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THE IMPACT OF FED'S MONETARY POLICY ON THE CAPITAL MARKET IN THE USA

The focus of this paper is the impact of the Federal Reserve (Fed) System's monetary policy on the United States capital market. To identify the capital market, we have segmented it into the government bond market, the corporate bond market, and the stock market. We have utilized a structural vector autoregressive model methodology in order to assess the interrelations between six US variables. We have performed impulse response functions and forecast error variance decomposition analyses for the model interpretation. The empirical findings based on monthly data suggest that the results, in general, are consistent with the expected effects, despite some deviations. The responses of the government, corporate bond markets and the stock market in the United States to the Fed's monetary policy interest rate shocks have developed mainly in the short run and gradually faded away in the long run. There are significant interdependencies between the observed variables, though each of them is affected to its own specific extent.

Keywords: *US monetary policy, capital market, VAR, impulse response analysis, variance decomposition*
JEL: F32, O16
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INTRODUCTION. The Federal Reserve System's monetary policy has a great influence on almost every aspect of US economy, especially financial markets. Simultaneously, the capital market is an important component of the US financial system. Thus, it is considered significant to study interactions amongst them. In this paper, we have tried to evaluate the effects Fed's monetary policy might have on the different parts of the US capital market in order to investigate how each part of the capital market interacts with monetary policy and if the results correspond to the general theoretic expectations. We have utilized US government and corporate bond markets, and the stock market indicators to describe the capital market responses to the monetary policy changes.

We have designed a standard structural vector autoregressive (VAR) model based on the US monthly dataset, as well as performed impulse response and variance decomposition analysis techniques to investigate the possible interrelations between monetary policy tools and capital market indicators.

The main part of this paper is organized as follows: Literature review, Research methodology, Results, Conclusions. In Literature review the focus is on the investigation of existing studies, concerning the monetary policy and the capital markets interactions and mutual effects. Research Methodology gives an idea of the main tools utilized to analyse what is considered as the key aim of the research. The section called Results presents the variables used in the model, the process of model estimation and the outcomes of our study. Finally, Conclusions emphasize the key points of our research.

LITERATURE REVIEW. The focus of our study is on the influence of Fed's monetary policy may have on different parts of the US capital market. Throughout recent decades there has been a large amount of studies dedicated to monetary policy and its possible impact on financial markets in both developed and emerging countries. To get an idea of the main findings, we have examined a number of analyses conducted by various authors for different economies.

Smolyansky and Suarez (2021) studied the information effect of Fed's monetary policy's on the corporate bond market. Their analysis revealed that investors interpret expansionary monetary policy as a signal of weaker-than-believed economic fundamentals, driving riskier asset prices down. The authors opined that following an unanticipated monetary policy tightening (easing), returns on corporate bonds with higher credit risk outperform (underperform). Their findings indicate a strong information component of the announcements of Federal Reserve's policy.

The impact of the monetary policy changes on equity prices was examined by Bernanke and Kuttner (2003). The authors found relatively strong and consistent reaction on the stock market to unexpected monetary policy actions. The stock market's and Fed's monetary policy interactions were also studied by D'Amico and Farka (2003) and Farka (2009). Gürkaynak et al. (2005) have

documented that monetary policy actions and statements have important but differing effects on bond yields and stock prices.

Rigobon and Sack (2001, 2002) analyzed both the impact of monetary policy on asset prices and the reaction of monetary policy to the stock market. They have concluded that the monetary policy reacts significantly to the stock market. Meanwhile, the authors have discovered that increases in the short-term interest rate have a negative impact on stock prices and a significant positive effect on market interest rates, which becomes smaller at longer maturities.

Craine and Martin (2003), due to their more general model, have revealed that in response to a monetary policy surprise short maturity yields rise, and long maturity yields do nothing. This can be considered as a solution to a puzzling effect estimated, among others, by Cochrane and Piazzesi (2002). Bond yields' reaction to the monetary policy changes has also been investigated by Kuttner (2001), who concludes that the response of interest rates to unanticipated changes is large and significant.

Fung (2002) examined the effects of monetary policy in seven East Asian economies using a VAR analysis methodology. The author studied impulse response functions taking either the interest rate or the exchange rate as the policy instrument depending on the country under investigation. According to the author, the impulse response functions were mainly consistent with the expected effects of monetary policy as found in other VAR studies.

Gilchrist et al. (2019) focused on how US monetary policy affected international bonds markets, using daily-frequency dataset. They identified that dollar-denominated foreign bond yields were highly responsive to unanticipated changes in the stance of US monetary policy during both the conventional and unconventional policy regimes. The findings of the authors suggested that there was no evidence that the US monetary policy tightenings and easings had an asymmetric effect on foreign bond yields, which cast doubt on the notion that the US monetary easings induced excessive risk-taking in international bond markets.

Jiang (2019) used a vector autoregression (VAR) model to estimate the influence the US monetary policy had on Chinese stock market. The results of the impulse response analysis indicated that the expansionary monetary policy in the US caused negative influence on Chinese stock market, while US contractionary monetary policy had a positive impact on Chinese stock market.

A large amount of theoretical and empirical literature confirms that there is a visible interaction between the central bank's monetary policy and financial markets.

RESEARCH METHODOLOGY. In order to investigate the influence monetary policy may have on capital markets in the US, we have used VAR-based methodology developed by Sims (1980, 1992). A VAR modelling is widely used in forecasting and policy analysis of macroeconomic indicators. They are

multivariate linear time-series models, which allow to study collective dynamics of multiple variables included in the system.

One of the main descriptive devices in these autoregressive systems is the analysis of the system's response to typical random shocks (Sims, 1980). Impulse response analysis gives an opportunity to trace the effects of structural shocks (impulses) on the endogenous variables of the model. The magnitude of the shock is one standard deviation.

Another important tool for the estimated vector autoregressive model interpretation is forecast error variance decomposition or variance decomposition, which helps to study the relations among the variables. Variance decomposition identifies how much of the forecast error variance of the endogenous variables can be explained by the exogenous shocks to the variables.

In the frame of this article, we have estimated standard structural vector autoregressive model (SVAR), which contains 6 US variables, using Cholesky decomposition. VAR modelling method has been employed on monthly time-series for the period from January 2000 to January 2023. We have conducted Impulse response and Variance decomposition analyses to uncover the relationships between the taken variables in more detail.

ANALYSIS. The interdependence between monetary policy and different parts of capital markets has been largely investigated during recent years. Existing analyses refer to both developed countries with their famous central banks' policies and emerging countries with their capital market conditions. As previously conducted studies prove, there are important and strong interrelations between monetary policy changes and capital markets. Within the framework of this article, we have decided to examine the impact of US Federal Reserve System monetary policy on the US capital market.

The main instrument of central banks' monetary policy is the interest rate. The US Federal Reserve's Federal Open Market Committee (FOMC) is responsible for setting the federal funds target rate range. Changes in the federal funds rate trigger a chain of events that affect other short-term interest rates, foreign exchange rates, long-term interest rates, the amount of money and credit, and, ultimately, a range of economic variables, including employment, output, and prices of goods and services[1]. For our analysis we have taken the upper limit of the target range.

[1] Source: The Federal Reserve, https://www.federalreserve.gov/monetarypolicy/fomc.htm

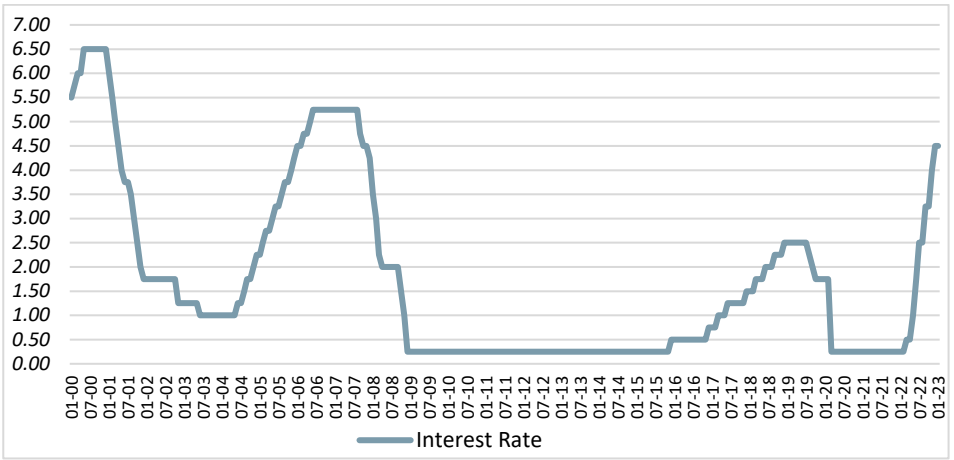

Chart 1. ***US Federal funds rate (%)***[2]

Chart 1 shows the dynamics of US key refinancing rate for the period spanning from January 2000 to January 2023. Another monetary indicator used in our study is M2, which is under Fed policy's direct influence. M2 is usually considered as overall money. Chart 2 illustrates M2 monthly, seasonally adjusted data from January 2000 to January 2023.

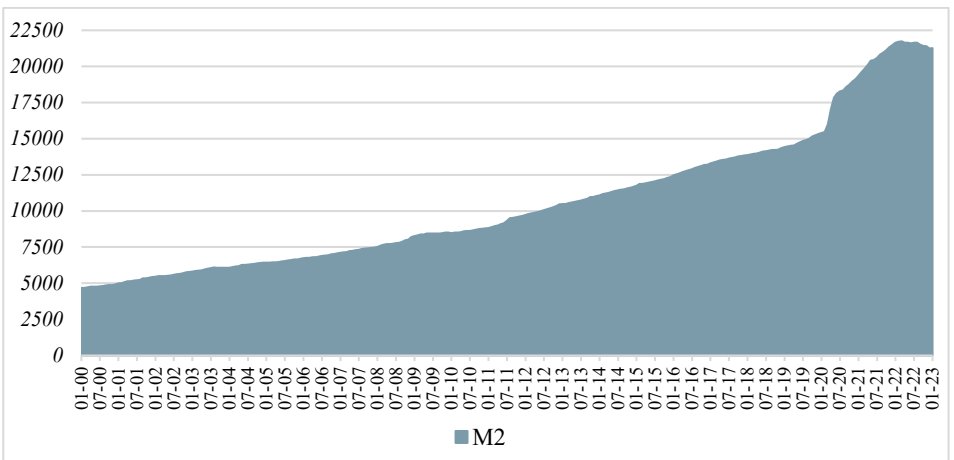

Chart 2. ***M2 monetary aggregate (billions USD, seasonally adjusted)***[3]

One of the main aims of central bank's monetary policy is price stability. Inflation is always under policymaker's supervision. As a measure of inflation, we have considered Consumer price index (CPI) (see Chart 3) to be included in the model.

[2] The data are from The Federal Reserve, https://www.federalreserve.gov/monetarypolicy/openmarket.htm

[3] The data are from The Federal Reserve, https://www.federalreserve.gov/releases/h6/current/default.htm

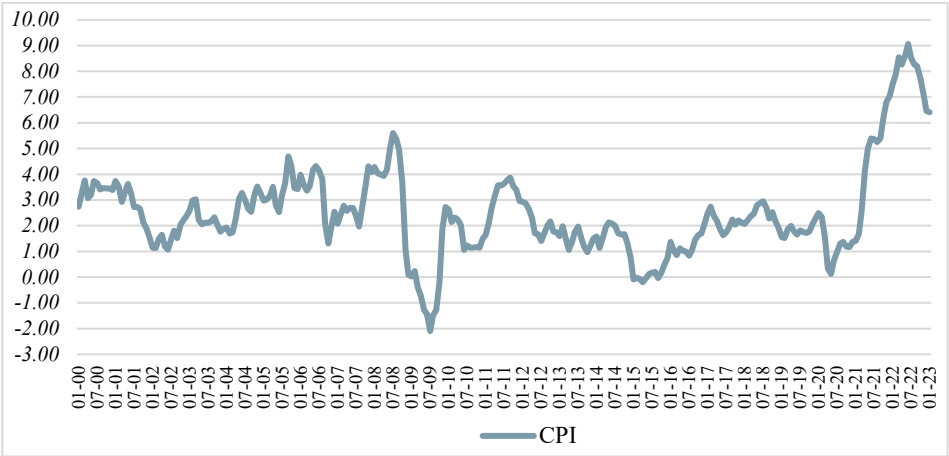

Chart 3. ***US CPI (%)***[4]

To investigate the impact the Fed monetary policy may have on the US capital market, we have used financial indicators, which describe different parts of the capital market. Charts 4 and 5 present 10-year US government bond market yields and US public corporate debt index yields correspondingly, which give an idea about overall US bond market. Chart 6 shows the historical movement of one of the most famous US stock indices, that is S&P 500, which is considered as a representative of the US stock market.

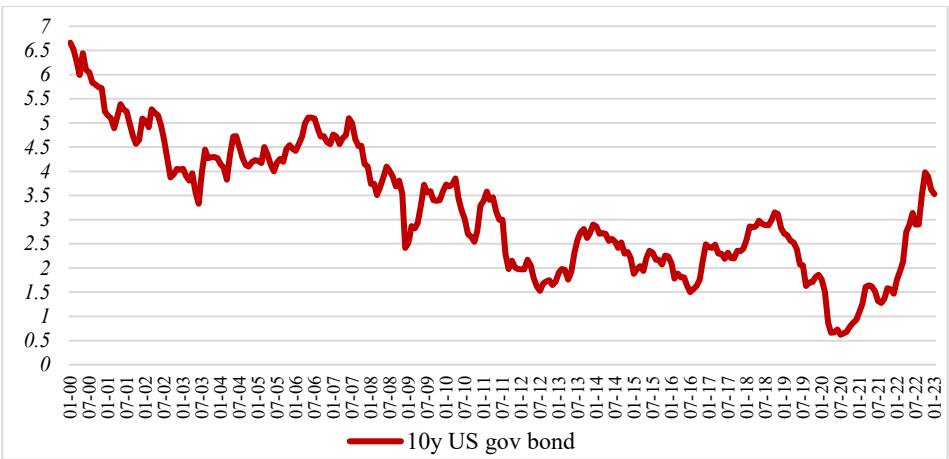

Chart 4. ***10-year maturity US government bond market yields (%)***[5]

[4] The data are from OECD, https://www.oecd-ilibrary.org/economics/data/prices/consumer-prices-complete-database_0f2e8000-en

[5] The data are from The Federal Reserve, https://www.federalreserve.gov/releases/h15/

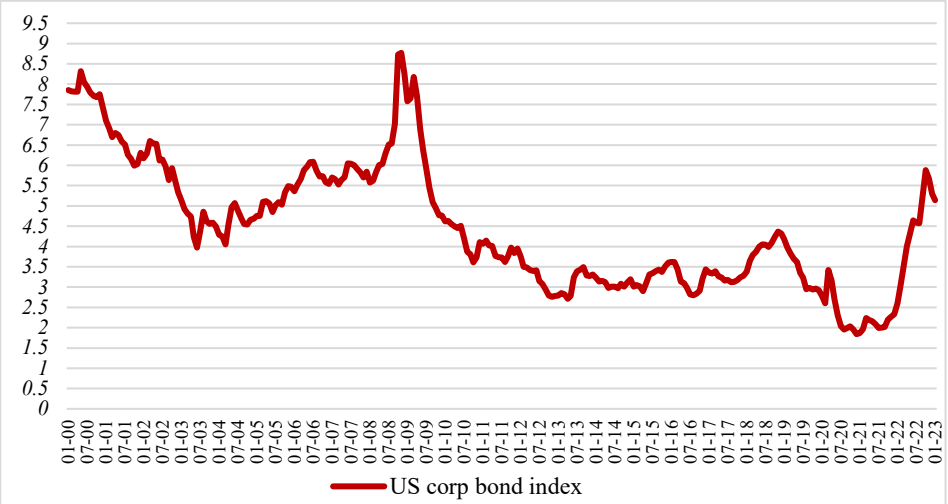

Chart 5. ***ICE BofA US Corporate Index Effective Yield (%)***[6]

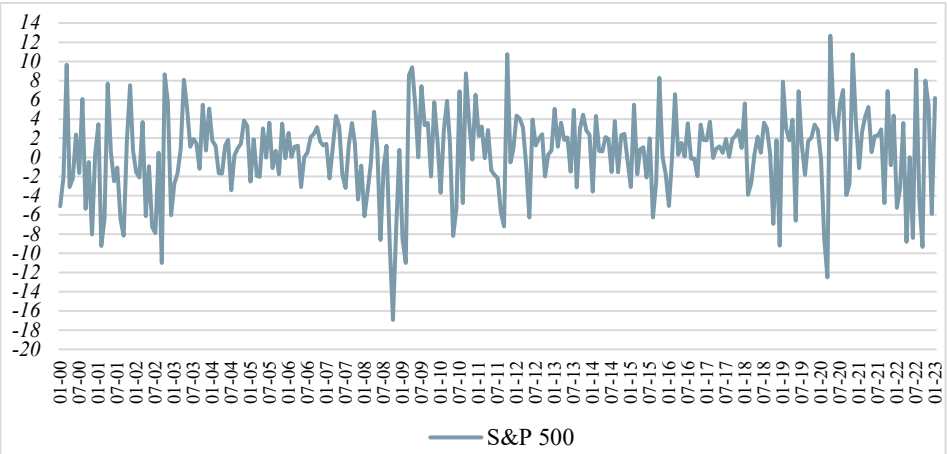

Chart 6. ***S&P 500 stock index historical changes (%)***[7]

Thus, to estimate the impact of the monetary policy on the US domestic capital market the following variables have been taken: Fed interest rate (R), M2 aggregate (M2), CPI, 10-year government bond yields (GB10), corporate bond yields (CB) and S&P 500 changes (S&P500_change). The dataset is monthly for the period spanning from January 2000 to January 2023.

During stationarity analysis we have performed Augmented Dickey-Fuller, Phillips-Perron and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. The results show that the order of integration of the taken variables is either I(0) or I(1). The unit root examination indicates that consumer price index, government and corporate bond yields, M2 and Fed interest rate are stationary at first difference. The changes of S&P 500 index are stationary at level.

[6] The data are from FRED, https://fred.stlouisfed.org/series/BAMLC0A0CMEY
[7] The data are from https://www.investing.com/indices/us-spx-500-historical-data

Lag-length analysis is very important for the model specification. If the lag length is too short, it will lead to the model's misspecification. On the other hand, if the lag length is extremally long, degrees of freedom will be wasted. Thus, to obtain the appropriate lag numbers we have used lag specification criteria, particularly Akaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion. These criteria offered lag numbers to be either 1 or 3. We have considered this lag order selection to be too short for our dataset with monthly frequency. According to the practice, in case of monthly data, lag length are supposed to be 12. The main requirement is that there should be no autocorrelation at the selected lag. Since there was an autocorrelation at 12 lags, 13 lags are applied to our VAR model.

VAR stability diagnostics' results have shown that all inverse roots of the characteristic AR polynomial lie inside the unit circle, which suggests that our VAR model is stable.

We have estimated structural VAR to trace the effects to a shock to monetary policy, in particular Fed interest rate, on other variables, especially on the indicators of different parts of US capital market. Funds rate can be considered as a measure of Federal Reserve policy (Bernanke & Blinder, 1992). We assume that the monetary policy shocks can be represented as shocks to Federal funds rate. Monetary policy interest rate is considered as the exogenous variable, and we want to examine how other endogenous variables react to the exogenous variable's shocks.

Impulse response functions show the responses to the shocks on the variables included in the model. Figure 7 illustrates the responses of government and corporate bond yields, S&P 500 index, M2, CPI and interest rate itself to an exogenous one-standard deviation shock on Fed interest rate. The impulse response functions are plotted for over a 24-month horizon.

The responses of the variables to the shock develop mainly in the short run and become gradually muted in the long run. The response of the Fed interest rate to its own shock is positive and significant. It returns to the pre-shock levels after around 15 months following the shock. M2 responds negatively to the positive shock of the interest rate. Interest rate shock increases inflation at first, but after a few periods it starts falling. Fed rate positive shock has an immediate positive impact on US government bond yields, but it is very short-lived lasting nearly two periods. The initial response of corporate bond yields is negative, but it starts recovering very quickly becoming positive after the first period following the shock. In case of S&P 500 index the immediate positive response starts decreasing and turns negative before reaching the second period.

We have performed a forecast error variance decomposition analysis to display the relations among the variables. Variance decomposition estimates the percentage of the variables' movements due to the shocks to themselves and to the other variables included in the vector autoregressive model.

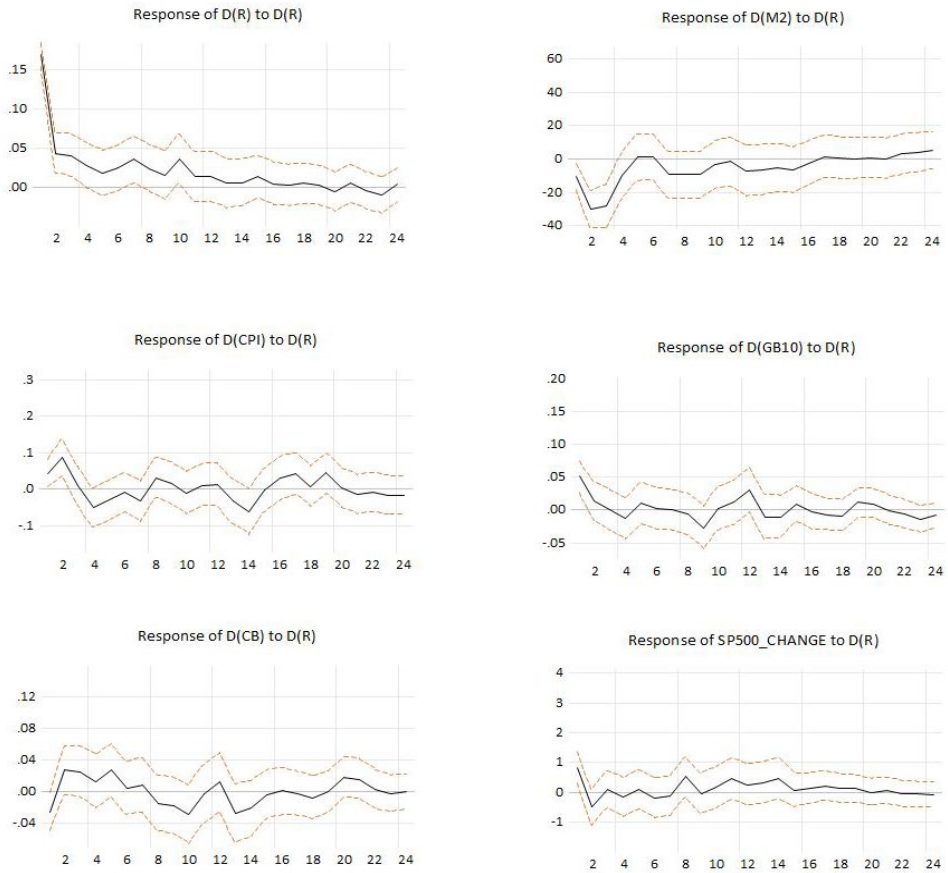

Chart 7. ***Responses to Cholesky One S.D. (d.f. adjusted) innovations ± 2 S. E.***[8]

Due to Cholesky ordering used in this VAR model, all variables have no contemporaneous effect on Fed interest rate in the first period. Over time the impact of interest rate on its own changes decreases reaching around 63.5% by the 24th period. In case of other variables, their effect on the interest rate grows during the observed period of time. Out of all variables included in our model Fed interest rate fluctuations are more largely explained by the shocks to US government bond yields. M2 variations are mainly explained by the shocks to themselves and interest rate in the course of time. In case of US government bond yields, in the short run up to 89% of movements can be explained by its own changes. In the long run the effects of interest rate, M2 and S&P 500 increase attaining around the 10% level. The movements of corporate bond yields are widely explained by the shocks to themselves, government bond yields and S&P 500 index. In the first period approximately 50% of corporate

[8] The figures are based on our model estimations and extracted from EViews software.

bond yields volatility is explained by the shock to itself and 47% by the shock to government bond yields. During some time these effects are falling. On the contrary, the impact of S&P 500 index on corporate bond yields strengthens amounting up to 14%. S&P 500 index variations are mainly explained by the shocks to themselves and corporate bond yields and to a small extent by shocks to government bond yields and interest rate.

CONCLUSIONS. The main aim of this article is to study the interaction between Federal Reserve System's monetary policy and different parts of the US capital market. To achieve the goal, we have estimated a structural VAR model with six variables, representing the monetary policy and capital market. The dataset includes monthly time-series for the period spanning from January 2000 to January 2023.

The scientific contribution of the conducted impulse response analysis is as follows:

- The responses to the interest rate shocks develop mainly in the short run and become gradually muted in the long run.
- The positive effect on the US government bond yields is very short-lived nearly fading away after two periods.
- Fed interest rate hike results in corporate bond yields' fall during the first lag, although it is believed that interest rate rise should lead to yields' growth in the fixed income securities market.
- When interest rates increase, stock market usually decreases, however according to our results, stock market's initial response has been positive.

In addition to the above-mentioned, we have found an evidence of so called "price puzzle", when a hike in monetary policy rate leads to higher instead of lower inflation. This is a common issue for most structural vector autoregression models and can be explained by the assumption that the policymakers possibly have information about future inflationary expectations that is not included in the model (Sims, 1992).

According to the results of variance decomposition analysis we can conclude:

- Fed interest rate fluctuations are more largely explained by the shocks to themselves and to the US government bond yields.
- The changes of corporate bond yields can be explained by the shocks to themselves, government bond yields and S&P 500 index.
- The movements of the yields of the US government bond can be explained by their own changes and the changes to the interest rate, M2 and S&P 500.
- In case of the stock market, the estimation has revealed that S&P 500 index variations are predominantly explained by the shocks to

themselves and corporate bond yields and, over longer period of time, by shocks to government bond yields and the interest rate.

As a result of a VAR analysis performed in this research, it can be inferred that the Fed's monetary policy has a significant effect on the capital market of the United States, though government bond, corporate bond and stock markets respond differently and to their own extent. It can be stated that although changes in monetary policy instruments affect capital market indicators, they cover stock and bond markets general volatility only partially.

The results of this paper can be helpful in our further analyses of monetary policy effects on capital markets in both developed and emerging economies. The comparison of the impacts monetary policy tools have on different segments of the capital market can be relevant in designing appropriate policy direction to trigger capital market enhancement.

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