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Government Spending Fluctuations and Their Effects on Value of Firms

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Abstract

This paper investigates the effect of fluctuations in government spending on the value of firms in preferred industries in the Tehran Stock Exchange (TSE). The study employed the TVP-FAVAR (Time-Varying Parameter Factor-Augmented Vector Autoregressive) method to analyze seasonal data from 2011 to 2018. The findings indicate that the nature and intensity of the impact of government expenditure on the value of firms vary across different sectors. This suggests that as circumstances change over time, the effects of fluctuations in government expenditure also evolve, and industries respond differently to these behavioral changes. Specifically, the value of firms in the automotive industry consistently showed a negative response throughout the entire period studied. In contrast, the food and beverage industry, as well as the pharmaceutical materials and products sector, exhibited a positive reaction to changes in government behavior. Furthermore, the impact of government spending on the chemical, plaster, cement, lime, base metals, and products industries fluctuated over time, with both positive and negative effects observed in the short run and long run. The researchers recommend that the government take into account the status and performance of firms when formulating policies. This is because the findings suggest that the impact of government spending on firm value is not uniform across different industries, and that the effects can evolve over time as economic conditions change.

Highlights

- Fluctuations of government spending have different effect on TES.
- The short and long term effect of government spending fluctuations on industries are different.
- The circumstance change over time influence the response of industries to government spending fluctuations.

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1. Introduction

What are the effects of government spending fluctuations on the financial market, and how are these effects transmitted? While these questions are crucial in macroeconomics and can significantly inform economic policy, there remains a lack of consensus on their answers, both empirically and theoretically. The connection between government spending and the stock market has garnered considerable debate recent years, as policymakers and economists strive to understand the effect of government expenditures on stock market performance. However, the results of this inquiry have often been more confusing than clarifying, primarily due to the absence of agreement on the findings and conclusions. From a theoretical perspective, Keynesians argue that government spending positively influences the stock market and stock prices. In contrast, Classical and Neoclassical economists contend that government spending adversely affects the stock market and stock prices.

Additionally, some theories suggest that government spending does not significantly impact the stock market at all. With government spending continuing to rise in many economies alongside increased volatility in those markets, the attention over whether positive, negative, or neutral effect of government expenditures on the stock market persists. Some studies have even attempted to disaggregate government spending into different elements, yet the results remain broadly ambiguous.

In the past decade, the stock market has assumed a more prominent role in the Iranian economy, experiencing significant fluctuations due to economic shocks. One of the most critical variables affected by these macroeconomic fluctuations is the value of firms across different industries within the stock market. Generally, changes in economic variables can influence the behavioral patterns of various sectors by affecting the value of firms in the capital market, particularly in the stock market. Therefore, understanding how these variables impact different sectors requires a thorough examination of their effects on key capital markets and how factors related to institutions evolve within these markets.

Changes in government spending represent exogenous shocks that can influence firm value and shareholder profits. Given the importance of this issue, this paper investigates the effects of government spending shocks as external influences on value of firm in preferred industries in the TSE. The primary objective is to determine whether fluctuations in government spending affect the value of firms across different industries in the Tehran Stock Exchange. Additionally, we aim to explore how the value of firms in various sectors of this market responds to government spending shocks.

The remainder of this paper is organized as follows: Section 2 presents the relevant literature, Section 3 outlines the methodology and data utilized, Section 4 shows the findings of paper, and Section 5 presents the conclusions.

2. A Review of the Related Literature

2.1. The Connection Between Fiscal Policy and Stock Market Performance

The effectiveness of economic activities is influenced by policies such as fiscal policy has been the debate of a longstanding thoughts in economic theory. There are three main approaches to modeling how capital markets react to government revenues and expenditures, which vary depending on whether the economic system operates under Classical, Keynesian or Ricardian assumptions.

Keynesians emphasizes the role of the fiscal multiplier and posits that rising the deficits of public sector public leads to higher levels of economic activity, ultimately resulting in rising stock prices. In other words, the Keynesian perspective holds that fiscal policy tools positively impact the stock market. Fiscal policymakers can leverage budget deficits, taxes, and other unrestricted parts to influence interest rates, so enhancing the performance of capital market (Foresti & Napolitano, 2016).

Conversely, the Ricardian view suggests no significant effect of fiscal policy on the economic activities. According to this perspective, along with the concept of the crowding-out effect related to classics, another theory—known as the non-Keynesian view (NKV)—presents evidence for the potentially unrestricted effects of fiscal policy. From the Classical standpoint, increased government spending can detract from private sector activity, leading to a decline in stock prices.

Depending on which perspective one adopts, the understanding and predictions regarding capital market reactions to policies such as fiscal ones can vary significantly. If market participants believe in the Keynesian effects of fiscal policy, they would expect public deficit expansions to have a positive impact on stock markets. However, if they adhere to a purely Ricardian viewpoint, fiscal maneuvers would not influence their decisions, and stock indexes would remain relatively unchanged in response to such policies.

Conversely, if market operators perceive an increase in deficits of public sector as reduction, a negative response in capital markets can be anticipated. Additionally, the dynamics of public debt levels play a crucial role in shaping market response to economics policies. The greater the concern among market participants about public debt levels, the more likely stock indices will negative response to a rising in the deficit of public sector.

The theoretical framework for understanding capital markets' reactions to policies such as fiscal ones has been discussed in various studies (Blanchard, 1981; Charpe, Flaschel, Hartmann, & Proaño, 2011; Paul, 2020; Stoian & Iorgulescu, 2020; Tobin, 1969). Mentioned studies illustrate that fiscal policy affects capital markets primarily through its impact on economic activities level. According to economic theory, the positive, negative, or neutral effects are obtained, depending on the assumptions made about fiscal policies and their influence on economic activity (Bernheim, 1989; Chiang, 2020; Dai & Peng, 2022).

2.2 Firm value

Many scholars have conceptually explored how value of firm is created (Booth, 1998). However, there remains substantial debate surrounding the value concept itself (Lieberman & Balasubramanian, 2007). Traditional accounting systems and reporting primarily focus on profit maximization, which It can straight extracted from financial statements. Additional measures of performance utilized to assess market value (MKV), net total assets (NTA), price-earnings ratio (P/E), earnings yield (EY), earnings per share (EPS), and dividend per share (DPS). These measures rely on profits of accounting while overlooking essential elements of created value. Market value, for instance, can be inadequate as it depends on factors beyond a company's direct control (Salawu, 2010), leading to potential misinterpretation of the underlying data and models.

Furthermore, many of these metrics complicate the distinction between value creation and value transfer or destruction (Booth, 1998). A firm value represents the assets it owns and is crucial for reflecting the prosperity of its owners. Thus, the manager is responsible for maximizing the value of firm (Nurul Ain, 2017). The primary objective for a firm flowing public is to enhance shareholder welfare through rising the value of firm. A higher firm value is vital as it correlates with the welfare of shareholders (Brigham & Gapenski, 2006). This welfare and the firm value are regularly reflected in stock prices, which essentially represent decisions of investment, financing, and management of asset.

To measure a firm's value, various indicators such as Tobin's Q, price-to-book value ratio, and price-to-earnings ratio are utilized (Damodaran, 2002). For this study, we focus on Tobin's Q, which measures the connection between a value of in stock market value and the cost of replacement resources (Sahay & Pillai, 2009). Tobin's Q is considered an excellent predictor of market corrections and can explain a significant portion of investment variability (Cooper & Ejarque, 2003). Tobin's Q is the ratio of the market value and the replacement value of assets in a firm. The market value of a company is the sum of the market value of shares (MVS) and the market value of debts in a firm (MVD), which combines both owned and third-party capital. The replacement value of assets (RVA) refers to the "monetary expenditure required to acquire the capacity of production in the company using the highest modern technology obtained at minimum cost" (Lindenberg & Ross, 1981). Thus, Tobin's Q can be expressed as follows:

$$Q=\frac{\text{MVS+MVD}}{\text{RVA}} \tag{1}$$

2.3 Value drivers

A value driver is a variable that shows the serves and situation as a measure of a strategy and performance in a firm. It is essential to analyze these value drivers concerning their impact on a firm's or performance of industry, focusing on internal factors such as cash flow of cash and value-adding goods or services. Through such analysis, establishing the causal relationships between value drivers and performance becomes crucial. Identifying these key value drivers is the first step in understanding the practical effects of economic and environmental factors on industry performance. This process can be challenging and often relies on trial and error (Copeland, Thomas, Koller, & Murrin, 1994).

For a firm's valuation, identifying key drivers of value is critical, as these drivers can either enhance or diminish value depending on their trends (Kazlauskienė & Christauskas, 2008). Numerous quantitative and qualitative studies have examined the factors influencing a value of firm value to gain a better considering drivers. However, there is no universally accepted approach to classifying these drivers. Generally, value drivers are categorized along two dimensions: internal versus external aspects and qualitative versus quantitative aspects. Drivers related to internal value pertain to the firm's implicit performance, while external drivers relate to the broader macroeconomic environment.

Quantitative value drivers involve factors that can be assessed and analyzed using numerical data, whereas qualitative value drivers are based on descriptions of attributes or characteristics of the firm. Although qualitative drivers significantly impact a firm's value, they are often challenging to measure due to their non-quantifiable nature (Tiwari & Kumar, 2015). Figure 1 shows the different types of value drivers.

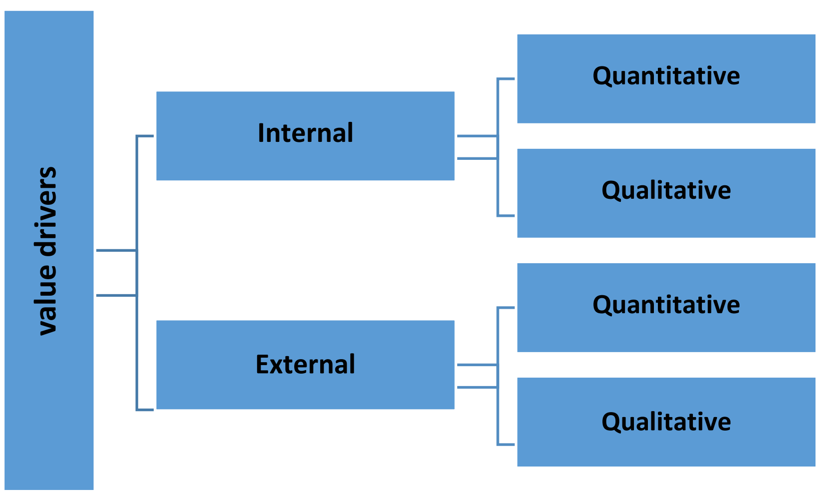

Figure 1. Types of value drivers
Source: *Research result*

One significant external driver that can influence firm value is fluctuations in government spending. This study aims to examine the effects of these fluctuations as one of the most critical external factors affecting the firm value in selected industries of the TSE.

3. Data and The Study Model

3.1. Data Collection

This study investigates the effects of fluctuations in government spending on firm value across various industries in the Tehran Stock Exchange. Due to constraints such as the limited number of companies in certain sectors and the irregular publication of financial information by many firms, we selected six industries comprising a total of 96 active companies:

1. Automotive Industry (CAR)
2. Food and Beverage Industry (FOOD)
3. Pharmaceutical Materials and Products Industry (MEDICINE)
4. Cement, Lime, and Plaster Industry (CEMENT)
5. Base Metals Industry (METALS)
6. Chemical Products Industry (CHEMICAL)

We utilized quarterly data during 2011:1 to 2018:4. The variables analyzed include firm value growth (Tobin's Q), liquidity growth rate (M), real interest rate (R), real exchange rate growth (EX), GDP growth rate (GDP), and inflation rate (measured by the Consumer Price Index, INF). The exogenous shock is represented by the growth rate of government expenditure (G). All variables are adjusted seasonally and used in real and growth rates form. Data were extracted from the Codal publishers, the Central Bank of Iran (CBI), and the Statistical Center of Iran.

3.2. Methodology

To analyze the data accurately and obtain both scientific and practical results, we aimed to restrict the number of variables and generate a new structure for them. One effective method for achieving this is Principal Component Analysis (PCA). PCA is a multivariate statistical approach that helps restrict the number of variables while improving information interpretation. By applying PCA, the initial input variables are transformed into new uncorrelated components. The generated components are linear combinations of the input variables, ensuring that the information from the original variables is retained with minimal loss (Vermunt & Magidson, 2005). In economics, PCA is often used for indexing. In this study, we apply PCA to construct a firm value index using the following formula:

$$Q_{it} = \sum_i w_{ij} \frac{q_{ijt} - q_{ijt-3}}{q_{ijt-3}} \tag{2}$$

Where; q_{ijt} is the value indicator of firm j's in industry i's at time t, q_{ijt-3} is the value indicator of firm j's in industry i's at the same period in the previous season, $\frac{q_{ijt} - q_{ijt-3}}{q_{ijt-3}}$ represents the growth rate of firm j's at time t, w_{ij} is the weight of firm j's in industry i's.

To investigate the impact of fluctuations in government expenditure on firm value in the preferred industries of the TSE, we employ the Time-Varying Parameter Factor-Augmented Vector Auto-regression (TVP-FAVAR) approach. Our model includes the following variables: firm value growth, liquidity growth rate, real interest rate, real exchange rate growth, GDP growth rate, and inflation rate. The exogenous fluctuations are represented by the government expenditure growth rate (G).

The general specification of model for the variables follows a TVP-FAVAR framework with stochastic volatility (Vasilyeva et.al. 2023). For t=1,…,T, let y_t be an $S \times 1$ vector of macroeconomic variables and f_t be the unobserved factor. The observables utilized for estimating f_t are contained in x_t, an $n \times 1$ vector. Selection of model is done across the 2^n-1 available combinations of x_t. Therefore, the Mi models for i=1,…,I take the following form:

$$x_{i,t}=\lambda^{f}_{i,t}f_{i,t}+\lambda^{y}_{i,t}y_t+\mu_{i,t} \tag{3}$$

Where $\lambda^{f}_{i,t}$ are $n \times 1$ loadings factor, and $\lambda^{y}_{i,t}$ are $n \times s$ matrices of coefficients in regression. The Gaussian errors $\mu_{i,t}$ ~N(0; $V_{i,t}$) are time-varying. Notice that Equation (1) represents equations in the form of linear space, which are complemented by i state equations:

$$\begin{pmatrix} f_{i,t} \\ y_t \end{pmatrix} = B_{i,t,1}\begin{pmatrix} f_{i,t-1} \\ y_{t-1} \end{pmatrix}+\ldots+B_{i,t,p}\begin{pmatrix} f_{i,t-P} \\ y_{t-P} \end{pmatrix}+\varepsilon_{i,t} \tag{4}$$

Where $B_{i,t,1},\ldots,B_{i,t,p}$ are time-varying VAR coefficients, and $\varepsilon_{i,t}$ ~N(0; $Q_{i,t}$) are Gaussian errors. The VAR coefficients and loadings factor expand according to equations in random walk form:

$$\lambda_{i,t}=\lambda_{i,t-1}+v_{i,t} \tag{5}$$

$$B_{i,t}=B_{i,t-1}+\eta_{i,t} \tag{6}$$

Where:

$\lambda_{i,t}=((\lambda^{f}_{i,t})^{T},(\lambda^{y}_{i,t})^{T})^{T}$, $B_{i,t}=(\mathrm{vec}(B_{i,t,1})^{T},\ldots,\mathrm{vec}(B_{i,t,p})^{T})^{T}$, $v_{i,t}$~N(O,$W_{i,t}$), $\eta_{i,t}$~N(O,$R_{i,t}$).

All errors are assumed to be uncorrelated over time.

4. Empirical Results

4.1. Estimation of Firms' Value Index Using Principal Component Analysis

In this section, we construct a value index for each of the selected industries using the principal component analysis (PCA) method. First, we calculate the Tobin's q for each firm within the chosen industries. Next, we determine the weights for each firm's value using PCA. Finally, we aggregate these weights to create the value index for the entire industry. The results for each selected industry are presented below.

4.1.1. Automotive Industry

$$\begin{aligned}\mathrm{COMP}_{1car} &= 0.240q_1+0.254q_2+0.246q_3+0.207q_4+0.226q_5+\\ &0.251q_6+0.167q_7-0.244q_8+0.251q_9+0.252q_{10}+0.223q_{11}+\\ &0.262q_{12}+0.248q_{13}+0.170q_{14}+0.183q_{15}+0.262q_{16}+0.231q_{17}-\\ &0.024q_{18}+0.218q_{19}+0.173q_{20}\end{aligned} \tag{7}$$

$$\begin{aligned}\mathrm{COMP}_{2car} &= -0.221q_1-0.040q_2-0.135q_3-0.088q_4-0.172q_5-\\ &0.076q_6-0.337q_7+0.080q_8+0.083q_9-0.107q_{10}+0.234q_{11}-\end{aligned}$$

$0.057q_{12} + 0.110q_{13} - 0.185q_{14} + 0.351q_{15} + 0.017q_{16} + 0.195q_{17} - 0.518q_{18} + 0.242q_{19} + 0.392q_{20}$ (8)

$Q_{car} = 0.198q_1 + 0.168q_2 + 0.149q_3 + 0.129q_4 + 0.130q_5 + 0.161q_6 + 0.064q_7 - 0.156q_8 + 0.185q_9 + 0.157q_{10} + 0.188q_{11} + 0.171q_{12} + 0.187q_{13} + 0.089q_{14} + 0.178q_{15} + 0.182q_{16} + 0.188q_{17} - 0.094q_{18} + 0.186q_{19} + 0.177q_{20}$ (9)

4.1.2. Food and Beverage Industry

$$\mathrm{COMP}_{1food} = 0.335q_1 + 0.381q_2 + 0.382q_3 + 0.031q_4 + 0.338q_5 + 0.165q_6 + 0.383q_7 + 0.124q_8 - 0.026q_9 + 0.1323q_{10} + 0.243q_{11} + 0.047q_{12} - 0.096q_{13} + 0.299q_{14} + 0.155q_{15}$$

$$\mathrm{COMP}_{2food} = -0.021q_1 + 0.003q_2 + 0.214q_3 + 0.322q_4 + 0.024q_5 + 0.257q_6 - 0.072q_7 - 0.313q_8 + 0.365q_9 - 0.047q_{10} + 0.328q_{11} + 0.406q_{12} + 0.414q_{13} - 0.251q_{14} - 0.186q_{15}$$

$$\mathrm{COMP}_{3food} = 0.272q_1 - 0.273q_2 + 0.076q_3 + 0.427q_4 + 0.122q_5 - 0.225q_6 - 0.054q_7 + 0.217q_8 + 0.034q_9 - 0.330q_{10} - 0.220q_{11} + 0.321q_{12} + 0.013q_{13} - 0.427q_{14} + 0.122q_{15}$$

$$\mathrm{COMP}_{4food} = -0.204q_1 + 0.014q_2 - 0.084q_3 - 0.209q_4 - 0.366q_5 + 0.498q_6 + 0.210q_7 + 0.338q_8 + 0.050q_9 - 0.283q_{10} + 0.114q_{11} - 0.023q_{12} + 0.339q_{13} + 0.237q_{14} + 0.311q_{15}$$

$$\mathrm{COMP}_{5food} = -0.273q_1 + 0.041q_2 - 0.240q_3 - 0.071q_4 + 0.175q_5 - 0.371q_6 + 0.151q_7 - 0.078q_8 + 0.722q_9 + 0.110q_{10} + 0.087q_{11} - 0.159q_{12} + 0.042q_{13} + 0.208q_{14} + 0.224q_{15}$$

$Q_{food} = 0.099q_1 + 0.097q_2 + 0.169q_3 + 0.120q_4 + 0.105_5 + 0.123q_6 + 0.124q_7 + 0.005q_8 + 0.134q_9 + 0.036q_{10} + 0.157q_{11} + 0.149q_{12} + 0.114q_{13} + 0.069q_{14} + 0.095q_{15}$ (10)

4.1.3. Pharmaceutical Materials and Products Industry

$$\mathrm{COMP}_{1medicine} = 0.250q_1 + 0.185q_2 + 0.264q_3 + 0.272q_4 + 0.278_5 + 0.265q_6 + 0.239q_7 + 0.251q_8 + 0.267q_9 + 0.155q_{10} + 0.257q_{11} + 0.263q_{12} + 0.267q_{13} + 0.086q_{14} + 0.295q_{15} + 0.118q_{16} + 0.040q_{17} + 0.275q_{18}$$

$$\mathrm{COMP}_{2medicine} = -0.207q_1 + 0.163q_2 + 0.046q_3 - 0.000q_4 + 0.122_5 - 0.191q_6 + 0.044q_7 + 0.120q_8 + 0.184q_9 + 0.063q_{10} - 0.073q_{11} - 0.231q_{12} - 0.258q_{13} - 0.277q_{14} + 0.013q_{15} + 0.505q_{16} + 0.601q_{17} + 0.039q_{18}$$

$$\mathrm{COMP}_{3medicine} = -0.361q_1 - 0.418q_2 - 0.205q_3 + 0.118q_4 + 0.223_5 - 0.129q_6 - 0.034q_7 + 0.076q_8 - 0.258q_9 + 0.512q_{10} + 0.254q_{11} + 0.208q_{12} - 0.160q_{13} + 0.287q_{14} + 0.069q_{15} + 0.112q_{16} + 0.008q_{17} + 0.018q_{18}$$

$$\mathrm{COMP}_{4\mathrm{medicine}} = 0.034q_1 - 0.092q_2 + 0.286q_3 - 0.302q_4 - 0.086_5 + 0.111q_6 - 0.078q_7 - 0.150q_8 + 0.191q_9 + 0.061q_{10} - 0.200q_{11} + 0.023q_{12} - 0.075q_{13} + 0.743q_{14} - 0.077q_{15} + 0.310q_{16} + 0.034q_{17} - 0.155q_{18}$$

$$\mathrm{Q}_{\mathrm{medicine}} = 0.097q_1 + 0.131q_2 + 0.142q_3 + 0.134q_4 + 0.106_5 + 0.070q_6 + 0.171q_7 + 0.156q_8 + 0.103q_9 + 0.156q_{10} + 0.108q_{11} + 0.160q_{12} + 0.147q_{13} + 0.184q_{14} + 0.125q_{15} + 0.136q_{16} + 0.156q_{17} + 0.172q_{18} \quad (11)$$

4.1.4. Cement, Lime, and Plaster Industry

$$\mathrm{COMP}_{1\mathrm{cement}} = 0.294q_1 + 0.302q_2 + 0.213q_3 + 0.218q_4 + 0.256q_5 + 0.296q_6 + 0.296q_7 + 0.312q_8 + 0.308q_9 + 0.070q_{10} + 0.303q_{11} + 0.289q_{12} + 0.200q_{13} + 0.269q_{14}$$

$$COMP_{2cement} = -0.214q_1 + 0.087q_2 - 0.516q_3 + 0.262q_4 + 0.353_5 - 0.002q_6 - 0.086q_7 + 0.057q_8 - 0.134q_9 + 0.292q_{10} - 0.120q_{11} - 0.213q_{12} + 0.509q_{13} + 0.224q_{14}$$

$$\mathrm{Q}_{\mathrm{cement}} = 0.171q_1 + 0.242q_2 + 0.196q_3 + 0.181q_4 + 0.117q_5 + 0.238q_6 + 0.209q_7 - 0.065q_8 + 0.219q_9 + 0.254q_{10} + 0.144q_{11} + 0.137q_{12} + 0.166q_{13} + 0.184q_{14} \quad (12)$$

4.1.5. Base Metals Industry

$$\mathrm{COMP}_{1\mathrm{metals}} = 0.216\mathrm{q}_1 + 0.299\mathrm{q}_2 + 0.317\mathrm{q}_3 + 0.285\mathrm{q}_4 + 0.141\mathrm{q}_5 + 0.117\mathrm{q}_6 + 0.031\mathrm{q}_7 + 0.322\mathrm{q}_8 + 0.180\mathrm{q}_9 - 0.010\mathrm{q}_{10} + 0.311q_{11} + 0.239q_{12} - 0.139q_{13} + 0.093q_{14} + 0.1259q_{15} - 0.246q_{16} + 0.284q_{17} - 0.254q_{18} + 0.150q_{19} - 0.171q_{20} + 0.011q_{21}$$

$$\mathrm{COMP}_{2\mathrm{metals}} = -0.164q_1 + 0.195q_2 + 0.169q_3 - 0.219q_4 - 0.316_5 - 0.347q_6 - 0.401q_7 + 0.124q_8 + 0.180q_9 + 0.267q_{10} + 0.185q_{11} + 0.151q_{12} - 0.134q_{13} + 0.002q_{14} - 0.063q_{15} + 0.212q_{16} - 0.142q_{17} + 0.049q_{18} + 0.360q_{19} + 0.166q_{20} - 0.224q_{21}$$

$$\mathrm{COMP}_{3\mathrm{metals}} = 0.286q_1 + 0.085q_2 - 0.069q_3 - 0.004q_4 - 0.113_5 + 0.235q_6 + 0.145q_7 + 0.076q_8 + 0.284q_9 + 0.369q_{10} - 0.094q_{11} - 0.013q_{12} + 0.294q_{13} + 0.360q_{14} - 0.142q_{15} + 0.112q_{16} + 0.096q_{17} + 0.199q_{18} + 0.157q_{19} + 0.304q_{20} - 0.408q_{21}$$

$$\mathrm{COMP}_{4\mathrm{metals}} = 0.229q_1 - 0.140q_2 - 0.101q_3 + 0.085q_4 + 0.458_5 + 0.058q_6 + 0.184q_7 + 0.171q_8 + 0.321q_9 + 0.161q_{10} + 0.038q_{11} - 0.064q_{12} - 0.296q_{13} - 0.474q_{14} - 0.232q_{15} + 0.312q_{16} - 0.149q_{17} - 0.018q_{18} + 0.092q_{19} + 0.037q_{20} - 0.002q_{21}$$

$$\mathrm{COMP}_{5\mathrm{metals}} = -0.243q_1 - 0.103q_2 - 0.002q_3 - 0.128q_4 + 0.123_5 - 0.077q_6 + 0.076q_7 - 0.112q_8 + 0.072q_9 + 0.319q_{10} + 0.149q_{11} - 0.554q_{12} - 0.191q_{13} + 0.143q_{14} + 0.478q_{15} + 0.124q_{16} + 0.263q_{17} - 0.194q_{18} - 0.068q_{19} + 0.146q_{20} + 0.033q_{21}$$

$$\mathrm{Q}_{\mathrm{metals}} = 0.099q_1 + 0.153q_2 + 0.132q_3 + 0.058q_4 - 0.005_5 + 0.009q_6 - 0.031q_7 + 0.161q_8 + 0.173q_9 + 0.139q_{10} + 0.142q_{11} + 0.089q_{12} - 0.047q_{13} + 0.082q_{14} + 0.064q_{15} - 0.005q_{16} + 0.096q_{17} - 0.056q_{18} + 0.115q_{19} + 0.035q_{20} + 0.034q_{21} \quad (13)$$

4.1.6. Chemical Products Industry

$$\begin{aligned}
\mathrm{COMP}_{1\mathrm{chemical}} = {} & 0.239q_1 + 0.062q_2 + 0.317q_3 + 0.203q_4 + 0.232_5 \\
& + 0.089q_6 - 0.090q_7 + 0.182q_8 + 0.141q_9 + 0.171q_{10} \\
& + 0.297q_{11} + 0.325q_{12} + 0.361q_{13} + 0.273q_{14} + 0.095q_{15} \\
& + 0.330q_{16} + 0.022q_{17} + 0.215q_{18} + 0.200q_{19} + 0.194q_{20} \\
\mathrm{COMP}_{2\mathrm{chemical}} = {} & -0.056q_1 - 0.000q_2 - 0.3184q_3 + 0.287q_4 + 0.024_5 \\
& + 0.435q_6 + 0.444q_7 + 0.002q_8 + 0.340q_9 + 0.289q_{10} \\
& + 0.091q_{11} - 0.133q_{12} - 0.056q_{13} + 0.221q_{14} + 0.277q_{15} \\
& - 0.088q_{16} + 0.110q_{17} - 0.266q_{18} - 0.203q_{19} - 0.070q_{20} \\
\mathrm{COMP}_{3\mathrm{chemical}} = {} & -0.144q_1 - 0.187q_2 - 0.124q_3 + 0.133q_4 - 0.066_5 \\
& - 0.097q_6 - 0.059q_7 + 0.430q_8 - 0.203q_9 - 0.195q_{10} \\
& - 0.311q_{11} + 0.240q_{12} + 0.177q_{13} + 0.188q_{14} + 0.196q_{15} \\
& - 0.237q_{16} + 0.460q_{17} - 0.215q_{18} + 0.068q_{19} + 0.216q_{20} \\
\mathrm{COMP}_{4\mathrm{chemical}} = {} & 0.167q_1 + 0.256q_2 - 0.214q_3 - 0.335q_4 - 0.506_5 \\
& - 0.065q_6 + 0.043q_7 - 0.085q_8 + 0.147q_9 + 0.210q_{10} \\
& - 0.067q_{11} + 0.139q_{12} + 0.010q_{13} + 0.101q_{14} + 0.309q_{15} \\
& - 0.117q_{16} - 0.181q_{17} - 0.025q_{18} + 0.434q_{19} + 0.210q_{20} \\
\mathrm{COMP}_{5\mathrm{chemical}} = {} & -0.560q_1 + 0.506q_2 - 0.158q_3 - 0.126q_4 - 0.000_5 \\
& + 0.149q_6 - 0.200q_7 + 0.205q_8 + 0.180q_9 - 0.039q_{10} \\
& - 0.067q_{11} + 0.136q_{12} - 0.159q_{13} + 0.196q_{14} - 0.096q_{15} \\
& + 0.139q_{16} + 0.024q_{17} + 0.298q_{18} - 0.203q_{19} + 0.049q_{20}
\end{aligned}$$

$$\mathrm{Q}_{\mathrm{chemical}} = 0.007q_1 + 0.041q_2 - 0.010q_3 + 0.091q_4 - 0.001q_5 + 0.095q_6 + 0.046q_7 + 0.131q_8 + 0.095q_9 + 0.087q_{10} + 0.027q_{11} + 0.126q_{12} + 0.107q_{13} + 0.174q_{14} + 0.143q_{15} + 0.021q_{16} + 0.094q_{17} - 0.020q_{18} + 0.058q_{19} + 0.102q_{20} \quad (14)$$

4.2. Evaluating the Time-Varying Effects of Fluctuations in Government Spending

In this study, we examined the time-varying effects of fluctuations in government spending on firm value by using two lags of the model variables to reduce residual correlation. We investigate the results of the impulse response function over the entire period. Additionally, we assess how an increase in standard deviation of government spending fluctuations affects the response of the dependent variable (firm value) in each of the selected industries. Economic shocks typically refer to sudden and unexpected changes in variables, a definition widely accepted by researchers. However, various methods exist for measuring macroeconomic variables, which may contribute to differences in research outcomes. For instance, Cooper (2003) defines an impulse as a standard deviation from a stable price trend, while Hamilton (1996) characterizes it as a rising in the level of price, where a rising exceeding 25% of the previous year's maximum price level is considered a shock.

In this study, to calculate government expenditure fluctuations, we first separate the trend component from the cyclical component in changes to government spending. After calculating the ratio of the cycle to the trend, we include ratios greater than 20% as government spending impulses in the model. In the three-dimensional representations in this section, the vertical axis indicates the variables, the horizontal axis represents the time elapsed after the impulse, and the transverse axis shows the research period. For better interpretation of the results, the horizontal and transverse axes may be switched in some figures; however, this does not affect the research findings.

4.2.1. Automotive Industry

Figure 2 illustrates the effect fluctuations in government expenditure on firm value in the automotive industry. According to the figure, government expenditure has a negative impact on firm value in the short term. However, in the long run, the reaction of firm value in this industry to government spending fluctuations is minimal; in other words, the negative effects of these fluctuations converge to zero over time. The most significant impacts of government spending fluctuations on firm value in this industry occurred in 2013 and 2018.

In recent years, the increase in government spending has led to a rise in government debt across various sectors, negatively affecting the economy as a whole. For example, rising government debt to the banking system has diminished the lending capacity of this sector, which is the primary source of financing for firms. This situation has not only reduced the number of loans available to various industries but has also increased the interest rates on loans for firms. Consequently, companies in different sectors face a credit crunch, which raises their costs and diminishes their investment and production plans, ultimately negatively impacting profitability and, therefore, their stock prices and overall value. Moreover, as government spending increases, the government is compelled to raise taxes on companies, further increasing their costs and reducing net profits.

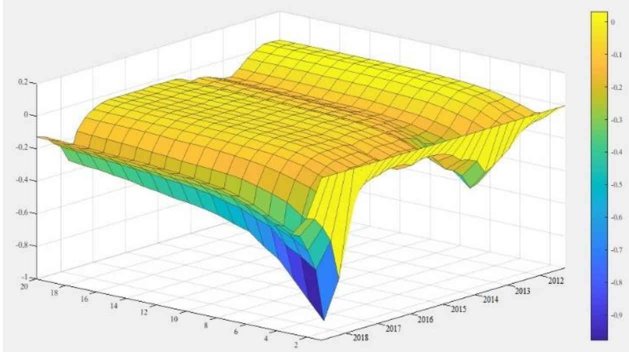

Figure 2. firms' value-IRF to government spending fluctuation in the automotive industry
Source: *Research result*

4.2.2. Food and Beverage Industry

Figure 3 illustrates the effect of fluctuations in government expenditure on firm value in the food and beverage industry. The data shows that throughout the entire period under consideration, firms in this industry have responded positively to government spending fluctuations. Initially, the firm value variable exhibited a more pronounced reaction to government spending shocks, but over time, the effects of these fluctuations have diminished. It should be pointed out that while the impact of government spending fluctuations on firm value has decreased over time, these effects have been persistent and have not completely dissipated. This suggests that increased government spending has fostered a positive outlook in the food and beverage industry, enhancing the profitability of firms within this sector. In other words, government spending positively influences the expected cash flows of firms in this industry.

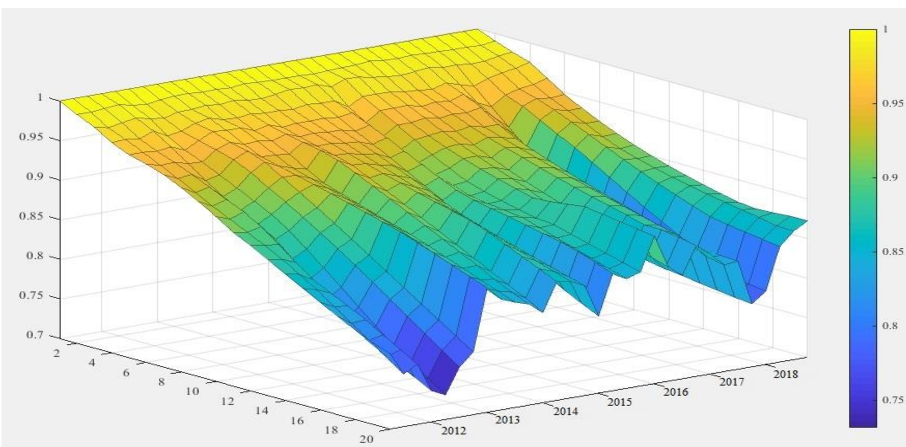

Figure 3. firms' value-IRF to government spending fluctuation in the food and beverage industry
Source: *Research result*

4.2.3. Pharmaceutical Materials and Products Industry

Figure 4 depicts the effect of fluctuations in government expenditure on firm value in the pharmaceutical materials and products industry. The results indicate a positive response of firm value to government spending fluctuations throughout the entire period analyzed. However, the impact of these fluctuations has varied over time. Specifically, from 2011 to 2015, the effects of government spending fluctuations were less pronounced compared to the years 2016 to 2018, during which the most significant impacts on firm value occurred. Notably, the persistence of these effects was greater during the years 2016 and 2017.

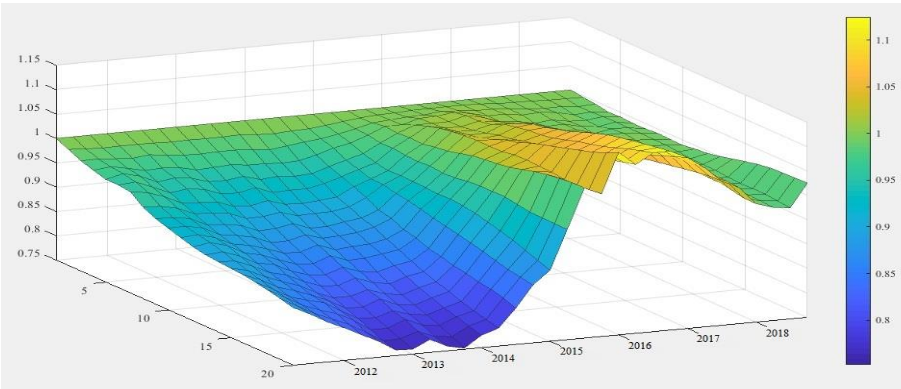

Figure 4. firms' value-IRF to government spending fluctuation in the pharmaceutical materials and products industry
***Source**: Research result*

4.2.4. Cement, Lime, and Plaster Industry

Figure 5 shows the effect of fluctuations in government expenditure on firm value in the cement, lime, and plaster industry. According to the figure, government spending fluctuations between 2011 and 2016 had negative effects on firm value in this sector, with these negative impacts persisting longer than in other years. However, these adverse effects dissipated after eight periods, indicating that the long-run impact of fluctuations in government expenditure on firm value in this industry has diminished. Additionally, during the years 2016 to 2017, government spending fluctuations had the least effect on firm value, suggesting minimal responsiveness to changes in government spending. The most significant impact occurred in 2018, when government spending fluctuations positively influenced firm value in this industry.

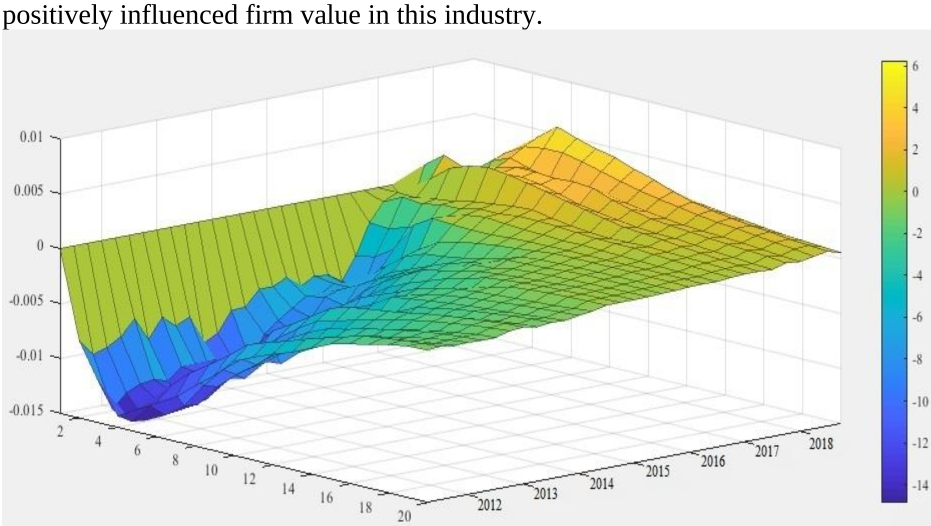

Figure 5. firms' value-IRF to government spending fluctuation in the cement, lime, and plaster industry
Source: *Research result*

4.2.5. Base Metals Industry

Figure 6 illustrates the effect of fluctuations in government expenditure on firm value in the base metals industry. The response of firm value to government spending fluctuations has varied throughout the analyzed period. In the early years, specifically 2011-2013 and 2018, firm value exhibited a negative reaction to government spending fluctuations, with a more pronounced response compared to other periods. However, in 2011 and 2018, the negative effects dissipated after three periods, leading to a positive reaction in firm value thereafter. In contrast, the negative impacts of government spending fluctuations persisted during 2012-2013. Conversely, in 2016-2017, government spending fluctuations positively affected firm value, with these positive effects being particularly strong in 2018.

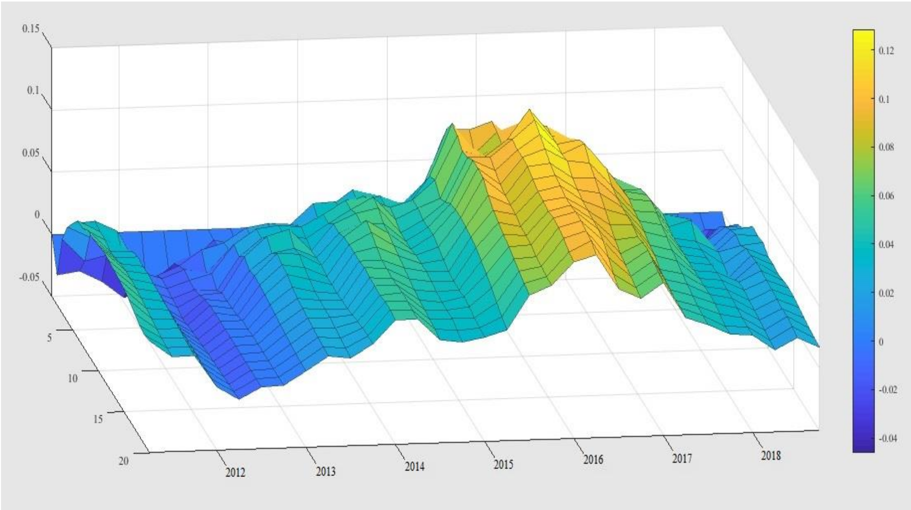

Figure 6. firms' value-IRF to government spending fluctuation in the base metals industry
Source: *Research result*

4.2.6. Chemical Products Industry

Figure 7 shows the effect of fluctuations in government expenditure on firm value in the chemical products industry. Throughout the years analyzed, government spending fluctuations initially indicated a positive effect on value of firm. However, the extent of this impact varied over time, with the most significant effects occurring in 2018. In the long-term, the reaction of firm value to government spending fluctuations decreased, and after ten periods of positive impact, the effects of government spending fluctuations faded, revealing negative consequences.

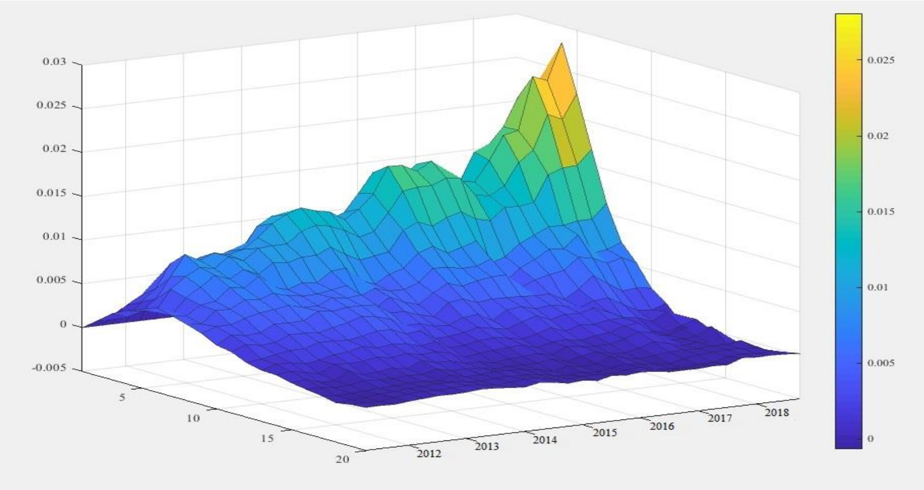

Figure 7. firms' value-IRF to government spending fluctuation in the chemical products industry
***Source**: Research result*

5. Concluding Remarks

This study examined the impact of fluctuations in government expenditure on firm value in preferred industries of the TSE. Using quarterly data from various sectors of the stock exchange, we found that the response of firm value to fluctuations in government spending varied significantly across different industries. Some industries exhibited stronger reactions, while others were less responsive to changes in government spending. Additionally, the nature of industry responses to government spending fluctuations differed from year to year, indicating that the effects of government spending are not uniform across all sectors.

The activities of these industries are closely linked to government behavior and policies, which, in turn, significantly influence their performance. Our findings corroborate the results of previous studies, including those by Dai, Z., & Peng, Y. (2022), Chiang, T. C. (2020), and Tiwari, R., & Kumar, B. (2015).

Another aspect of the disparity in industry responses to government spending impulses can be attributed to the specific characteristics and operational frameworks of these sectors. When government spending shocks occur, they can trigger changes in the main macroeconomic variables such as inflation, exchange rates, interest rates, investment levels, and economic growth. The extent to which different industries are affected by these changes dictates their varying responses to government spending fluctuations. For instance, industries dominated by small firms that rely heavily on bank financing may face more significant negative impacts if government spending disruptions hinder the flow of financial resources. This would be more pronounced than in industries with fewer funding challenges.

Therefore, it can be concluded that an essential factor influencing the effectiveness and response of various industries to government spending fluctuations is how these changes interact with other macroeconomic variables. Our study suggests that the government should take into account the specific conditions and performance of firms when formulating policies. Additionally, firm value should be a primary consideration in government policymaking processes.

Author Contributions

Conceptualization, all authors; methodology, S.B. and R.A.; validation, S.B.; formal analysis, all authors; writing—review and editing, all authors; supervision, S.B. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

Data Availability Statement

The data used in the study were taken from https;//cbi.ir and http://www.codal.ir.

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