{p_t^i}{p_t} \lambda_t^p = Q_t \left[1 - \rho \left(\frac{i_t}{i_{t-1}} \right) - \rho' \left(\frac{i_t}{i_{t-1}} \right) \left(\frac{i_t}{i_{t-1}} \right) \right] + \beta E_t Q_{t+1} \rho' \left(\frac{i_t}{i_{t-1}} \right) \left(\frac{i_t}{i_{t-1}} \right)^2$$

$$Q_t = \beta_p E_t \lambda_{t+1}^p R_{t+1}^k + \beta_p (1 - \delta) E_t Q_{t+1}$$

Borrower household

This group of households does not have access to financial markets and has no source of income other than the supply of labor, and as a result it is assumed that they will need to obtain a loan (L_t^h) to cover their living expenses. The maximum loan that a bank lends to a household is based on a ratio of household income (Rabitsch and Punzi, 2017).

$$(4) \quad L_t^h = l_t v^h \cdot (w_t l_{i,t})$$

The household budget constraint in terms of real variables will be in the form of relation (5).

$$(5) \quad c_t^l + m_t^{c,l} + (1 + R_{t-1}^h) \frac{l_{t-1}^h}{\pi_t} = w_t l_t^l + \frac{m_{t-1}^{c,l}}{\pi_t} + Q_t^\psi z_t^h + l_t^h - T_t^l$$

By maximizing the utility function relative to the budget constraint of this group of households and the constraint on loans, stocks, consumption, money retention and labor supply are determined. By summing the supply and demand of the above two groups, the supply of labor, consumption and demand for money and stocks of society is obtained.

$$c_t^{1-\sigma_c} = \beta_l E_t \left[\frac{c_{t+1}^{1-\sigma_c} (1 + R_t^h)}{\pi_{t+1}} \right]$$

$$m_t^{c,l} = \psi_x(\mu) c_t^{1-\sigma_c} \frac{1+R_t^h}{R_t^b}$$

$$n_t^{l\sigma_n} = \frac{w_t}{c_t^{1-\sigma_c}} \left(1 - \frac{R_t^h}{1+R_t^h} l_t v^h \right)$$

Intermediate goods firms

Each firm receives a loan of L_{jt} from the bank at the beginning of each period and sells the x_t deduction in the form of stock sales in proportion to γ_t of the cost of capital and labor, which follows an AR (1) process. The amount of the loan received is equal to:

$$(6) \quad L_{jt}^N + X_{jt} = \gamma_t (P_{jt}^N r_{jt}^k + P_{jt}^N W_t L_{jt})$$

4. Data

The data used in this study are quarterly adjusted data for 1368-98 including real GDP variables, consumer price index (CPI), real oil revenues, real government expenditures, tax revenues, monetary base volume and All data have been extracted from the time series database of the Central Bank and the Tehran Stock Exchange.

5. Research findings

The results of this estimate indicate that with a shock equal to a standard deviation from the demand side in the capital market, private investment, production, inflation, consumer spending increased and interest rates decreased,

which according to the theories of these results It was as expected. Considering the impact of the stock market on macroeconomic variables, especially consumption and investment, it is suggested that by implementing regular rules in the capital market, liquidity be directed to this market and financing of this market for other regulated sectors, which can pave the way for long run economic prosperity.

References

- Agénor, P. R., & Da Silva, L. A. P. (2014). Macroprudential regulation and the monetary transmission mechanism. *Journal of Financial Stability*, 13, 44-63.
- Bernanke, BS. & M. Gertler. (1989). Agency Costs, Net Worth and Business Fluctuations. *American Economic Review*, 79(1):14–31.
- Copeland, T. O, John F. W. and Shaster C. (2005). *Financial Theories, Advanced Financial Management*. Translated by Reza Tehrani and Asgar Nourbakhsh. Tehran: Negah Danesh Publishing.
- Jin, T., Kwok, S., & Zheng, X. (2020). *Financial Wealth*, Investment and Sentiment in a Bayesian DSGE Model.
- Kiyotaki, N., & Moore, J. (1997). Credit cycles. *Journal of political economy*, 105(2), 211-248.
- Komijani, A. and Tavaklian, H. (2012). Monetary Policy under Fiscal Dominance and Implicit Target Inflation in the Form of a Stochastic Dynamic General Equilibrium Model for the Iranian Economy, *Quarterly Journal of Economic Modeling Research*, 2 (8), 117-87.
- Rabitsch, K., & Punzi, M. T. (2017). Borrower heterogeneity within a risky mortgage-lending market.