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Investigating the effects of policy interest rate on the Thai economy in the FAVAR framework

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ABSTRACT

The policy rate is a crucial monetary policy tool used by central banks to control economic conditions. Its main channel works via a transmission mechanism in which shocks to the policy rate proliferate through the financial system, which then affects the real economy. This study looks at how monetary policy affects the Thai economy and how it works by using a Factor-Augmented Vector Autoregressive (FAVAR) model, which can include both visible and hidden factors in the analysis, unlike traditional VAR methods. To achieve the objective of this study, monthly data from the Bank of Thailand database for the period between January 2011 and December 2023 were collected and analyzed using Principal Component Analysis, Vector Autoregressive technique, Granger causality tests, and impulse response analysis. The results indicate that interest rate hikes have temporary adverse effects on consumer confidence, retail sales, and asset prices. In addition, the findings show the interplay between interest rate shocks and labor markets, represented by worker outflow, employment levels, and job vacancies. The results also reflect the effective transmission of monetary policy through the money market channel, as market interest rates were aligned with the policy rate shock. These results suggest that monetary policy should be implemented in a balanced manner while considering the interconnections between various aspects of the economy. These results justify some supportive fiscal and labor market policies to promote consumption and reduce the adverse effects of monetary policy tightening.

Contribution/ Originality: This study provides a novel holistic perspective on the effects of the policy rate, particularly within Thailand, on the key markets that are often separately studied by previous research. A crucial contribution of this study is the application of the FAVAR approach, which allows the integration of a large set of variables overlooked by previous studies.

1. INTRODUCTION

The policy interest rate, also referred to as the monetary policy rate or central bank rate, is an important tool used by central banks to intervene in the economy and attain their monetary policy goals (Abadi, Brunnermeier, & Koby, 2023; Gregor, Melecký, & Melecký, 2019). The central bank uses the interbank short-term interest rate as a reference for other interest rates in the financial system, and this rate is an important aspect of monetary policy transmission, which also has implications for the movement of other interest rates in the economy, such as money markets, bank lending, and deposit rates (Gregor et al., 2019; Oyadeyi, 2023). The transmission of monetary policy

decisions to a broader economy occurs through this crucial channel (Gregor et al., 2019; Wang, 2020). However, how effective changes to the policy interest rate are can vary based on factors like how fixed interest rates are, differences in information, costs for banks to switch, and the level of financial development (Oyadeyi, 2023).

The policy rate is the main instrument used by central banks to control levels of economic activity to achieve macroeconomic targets. Central banks, such as the South African Reserve Bank (SARB) and the Federal Reserve of the United States, adjust the policy rate depending on the economic situation to take control of inflation, promote economic productivity, stabilize financial markets, and foster the general health of the economy (Gregor et al., 2019; Iddrisu & Alagidede, 2020). Policy rate is important because it is a powerful tool that affects a wide range of economic and financial variables. An essential mechanism of how the policy rate works is through the interest rate pass-through channel, which impacts short-term money market rates, e.g., lending and deposit rates, and eventually translates into the corresponding cost of borrowing for both businesses and households (Oyadeyi, 2023), which further affects investment and consumption demands within the economy. A decrease in policy rate usually leads to lower borrowing rates and higher disposable income, which spurs additional spending and capital formation. On the other hand, when monetary policy is tightened, the policy rate rises, which increases the cost of borrowing and entails a decline in consumption and investment demand in addition to suppressing inflation pressure (Iddrisu & Alagidede, 2020). The policy rate also serves as a reference point for short-term interest rates and plays a fundamental role in determining long-term interest rate expectations, thereby directly impacting asset prices, bond yields, and exchange rates (De Pooter, Favara, Modugno, & Wu, 2021). Moreover, the transparency and predictability of policy rate adjustment are key to reducing market uncertainty.

Thus, adequate communication on future policy rate paths by central banks allows financial institutions and investors to better interpret signals about monetary policy, which, in turn, reduces interest rate volatility and the chances of shocks to the economy (De Pooter et al., 2021). For these reasons, it is important for policymakers and related economic agents to understand how the policy rate affects the economy, as it allows policymakers to formulate effective monetary policy rules and related economic agents to plan for their consumption and investment. When policymakers understand the relationships between the monetary policy rate and other macroeconomic variables, such as employment, retail sales, and asset prices, they can better understand the consequences of changing the policy rate on the variations in these variables and, hence, can take tailored actions to improve financial market stability, investor confidence, and economic stability.

Thailand primarily uses low interest rates to encourage the economy by minimizing the cost of doing business and simultaneously promoting lending and spending. This practice boosts investment and demand, which are the core economic engines of Thailand (Sulisnaningrum & Puspaningtyas, 2022). The Thai government governs interest rates based on the effectiveness of rate movements on major macroeconomic variables, such as gross domestic product, consumption, and investment. This management mirrors the careful nature of holistic policymaking, in which domestic economic dynamics are concerned. Moreover, the Thai government has monitored and regulated interest rates through policy implementation, focusing on monetary stability and economic growth (Shaibu & Enofe, 2021).

The main issue with regulating interest rates' economic impact is that some traditional methods of studying their effects may be misleading, as they exclude relevant economic variables. The exclusion of crucial variables often leads to partial and biased findings. To address this issue, researchers created the Factor-Augmented Vector Autoregressive (FAVAR) method, which combines both visible variables and hidden factors taken from a wide range of important variables. Therefore, this study aims to add to the existing research, especially regarding the Thai economy, by using the FAVAR method to examine how interest rates interact with various economic variables that are not easily analyzed with the smaller equations used in earlier studies. In addition, this study uses Granger causality and impulse response to investigate the interactions between interest rates and other selected variables. The following sections organize this study to achieve these objectives. The next section focuses on the explanation of theories related to interest rates and a review of empirical studies that provide insights into the relationship between

interest rates and some economic variables. The methodology section details the analytical techniques used. The subsequent section presents the empirical results and discusses our findings.

2. LITERATURE REVIEWS

This section covers some of the major theories dealing with interest rates and some empirical studies that identify the relationship between interest rates and other variables for application in this study.

The interest rate theory encompasses economic principles and mathematical models that explain the relationship between interest rates and economic variables. The classical theory of interest is one of the most basic theories of economics used to study how interest rates are determined in a free-market economy. According to classical economists, namely Adam Smith and David Ricardo, the interest rate is determined at the level of investment, where investment demand schedules are downward sloping and saving schedules are upward sloping. The premise of this theory is that automatic self-adjustment mechanisms allow an economy to return to full employment. In the classical approach, the interest rate acts as a balancing factor between savings and investment when the levels of income and employment are constant. This balance occurs when the marginal efficiency of capital (investment demand curve) meets the loanable funds (savings curve) at a determined level of aggregate income (Carvalho & Carvalho, 2019). This idea argues that the interest rate is determined by investment returns made with debt and not by money supply or currency in circulation. This has led to one of the biggest criticisms of this framework when it is applied to credit economies. In modern financial systems, where credit is practiced internally in production and distribution, the interest rate loses its connection with the profit rate in the real economy. This is because capitalists have savings and can borrow, so they can pay interest from profits accumulated in the past, rather than only current profits. Moreover, interest and debt act as channels for income distribution in the hands of capitalists, without any need for production or investment in profits (Toporowski, 2020). The original formulation of the theory had several limitations over time. Classical economists recommended actual optimal interest rates (5%, as proposed by Adam Smith) that had no regard for the normal profit rate, which must be offered to induce savers to invest their savings instead of earning interest. Focusing on the normal profit rate in macro modeling, it has been observed that the interest rate for full employment tends to hover around 4.5 percent, which is where the exploitation of labor by capital is at its lowest (Cole, 2022). Contemporary versions stress that bank profitability is a function of the spread between deposit and loan rates, rather than the absolute level of interest rates. Such insights show that interest rates play a largely distributional role in credit economies, which cannot be understood simply as being reflected or mirrored in the borrowing sector's profit rates. So, the classical theory of interest only works in specific situations, and for systems using commodity money, we need to make important changes to understand how interest rates behave in today's economies that rely on credit money.

One of the most important monetary economics equations is the Fisher Equation, which describes the relationship between nominal interest rates, real interest rates, and anticipated inflation. This equation suggests that nominal interest rates must be adjusted one-to-one with expected inflation to keep real interest rates constant (Levi & Makin, 1981). According to this theoretical construct, a one percent rise in inflation must equate to a one percent rise in nominal interest rates and thus keep the real interest rate unchanged in the equilibrium. After the early models, empirical work on the long-run equilibrium relationship between nominal interest rates and expected inflation appeared in the 1990s (Bonham, 1991). Later studies explored the permanence of this link, with the results observing a timing-dependent persistence of the Fisher Effect (Crowder, 1997). Thus, the study shows that, although inflation drives interest rates, the relationship does not always hold, as the original theory states a one-to-one correspondence. It was also discovered that unanticipated shocks and monetary policy interventions can have large effects on nominal interest rates and inflation (Sun & Phillips, 2004), which further complicates explanations of the Fisher Effect (Mitchell-innes, Aziakpono, & Faure, 2007). More recent studies have shown evidence for regime-switching effects on the inflation-interest rate nexus, where the correlation becomes stronger with "high" inflation (Kim, Lin, Hsieh, &

Suen, 2018). This indicates that the Fisher Effect acts within a more complicated structure than originally apparent, with several variables indirectly affecting the classic theory relating nominal interest rates to inflation expectations.

The International Fisher Effect (IFE) is a financial theory that proves the relationship between interest rates, inflation, and exchange rates of different countries. This finding implies that the difference in nominal interest rates between a pair of countries is equal to the expected change in the exchange rate between the two currencies (Bernanke, Boivin, & Eliasz, 2005). The Fisher effect serves as the foundation of IFE, which suggests a positive correlation between the nominal interest rates of a country and its inflation rates. IFE theory was developed through empirical research in many different periods. Initial contributions proved the base between interest rates and inflation, with a long-run relationship with common stochastic trends (Mishkin, 1992). The research was then supplemented with an assessment of the short- and long-run effects to provide a better picture. However, the results tend to favor long-term relationships over short-run correlations (Mishkin & Simon, 1995; Peláez, 1995). Later research investigated the validity of the theory concerning other economies, but the results were mixed with regard to the applicability of the Fisher effect in different countries and periods (Koustas & Serletis, 1999). From there, researchers move on to compare inflation rates with interest rates in different economic conditions (Ghazali & Ramlee, 2003). Studies have reinforced the development of the theoretical framework by proving the linkage between interest, inflation, and foreign exchange rates between countries (Bartram, Dufey, & Frenkel, 2005). This investigation helped in a broader understanding of how these distinct economic parameters intermingle on a global economic sphere. Recently, researchers have shifted toward the practical application of the IFE theory, exploring the relationship between variation in countries' interest rates and expectations regarding future exchange rates. Recent developments have always emphasized the role of arbitrage in conditioning the real interest rate harmonization among the settlements, while such recurring monetary policy patterns are also dependent on monetary decisions (Pangestuti, Fadila, & Nugraheni, 2022).

Interest Rate Parity (IRP) is a theory in international finance that draws a connection between interest rates and the exchange rate between two currencies. This theory states that the interest rate differential between two countries is equal to the expected change in exchange rates between the two countries' currencies (Lothian, 2016). There are two basic types of IRP, i.e., covered interest rate parity (CIP) and uncovered interest rate parity (UIP). While CIP is a hedging strategy that involves the use of forward contracts to mitigate exchange rate risk, the UIP does not involve hedging exchange rate risk. People generally expect CIP to be more sound than UIP due to its frequent violations of this theory (Ilut, 2012; Lothian, 2016). The development of IRP theory reflects the multifaceted nature of interest rates and currencies. Early studies showed that UIP was more successful in the 1990s than in earlier periods (Flood & Rose, 2002), a compliment to UIP as a financial relationship but a breakthrough in understanding the closer connection between macroeconomic fundamentals and financial markets. Later studies by Sarno, Valente, and Leon (2006) found that deviations from UIP might not follow simple patterns and also provided reasons for some confusing issues related to the theory. Later studies broadened the comprehension of UIP settings, indicating that the theory performs better under low-uncertainty conditions (Ismailov & Rossi, 2018). Recently, this framework has become more complicated. Factors such as market uncertainty, nonlinearities, and regulatory constraints have been identified in the literature that can impact the relationship between interest rates and exchange rates (Amador, Bianchi, Bocola, & Perri, 2020). Recent developments are mainly a critique of the practical applicability of this theory in that it fails to account for the reality of multiple aspects happening externally, such as speculation, expectations, and short-run interest rate changes (Mwange, Matoka, Kafwabulula, Chaampita, & Marebesa, 2022). Also, improvements in IRP theory have shown that we need a better understanding of international capital markets, even though research is still ongoing to deal with the complexities of financial markets and how they connect with each other (Augustin, Chernov, Schmid, & Song, 2024).

Now, we will highlight some empirical studies that reveal the relationship between interest rates and the variables included in this study.

Regarding the relationship between interest rates and consumer confidence, Gurgur and Kilinc (2015) use the ARDL (Autoregressive Distributed Lag) model to show that the exchange rate, interest rate, unemployment rate, and consumer price could affect consumer confidence. Kłopocka (2017) examined the impact of consumer confidence on household savings and borrowing in Poland. The authors found that the consumer confidence index had durable predictive power for the evolution of both household savings and household borrowing rates. A recent study by Arzova, Şahin, Ertuğrul, and Polat (2024) showed how economic confidence, energy prices, geopolitical stress, and interest rates in the Euro Area were related from 1994 to 2023 using special statistical methods.

For the relationship between interest rates and asset prices, Kontonikas and Ioannidis (2005) used a structural rational expectations model and revealed the reaction of monetary policy via interest rates to asset price misalignments to influence aggregate demand and decrease macroeconomic volatility. Ahrend (2010) also examines the persistence of the interest rate effect on asset prices. The author showed evidence of associating periods of persistently low short-term interest rates with booming asset prices, particularly in the housing market. Moreover, Guswardi (2016) conducts an empirical analysis to investigate the effects of capital flow, exchange rates, and interest rates on asset prices in emerging market economies. The results reveal that interest rates move positively with asset prices. Fenig, Mileva, and Petersen (2018) illustrated how interest rates can be used to deflate asset price bubbles. The authors reveal that leverage constraints and monetary policy can affect asset prices and stabilize macroeconomic conditions. The authors also show that there is an interaction between the labor, goods, and asset markets.

Regarding the relationship between interest rates and the labor market, some results from previous investigations are as follows. Del Boca and Lusardi (2003) find an association between credit access and labor market outcomes. The authors focused on the relationship between mortgage availability or credit market constraints and labor market decisions from 1989 to 1993 regarding the effect on the labor market participation of married women in Italy. This is crucial because interest rates are known to play a significant role in mortgage markets and in how people design to participate in the labor market, among other financial matters. In this regard, the opportunity cost of working increases at higher interest rates. Therefore, interest rates directly affect decisions in the labor market, especially for workers who decide to own homes. In addition, (Walsh, 2005) addressed issues related to the analysis of the impacts created by labor market search, sticky prices, and policies regarding the interest rate, which further explained that policy changes regarding the interest rate could impact the action of the labor market.

Many studies have been conducted on the relationship between interest rates and retail sales. For instance, in the analysis of retail trade in Croatia conducted by Benazić (2014), the study established that in the long run, if the retail prices and short-term interest rates increase, then there will be a reduction in nominal retail trade, while an increase in net wages increases nominal retail trade. In the short run, retail price changes positively affect nominal retail trade, but positive changes in net wages and short-term interest rates negatively impact it. In the Euro Area, Shaibu and Enofe (2021) found that bank lending rates are slow to drop when short-term market rates go down, meaning banks take longer to lower their rates compared to when they raise them. The author expresses that such rigidity can create important macroeconomic effects by increasing the sensitivity of Gross Domestic Product (GDP) to economic shocks, particularly those affecting retail sales. Novotná (2020) studied consumer lending and interest rates in the Slovak Republic for the period 2009–2019 and concluded that interest rates fixed by the European Central Bank, the EONIA (Euro Overnight Index Average) interest rate, and the average interest rate for certain groups of loans have a great influence on the volume of granted loans. Such an effect implies a shift in consumer lending and spending, which feeds into retail sales.

For the association of interest rates and the interest rate in the money market, Kganyago and Gumbo (2015) found that the interest rate in the money market exerts a statistically significant inverse causal influence on stock market returns. The passive nature of the money market, which controls interest rates through monetary policy, anchors this relationship. Furthermore, Zhang, Chen, and Liu (2016) based on Dynamic Vector Autoregression (DVAR), show that the transmission mechanism works between interest rate levels. For instance, the central bank's

bill interest rate can successfully reflect monetary policy changes and guide market liquidity, thus playing an anchor role in interest rate setting. The author also expressed closed-loop feedback between the central bank's bill rates and interest rates in the money market, as well as between the money market rates and bond market rates.

Complex relationships across interest rates and other economic factors underline the intricate links that monetary policy makes, especially in economic confidence, asset prices, the labor market, retail sales, and money market interest rates. These findings provide useful considerations that can be drawn upon for further analysis.

3. METHODOLOGY

Factor-Augmented Vector Autoregression (FAVAR) is an econometric model that combines factor analysis and vector autoregression to make it possible to analyze a large dataset or complex relationships (Bai, Li, & Lu, 2016; Fernald, Spiegel, & Swanson, 2014). FAVAR generalizes standard VAR models by including pseudo-unobserved components (Bai et al., 2016), which allows for unobservable factors in the analysis. This approach has several advantages over standard VAR models, as it can deal with the problems of data quality, short horizons, and issues of rapid institutional changes, and it is particularly useful for the analysis of rapidly evolving economies (Fernald et al., 2014). FAVAR is suitable for analyzing the associations between sectors of the economy. For instance, it powerfully applies to the study of the links between the prices of non-energy commodities and the associated macroeconomic variables to derive invaluable conclusions from the association (Lombardi, Osbat, & Schnatz, 2012). Mathematically, the FAVAR model was expressed by Bernanke et al. (2005) as follows:

Let Y_t be an $n \times 1$ vector of observed economic variables at time t, and F_t be a $k \times 1$ vector of unobserved common factors. The FAVAR model is given by

$$\begin{pmatrix} Y_t \\ F_t \end{pmatrix} = \Phi(L) \begin{pmatrix} Y_{t-1} \\ F_{t-1} \end{pmatrix} + \epsilon_t \qquad (1)$$

Where Y_t represents the observed economic variables, namely domestic interest rate, policy pate (DINT) in this study, job vacancies (DJOV), and recruitment (DREC). F_t represents the unobserved factors extracted through Principal Component Analysis (PCA) based on the following equation:

$$X_t^{'} = \Lambda^f F_t^{'} + \Lambda^y Y_t^{'} + e_t^{'} \qquad (2)$$

Where is a vector that includes a large number of observable economic indicators including economic confidence (DECC), asset price (DASP), labor outflow (DLAF), retail sell (DRES), and money market interest rate (DMMR). $\Phi(L)$ is a lag polynomial matrix capturing the dynamic relationships among the variables and factors. ϵ_t is a $(n + k) \times 1$ vector of error terms. This model integrates many variables by augmenting the VAR framework with factors derived from PCA to provide a comprehensive analysis of economic relationships in the Thai economy. This FAVAR model is then used to conduct an impulse response analysis to identify the shock affecting the economy.

In this study, the Granger causality test is employed to decipher the predictive relationship between variables and factors. In other words, Granger causality tests whether, for any two variables, the past values of one variable help improve the prediction of the other variable. Specifically, the test can be modeled (Yang, Wah, & Erdan, 2019) as follows:

$$\begin{aligned} \Delta F_t &= \alpha + \sum_{i=1}^{k} \beta_i \Delta F_{t-i} + \sum_{i=1}^{k} \gamma_i \Delta Y_{t-i} + \epsilon_{F,t} \\ \Delta Y_t &= \alpha + \sum_{i=1}^{k} \delta_i \Delta Y_{t-i} + \sum_{i=1}^{k} \eta_i \Delta F_{t-i} + \epsilon_{Y,t} \end{aligned} \qquad (3)$$

Where ΔF_t and ΔY_t are the first differences between the observed variables and unobserved factors. For instance, Null Hypothesis (H0) $\sum_{i=1}^{k} \gamma_i = 0$representing that Y does not Granger-cause F. The hypotheses are tested using an F-test, and the null hypothesis is rejected, indicating a Granger-causal relationship. To estimate the model, data for Thailand from January 2011 to December 2023 were downloaded from the Bank of Thailand.

4. RESULT

This section is divided into four subsections, i.e., principal component analysis, FAVAR model estimation, Granger causality test, and impulse response analysis.

First, the new factors are identified by the variables listed in Table 8 using Principal Component Analysis (PCA), and the formulated factors are listed in Table 1. In addition, the data were tested using the Kaiser-Meyer-Olkin measure of sampling adequacy test, whose value is equal to 0.9515; that is, the variables cover 95.15 percent of the variance. It can be concluded that the extracted factors are appropriate because they are greater than the threshold of 0.5.

Table 1. Principal component analysis.

Variables	Components
Economic confident (ECC)	
cn1	0.466
cn2	0.435
cn3	0.442
cn4	0.439
cn5	0.453
Asset price (ASP)	
ph1	0.355
ph2	0.351
ph3	0.354
ph4	0.356
ph5	0.355
ph6	0.354
ph7	0.352
ph8	0.352
Labor outflow (LAF)	
wf1	0.561
wf2	0.447
wf4	0.352
wf6	0.461
Retail sale (RES)	
rs12	0.324
rs14	0.321
rs19	0.337
rs20	0.346
Money market interest rate (MMR)	
nr1	0.138
nr2	0.135
nr3	0.137
nr4	0.138
Variable	Components
nr5	0.138
nr6	0.138
nr8	0.138
nr9	0.138
nr10	0.138
nr11	0.138
nr12	0.138
nr13	0.139
nr14	0.138
nr15	0.139
nr16	0.139
nr17	0.139
nr18	0.138
nr19	0.137
nr20	0.135
nr21	0.134
nr22	0.132
nr23	0.130
nr53	0.133
nr54	0.134

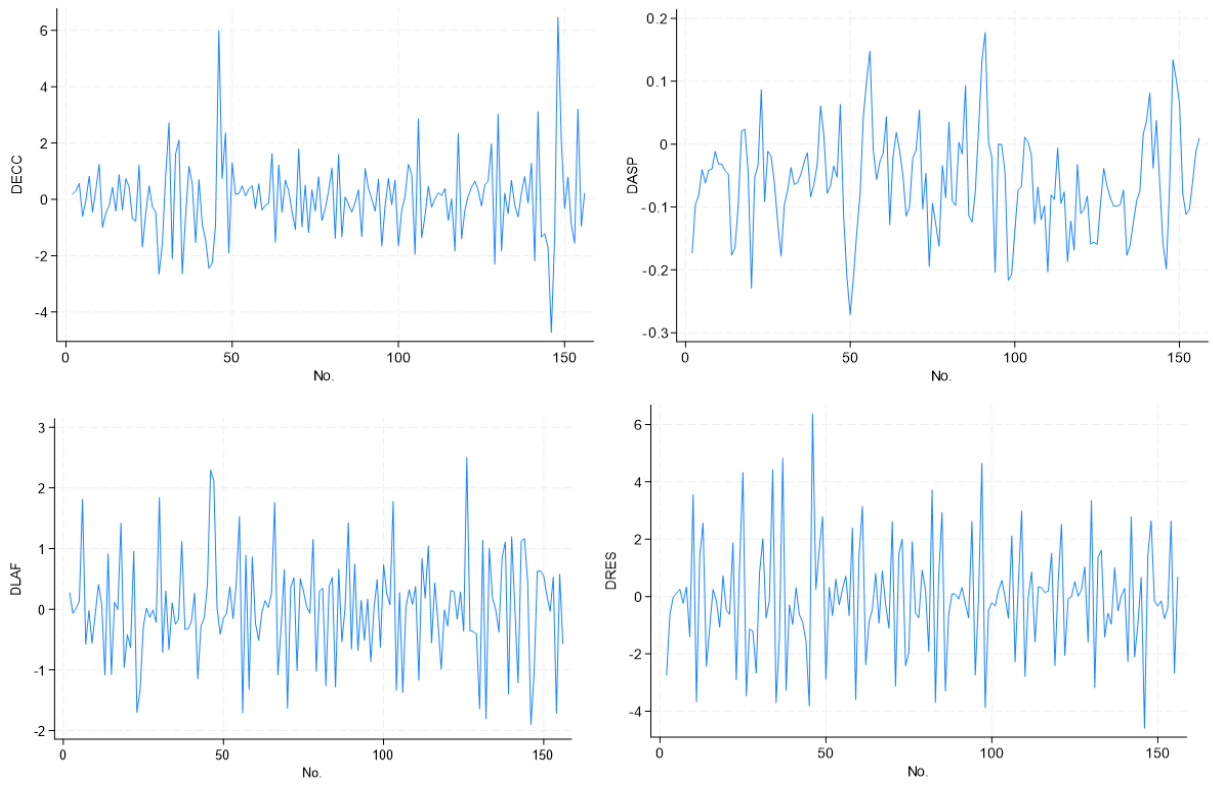
Variables	Components
nr56	0.133
nr61	0.137
nr63	0.136
nr64	0.131
nr65	0.137
nr66	0.134
nr67	0.138
nr68	0.137
nr69	0.138
nr70	0.135

The PCA results in Table 1 reveal the extraction of five factors from the variables under consideration. These consisted of the Economic Confidence (ECC) factor, including cn1–cn5, with component loadings of 0.434–0.466. The Asset Price (ASP) factor, including ph1–ph8, has component loadings of 0.351–0.356. The Labor Outflow (LAF) factor combines wf1, wf2, wf4, and wf6, with component loadings of 0.352– 0.561. The Retail Sell (RES) factor included rs12, rs14, rs19, and rs20 with component loadings of 0.321–0.347. Lastly, the Money Market Interest Rate (MMR) factor is a broad set for nr1–nr70 with relatively lower component loadings of approximately 0.138–0.139.

Table 2. Augmented Dickey-Fuller unit root tests for first difference variables.

Stat.	DECC	DASP	D LAF	D RES	DMMR	DINT	DJOV	DREC
t-Stat.	-14.783	-7.342	-16.365	-19.638	-8.090	-9.458	-21.259	-15.776
Prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

The results of the unit root test for created factors and the three extra observed variables used in the FAVAR model estimation are shown in Table 2. The results indicate that all first-difference variables are stationary. Figure 1 presents the time series of the first-difference variables, illustrating their behavior over time.



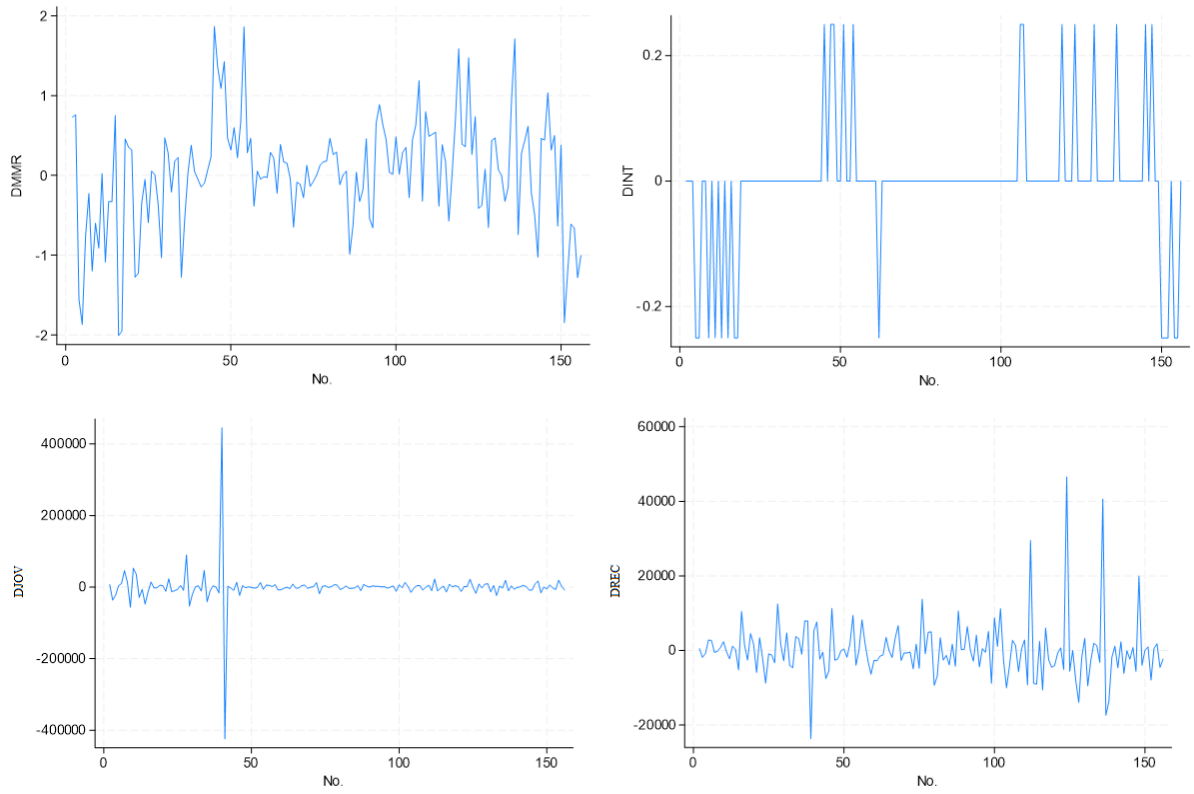


Figure 1. Series of first difference variables.

Table 3. Lag-order selection criteria.

Lag	LL	LR	p	FPE	AIC	HQIC	SBIC
0	- 3,901.470			17,000,000,000,000	53.190	53.256	53.352*
1	- 3,766.880	269.180	0.000	6,700,000,000,000	52.230	52.825	53.694
2	- 3,657.880	218.010	0.000	3,600,000,000,000	51.617	52.741*	54.384
3	- 3,601.520	112.700	0.000	4,100,000,000,000	51.721	53.375	55.790
4	- 3,524.030	154.990	0.000	3,500,000,000,000	51.538	53.720	56.908
5	- 3,434.370	179.320	0.000	2,700,000,000,000	51.189	53.900	57.861
6	- 3,369.620	129.500	0.000	2,900,000,000,000	51.179	54.419	59.153
7	- 3,303.250	132.730	0.000	3,200,000,000,000	51.146	54.915	60.423
8	- 3,210.980	184.550*	0.000	2,600,000,000,000	50.762*	55.060	61.340

Note: * indicates the optimal value.

Based on Table 3, the lag-order selection criteria indicate that most of them suggest that 8 lags are appropriate for the model.

Table 4. FAVAR (8) model fit information.

Equation	RMSE	R-sq	chi2	P>chi2
DINT	0.083	0.622	241.984	0.000
DECC	1.021	0.726	389.525	0.000
DASP	0.059	0.710	359.601	0.000
DLAF	0.615	0.714	366.175	0.000
DRES	1.191	0.801	591.306	0.000
DMMR	0.555	0.620	239.515	0.000
DJOV	36,920	0.728	392.681	0.000
DREC	7,045	0.583	205.054	0.000

Table 4 provides the fit information. For example, in the DINT equation, the RMSE (Root Mean Square Error) is 0.083, with an R-squared value of 0.622, indicating that the model explains approximately 62.210 percent of the

variance in interest rate differences. The χ^2 statistic was 241.984, with a p-value of 0.000, demonstrating a statistically significant fit. The results in Table 4 imply that all equations for the endogenous variables in the model exhibit a good fit to the data.

Figure 2 illustrates the residual dynamics of the FAVAR (8) model, which provides a visual assessment of the model's residual behavior over time.

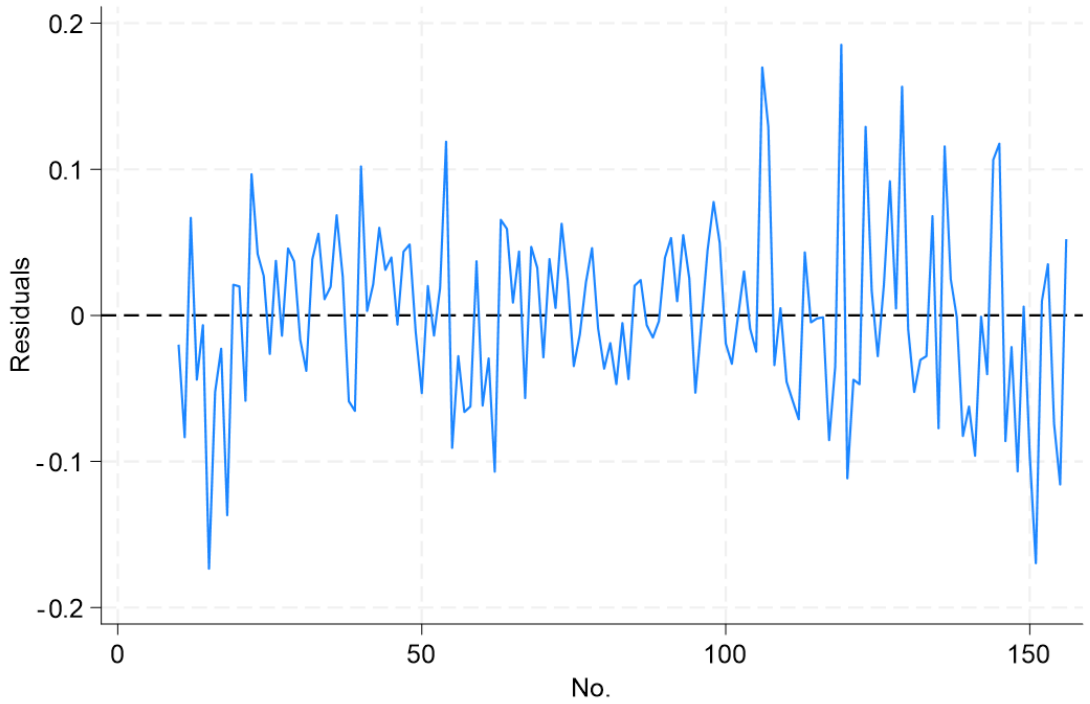


Figure 2. FAVAR (8) model residual dynamic.

Table 5. Lagrange multiplier test.

Lag	chi2	P-value
1	61.739	0.557
2	71.390	0.246
3	57.658	0.699
4	54.240	0.803
5	57.338	0.709
6	64.794	0.449
7	75.281	0.158
8	71.237	0.250

Table 5 shows the results of the Lagrange Multiplier (LM) test, which indicates that the leftover values from the FAVAR (8) model do not show important autocorrelation.

Table 6. Jarque Bera test.

Equation	chi2	P-value
DINT	2.502	0.286
DECC	2.564	0.277
DASP	0.018	0.991
DLAF	5.528	0.063
DRES	0.882	0.643
DMMR	7.054	0.029
DJOV	794.553	0.000
DREC	61.467	0.000

Table 6 presents the unsatisfactory results of the Jarque-Bera test, as it shows that most residuals deviate from normality.

Table 7. Portmanteau test for white noise.

Portmanteau (Q) statistic	**27.675**
P-value	0.930

Table 7 details the results of the Portmanteau test for white noise, indicating that the null hypothesis of no autocorrelation cannot be rejected.

Table 8. List of variables.

Variables	**Description**
cn1	Financial confidence index
cn2	Total order confidence index
cn3	Investment confidence index
cn4	Employment sentiment index
cn5	Manufacturing confidence index
ph1	Single house price index with land for the whole country
ph2	Price index Single house with land Bangkok and perimeter
ph3	Price index single house with regional land excluding Bangkok and perimeter
ph4	Price index townhouse with land in whole country
ph5	Price index townhouse with land Bangkok and perimeter
ph6	Price index townhouse with regional land excluding Bangkok and perimeter
ph7	Bangkok & perimeter building price index
ph8	Bangkok land and perimeter index
uem	Job vacancies
wok	Recruitment
wf1	Thai workers travel to work in Taiwan
wf2	Thai workers traveling to work in Singapore
wf3	Thai workers traveling to work in Malaysia
wf4	Thai workers travel to Japan
wf5	Thai workers traveling to work in Israel
wf6	Thai workers traveling to work, others
rs1	Non-durable retail store food retail store
rs2	Non-durable retail store beverage retail store
rs3	Non-durable retail index tobacco product retail store
rs4	Non-durable retail index, retail stores, pharmaceutical and pharmaceutical products, fragrances, and perfumery.
rs5	Durable retail index retail store audio visual equipment
rs6	Durable goods retail index textile retail store
rs7	Durable merchandise retail index, retail stores colored metal and glass
rs8	Index retail durable goods retail shop carpet flooring wall covering and flooring
rs9	Index of retail, durable goods, retail stores, electrical appliances, furniture, lighting equipment, and other household items.
rs10	Index retail durable goods retail stores, books, newspapers, and stationery
rs11	Durable goods retail index retail stores other cultural and recreational products
rs12	Durable goods retail index retail stores clothing, shoes, and leather
rs13	Index retail durable goods retail stores used products
rs14	Retail index, sales, department stores and general stores, retail stores, food, beverages and tobacco are the main items.
rs15	Retail index sales department stores and general stores retail stores other general products
rs16	Retail sales, auto repair car and fuel oil sales index
rs17	Auto sales retail sales automotive repair and fuel oil automotive sales
rs18	Retail index car sales auto repair and fuel vehicle maintenance and repair
rs19	Retail index car sales auto repair and fuel sales, automotive parts and accessories

Variables	Description
rs20	Retail index: auto sales, auto repair car, and fuel sales, maintenance and repair motorcycle parts and accessories, and related
rs21	Retail sales auto repair car and fuel retail automotive fuel retail store
INT	Policy interest rate
nr1	Interest rate in the money market, interest rate, overnight loan between banks
nr2	Interest rate in the money market interbank overnight loan interest rate: Lowest
nr3	Interest rate in the money market interbank overnight loan interest rate: Maximum
nr4	Bilateral repurchase transaction interest rate of Bot 1 day
nr5	Bilateral repurchase transaction interest rate of Bot 7 days
nr6	Bilateral repurchase transaction interest rate of Bot 14 days
nr7	Bilateral repurchase transaction interest rate of Bot 1 month
nr8	1-week interbank rate on Bangkok market
nr9	1-month interbank rate in Bangkok market
nr10	2-month interbank rate in Bangkok market
nr11	Interbank Interest Rate in Bangkok Market 3 months
nr12	Interbank Interest Rate in Bangkok Market 6 months
nr13	1-year interbank rate in Bangkok market
nr14	Return on treasury bills and government bonds 1 month
nr15	Return on treasury bills and government bonds 3 months
nr16	Return on treasury bills and government bonds 6 months
nr17	Return on treasury bills and government bonds 1 year
nr18	Return on treasury bills and government bonds 2 years
nr19	Return on treasury bills and government bonds 3 years
nr20	Return on treasury bills and government bonds 4 years
nr21	Return on treasury bills and government bonds 5 years
nr22	Return on treasury bills and government bonds 6 years
nr23	Return on treasury bills and government bonds 7 years
nr24	Return on treasury bills and government bonds 8 years
nr25	Return on treasury bills and government bonds 9 years
nr26	Return on treasury bills and government bonds 10 years
nr27	Return on treasury bills and government bonds 11 years
nr28	Return on treasury bills and government bonds 12 years
nr29	Return on treasury bills and government bonds 13 years
nr30	Return on treasury bills and government bonds 14 years
nr31	Return on treasury bills and government bonds 15 years
nr32	Return on treasury bills and government bonds 16 years
nr33	Return on treasury bills and government bonds 17 years
nr34	Return on treasury bills and government bonds 18 years
nr35	Return on treasury bills and government bonds, 19 years
nr36	Return on treasury bills and government bonds 20 years
nr37	State enterprise bond yield 0-1 years: Lowest
nr38	State enterprise bond yield 0-1 years: Maximum
nr39	State enterprise bond yield >1-3 years: Lowest
nr40	State enterprise bond yield >1-3 years: Maximum
nr41	State enterprise bond yield >3-6 years: Lowest
nr42	State enterprise bond yield >3-6 years: Maximum
nr43	State enterprise bond yield >6-10 years: Lowest
nr44	State enterprise bond yield >6-10 years: Maximum
nr45	State enterprise bond yield >10-14 years: Lowest
nr46	State enterprise bond yield >10-14 years: Maximum
nr47	State enterprise bond yield >14 years: Lowest
nr48	State enterprise bond yield >14 years: Maximum
nr49	Interest rate of commercial bank financial institution loan interest rate maximum loan interest rate: Minimum
nr50	Interest rate of commercial banks loan interest rate maximum loan interest rate: Maximum
nr51	Interest rate of commercial bank financial institution loan interest rate overdraft interest rate: Minimum

Variables	Description
nr52	Interest rate of commercial bank financial institution loan interest rate overdraft interest rate: Maximum
nr53	Interest rate of commercial bank financial institution loan interest rate good major customer loan interest rate: Lowest
nr54	Interest rates of commercial banks, interest rates, interest rates, loan rates, large-scale clients, top-grade:
nr55	Interest rate of commercial banks, loan interest rate, loan interest rate, large-scale customers, weighted average (All contracts)
nr56	Interest rate of commercial banks, loan interest rate, new loan interest rate of the business sector, weighted average 10
nr57	Interest rate of commercial bank financial institution loan interest rate, good retail loan interest rate: Lowest
nr58	Interest rates of commercial banks, interest rates, interest rates, loans, retail clients, premium: Highest
nr59	Interest rate of commercial bank financial institution loan interest rate Savings deposit rate: Lowest
nr60	Interest rate of commercial bank financial institutions loan interest rate Savings interest rate: Maximum
nr61	Interest rate of commercial bank financial institutions loan interest rate 3-month fixed deposit interest rate: Lowest
nr62	Interest rate of commercial bank financial institutions loan interest rate 3-month fixed deposit interest rate: Maximum
nr63	Interest rate of commercial bank financial institutions loan interest rate 6-month fixed deposit interest rate: Lowest
nr64	Interest rate of commercial bank financial institutions loan interest rate 6-month fixed deposit interest rate: Maximum
nr65	Interest rate of commercial bank financial institutions loan interest rate 12-month fixed deposit interest rate: Lowest
nr66	Interest rate of commercial bank financial institutions loan interest rate 12-month fixed deposit interest rate: Maximum
nr67	Interest rate of commercial bank financial institutions loan interest rate 2-year fixed deposit interest rate: Lowest
nr68	Interest rate of commercial bank financial institutions loan interest rate 2-year fixed deposit interest rate: Maximum
nr69	Interest rate of commercial bank financial institutions loan interest rate and fixed deposit interest rate for more than 2 years: Minimum
nr70	Interest rate of commercial bank financial institutions loan interest rate and fixed deposit interest rate more for than 2 years: Maximum
nr71	Interest rates of commercial banks, loan interest rates, average fixed deposit interest rates, weighted

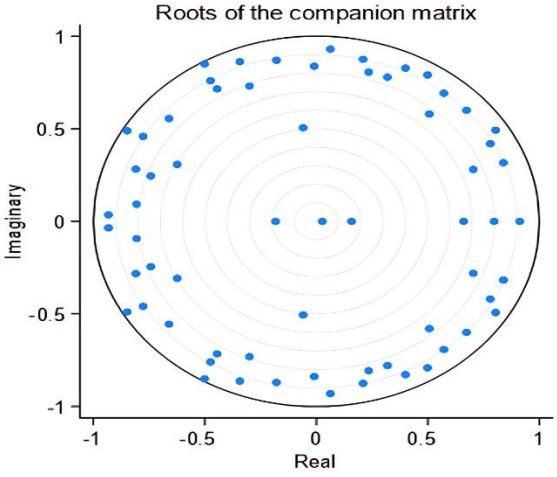


Figure 3. Inverse roots of the AR characteristic polynomial.

Figure 3shows the opposite roots of the autoregressive (AR) characteristic polynomial, which means that the FAVAR (8) model is stable and trustworthy for more analysis.

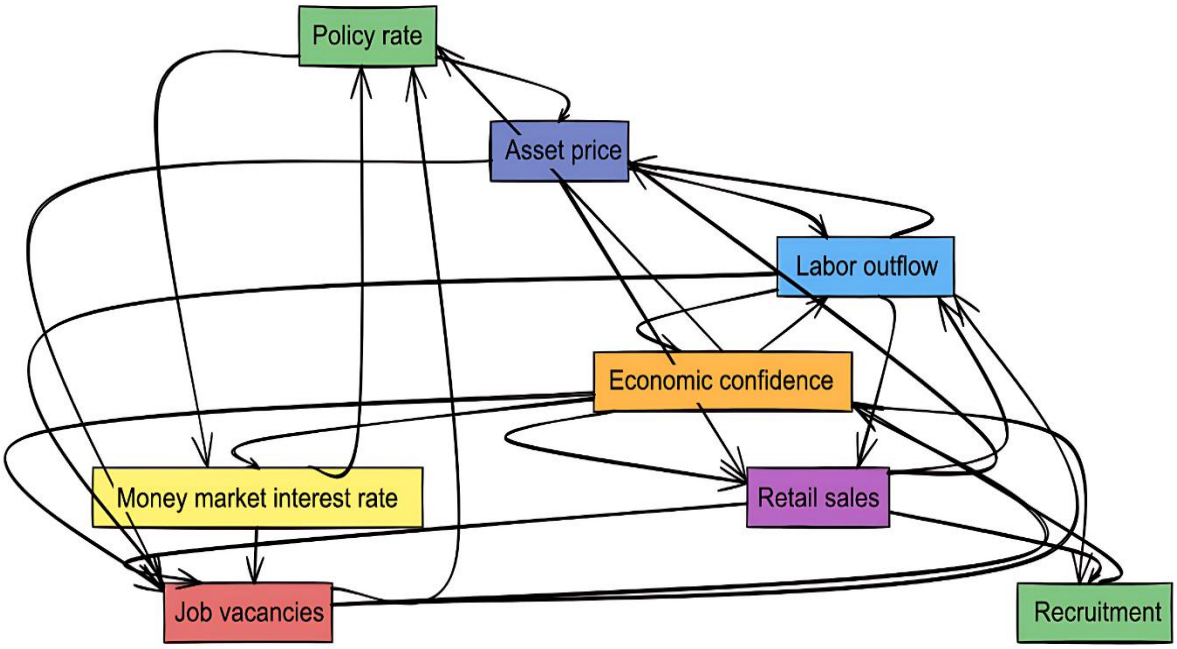


Figure 4. Granger causality.

Figure 4 shows the results of the Granger causality test. From the DINT equation, DECC, DMMR, and DJOV significantly cause changes in DINT with p-values of 0.000, 0.000, and 0.003, respectively. This means that changes in economic confidence, money market interest rates, and job vacancies can predict changes in the interest rate. The DECC equation reveals that DLAF, DJOV, and DREC significantly contribute to DECC, with p-values of 0.000. Thus, all variables are significant predictors of changes in economic confidence. Turning to the DASP—asset price equation, the significant predictors include DINT, DLAF, and DRES, with p-values of 0.042, 0.001, and 0.000, respectively. This evidence indicates that interest rates, the outflow of labor, and retail sales can predict asset prices. The predictors with relatively high p-values in this DLAF equation include DECC, DASP, DRES, and DJOV, which are 0.001, 0.009, 0.000, and 0.000, respectively. This evidence indicates that these variables can anticipate changes in labor outflow. The DRES equation shows a strong cause-and-effect relationship from DECC, DASP, and DLAF, with p-values of 0.001, 0.002, and 0.032, which means these variables can help predict retail sales. The DMMR equation indicates that only DINT and DECC significantly Granger-cause DMMR, with p-values of 0.010 and 0.000, respectively, indicating that changes in the interest rate and economic confidence can predict interest rates in the money market. The significant predictors for the DJOV equation were DECC, DASP, DLAF, DRES, and DMMR. The corresponding p-values are 0.000, 0.035, 0.000, 0.000, and 0.000, indicating a strong predictive relationship. Lastly, in the case of the DREC equation, there is significant causality from DECC and DRES, with p-values of 0.047 and 0.003, respectively. This result clearly shows that these variables can predict changes in recruitment. The results of the Granger causality test show that there are direct effects of the interest rate on money market interest and asset price, which in turn affect other variables, and hence, the indirect effects of the interest rate.

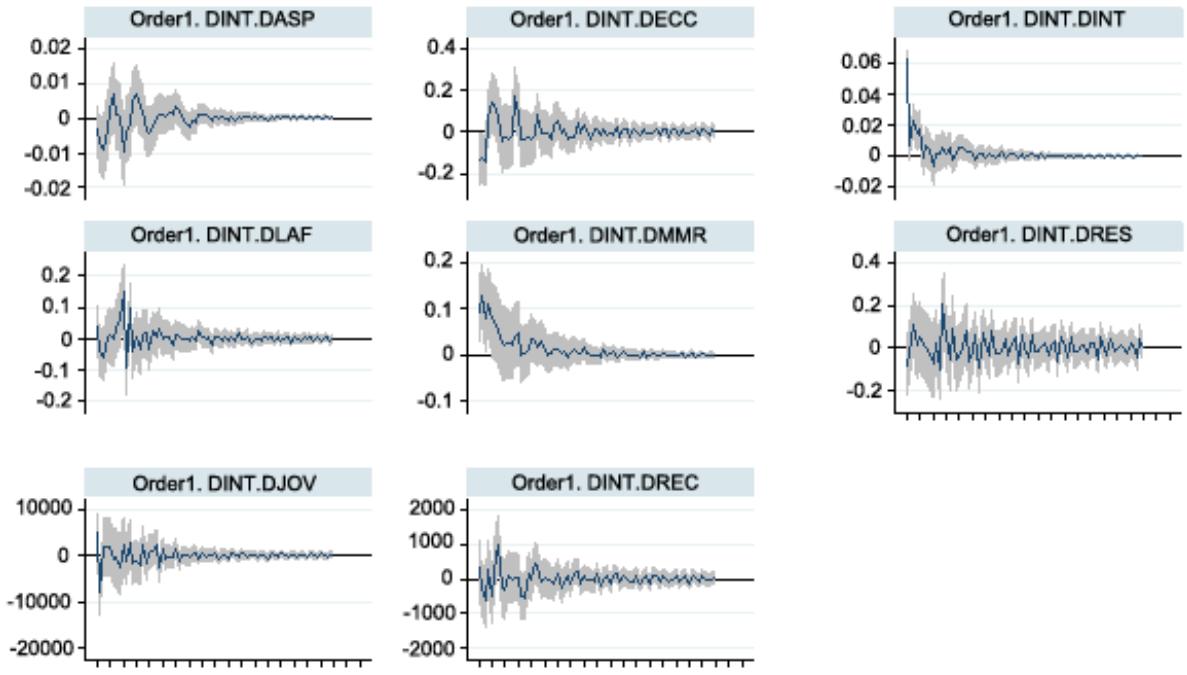


Figure 5. Response of variables to the shock of 1 standard deviation to DINT.

Figure 5 shows the impulse responses of the variables to a single standard deviation shock in the DINT. The above response of the DECC to the shock in DINT shows that, on a shock in DINT, it begins to drop before gradually rising back to the trend. This data indicates that an increase in the interest rate will have a negative influence on economic confidence, but only for a temporary period before stabilization. Similarly, the DASP reacts somewhat negatively to the shock, suggesting that asset prices might decline temporarily because of a higher policy rate. The DLAF's response tends to be noisy. This suggests the sensitivity of labor outflow to movements in the policy rate but that the adjustments are gradual. DRES reacts negatively at the beginning, but afterward tends to signal that higher policy rates hurt retail sales, which then gradually recover. The response of DMMR is positive and persistent; that is, interest rates in the money market increase when the policy rate increases, which mirrors what the market would anticipate. DJOV responds more strongly, and the immediate increases in job vacancies after the interest rate shock are significant, showing its adverse impact on employment. Finally, DREC responds slightly negatively, denoting a slight downward effect on recruitment, which then appears to stabilize over.

5. DISCUSSION

The results from the impulse response analysis indicated that initially economic confidence, a measure of the economic outlook, fell before slowly returning to its stable state. This result aligns with the findings of Gurgur and Kilinc (2015), who find interest rates to have a significant effect on consumer confidence, especially in the short run. The interest rate hike is widely attributed to dampened consumer activity, as more expensive loans can correspond to periods of transient confidence. Asset prices also initially fell in response to the policy rate shock, but this effect quickly dissipated. Higher rates hit asset prices as borrowing becomes more expensive, and thus there is less investment, which can impact the prices of assets. This is similar to the findings of Fenig et al. (2018), who state that interest rates can play a role in bursting bubbles in asset prices, even in the presence of macro-stabilizing monetary policies. In the case of labor outflow, its responses to the policy rate shock, both noisy and sensitive, highlight the findings of Del Boca and Lusardi (2003) regarding the role of credit market constraints in labor market participation. They found that interest rate fluctuations affect labor market decisions, although with differing effects depending on the availability of loans and the state of the job market. Aligning with the empirical studies of Benazić (2014), retail

sales also show a temporary fall in response to the policy rate shock, which reflects how higher interest rates first cut consumer spending, as an increase in short-term interest raises borrowing costs, thus hindering consumption. In the long run, retail sales seem to bounce back, suggesting that an economy can eventually adjust to a tightening monetary policy environment.

On the contrary, interest rates in the money market react positively to policy rate shocks. This outcome is consistent with the monetary policy guidance. From a theoretical perspective, this reaction illustrates that monetary policy successfully affects the financial market. The relationship between high policy interest rates and a high number of job openings seems to go against what is predicted theoretically. This could be due to the lag in monetary policy effects transmission; even since borrowing costs are beginning to head higher, firms might continue to be in a hiring market as they detect a steady boom in the period. Additionally, when the job market is unusually tight before the rate increases, large vacancies can be slow to evaporate, even as central banks' wheel up rates. Moreover, high vacancies can indicate structural labor market issues such as skill or demographic mismatches.

For example, if the technology or healthcare sectors are short of labor, vacancies can remain steady even when interest rates climb. Moreover, sectors at the resilient end of a high-rate economy, such as healthcare or public sector industries, could continue to expand or at least recover, as will those less impacted by higher borrowing costs, keeping vacancy rates elevated, regardless of the interest rate level.

Recruitment fell slightly after the policy rate shock, which means that climbing interest rates hampered hiring. Such a cohort variation is similar to the evidence presented in the labor market literature, such as Del Boca and Lusardi (2003) and Walsh (2005).

6. POLICY IMPLICATIONS

The results indicate that interest rates have a wide spectrum of economic response variables. Thus, given these broad impacts, the Bank of Thailand should be cautious about using monetary policy to achieve balanced economic results. Considering the short-term impact of higher interest rates on economic confidence, it is preferable to have the Bank of Thailand be more gradual with the implementation and clear with its communication concerning any interest rate decisions. Such an approach mitigates the negative effect on economic confidence and enables individuals to adjust their expectations smoothly. Interest rate changes impact asset prices, necessitating a more comprehensive approach to stabilizing asset markets alongside monetary interventions. Complementary policies are vital, given that high interest rates increase the outflow of labor and the volatility of job vacancies. It is important to implement measures such as ensuring access to loans and supporting job training programs to minimize damaging effects on households and firms during the transition period of the policy rate shock. Such measures would alleviate household welfare and stabilize the overall labor market in the face of monetary tightening. When interest rates rise, household consumption matters, as do borrowing costs, as the results suggest that the decline in retail sales follows this rise. This result is especially pertinent when consumption borrowing is based on credit rather than savings. In such cases, we should complement fiscal policy tools like tax cuts, financial grants, and subsidies with the policy rate measure. Given the critical impact on household consumption, these fiscal measures should target retail consumption.

7. FUTURE RESEARCH

Further research on the effects of interest rate shocks on the output sector is crucial for designing better monetary policies. We should conduct further research on non-traditional financial instruments to understand their interaction with policy rates. As financial markets evolve continuously, derivative instruments and crypto currencies have become integral parts of the global financial system. So, looking at how they interact with policy rates can give us a better overall view and help us understand the complicated relationships between non-traditional financial instruments, interest rates, and certain economic factors.

8. CONCLUSION

The policy interest rate is a basic monetary policy tool used by central banks to control economic conditions. Its main channel works via a transmission mechanism in which shocks to the policy rate proliferate through the financial system and then affect the real economy. Hence, it is imperative to not only understand the economic impacts of a policy rate but also that effective policymaking and market stability depend on it. Using the Factor-Augmented Vector Autoregressive (FAVAR) model, this study analyzed the impacts of the policy interest rate, that is, the interest rate, on the Thai economy. This model overcomes the limitations of traditional models, which often rely on few variables, by allowing the analysis to include both variables that can be observed and those that cannot, such as confidence in the economy, asset prices, labor flow, retail sales, and interest rates in the money market. This study used monthly data from the Bank of Thailand from January 2011 to July 2023, some of which were extracted as common factors using the principal component technique. In addition, the interrelations between interest rates and other key economic variables are examined using the Granger causality test and impulse response analysis. The results indicate that a hike in interest rates had a potential but temporary detrimental effect on economic confidence, retail sales, and asset prices. Moreover, there was a correlation between the interest rate change and the outflow of workers, employment, and vacancies. The results also indicate that there was an adjustment in interest rates for the money market in response to changes in the policy interest rate, which is an indication of the effective operation of the monetary transmission mechanism through the money market channel. The transmission of the policy rate to the rest of the economy implies the need for a balanced implementation of monetary policy. These results justify some staggered increases in interest rates, some supportive fiscal policy measures to promote consumption, and some labor market measures to reduce the adverse effects of monetary tightening.

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