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DIANA TERYAN
PhD Student of the Chair of Finance at Armenian State University of Economics
https://orcid.org/0000-0003-1253-9567

MONETARY POLICY IMPACT ON THE CAPITAL MARKET: EVIDENCE FROM ARMENIA

The main aim of this research is to study the impact monetary policy has on different segments of the capital market in the Republic of Armenia. In the frame of the paper, we investigated the relationship between monetary indicators and government bond, corporate bond, and stock markets. We designed and estimated a structural vector autoregressive model using a monthly dataset of six variables describing the monetary policy of the Central Bank of Armenia and different segments of the capital market. Based on the model, we forecasted baseline and alternative scenarios to compare the results with the actual indicators. In addition, we conducted impulse response and forecast error variance decomposition analyses. The research results showed that our model was generally able to predict the key trends in the observed capital markets over the projection period. According to the alternative forecast scenario, tighter monetary policy with a more aggressive interest rate hike would have led to higher volatility in government, corporate bonds, and stock markets in Armenia. The outcomes of the conducted analyses suggested that monetary policy had a stronger relationship with the government bond market, while its interactions with the corporate bond and stock markets were mostly insignificant in Armenia.

Keywords: *monetary policy, capital market, vector autoregression, impulse response analysis, variance decomposition*

JEL: E44, E52, G10
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INTRODUCTION. The monetary policy developed by the Central Bank has primary importance in affecting various sectors of the economy. The Central Bank of Armenia (CBA) uses its monetary policy toolset to ensure realization of its primary objectives: financial stability and price stability. Different segments of the capital market in the Republic of Armenia (RA) have different levels of sustainability and development. The government bond market is quite active, whereas the corporate bond and, especially, stock markets can be considered emerging.

Our primary goal was to investigate how monetary policy impacts various segments of the capital market in Armenia and to study the relationships between monetary and capital market indicators. Therefore, we used the structural vector autoregressive (SVAR) methodology. We forecasted government bond, corporate bond, and stock market variables, designing baseline and alternative scenarios to evaluate the model's capability to catch the main trends in the markets and to compare forecasted values to the actual figures. Furthermore, we conducted impulse response analysis to examine the reactions of the government, corporate, and stock market indicators to the shock to the Central Bank's main refinancing rate. Variance decomposition analysis was employed to investigate the interrelations between the variables included in our model.

International literature indicated significant relations between monetary policy tools and the capital markets in different countries. However, in the case of Armenia, very few researches have been conducted to estimate the possible impact of monetary policy changes on government bond, corporate bond, and stock markets, to examine the interrelations between the mentioned indicators, to design and forecast baseline and alternative scenarios, using structural vector autoregressive modeling techniques.

LITERATURE REVIEW. Many studies have investigated the interrelations between monetary policy indicators and financial markets over recent decades. Many countries are interested in the possible impact that central banks' monetary policy might have on capital markets.

Bernanke and Kuttner (2003) studied the impact of monetary policy changes on equity prices in the US and found a relatively strong and consistent reaction in the stock market to unexpected monetary policy actions. Rigobon and Sack (2001, 2002) revealed that the monetary policy reacts significantly to the stock market; at the same time, increases in the short-term interest rate have a negative impact on stock prices and a significant positive effect on market interest rates. The effect of the US Federal Reserve System's monetary policy on the corporate bond market was analyzed by Smolyansky and Suarez (2021). They revealed a strong information component of Federal Reserve policy announcements. The authors indicated that following an unanticipated monetary policy tightening (easing), returns on corporate bonds with higher credit risk

outperform (underperform). Ca' Zorzi et al. (2020) concluded that the monetary policy tightenings of both the Federal Reserve System and the European Central Bank raise domestic bond yields, depress domestic equity markets, slow output, and growth inflation. Brand et al. (2006) and Creel et al. (2015) revealed that the European Central Bank's monetary policy changes had a significant influence on medium to long-term interest rates. Their findings on the relations between the ECB and market interest rates were consistent with the literature and similar to those of the US.

During the research, we also investigated the literature related to the main specifics of the Central Bank's monetary policy and the financial markets in Armenia. Dabla-Norris and Floerkemeier (2006) examined the transmission mechanisms of monetary policy in Armenia through different channels. They concluded that amid the inflation-targeting regime, the ability of the monetary policy to affect inflation and economic activity was somehow limited, as some of the transmission channels remained weak. The inflation reacted more strongly to expansionary monetary policy than to contractionary policy, the output showed the opposite response, which highlighted asymmetries in the monetary policy transmission mechanism in Armenia (Igityan, 2021). Some researchers tried to study the features of different parts of the Armenian securities market. Salnazaryan and Aramyan (2017) examined the impact of financial market segments on economic growth and concluded that the greatest impact had the credit market in Armenia. The authors found that in the Armenian securities market, the government bond market had the most significant impact, while the corporate bond and stock markets were too underdeveloped to effectively interact with economic growth. It can be stated that the debt securities markets are more developed compared to the equity market, which is the least developed capital market in Armenia (Bayadyan & Baghdasaryan, 2017; Yakovlev & Shvandar, 2018).

RESEARCH METHODOLOGY. To study the effects monetary policy might have on different segments of the capital market in Armenia, we designed an econometric model based mainly on vector autoregressive modeling methodology suggested by Sims (1980, 1992). We designed a standard structural VAR model that can be represented as:

$$AX_t = \beta_0 + \beta_1 X_{t-1} + u_t \quad (1)$$

X_t - matrix of variables,
A - matrix reflecting contemporaneous relations between variables,
β_0 - vector of constants,
β_1 - vector of coefficients,
X_{t-1} - matrix of the endogenous variables lagged for one period,
u_t - vector containing structural shocks.

Cholesky decomposition identification criteria were used to impose restrictions on our structural VAR model. We constructed the model using a monthly dataset of six variables describing the monetary policy and the segments of the capital market in Armenia. The variables were the following: the Central Bank's main refinancing rate, government bond yields, corporate bond and stock values traded on the Armenia Securities Exchange (AMX), M2X monetary aggregate, and consumer price index. The sample period was from January 2010 to December 2023. This range was chosen, considering the possibility of obtaining the longest monthly time series for the available indicators.

To assess the model's ability to predict market trends and movements' directions, we forecasted government bond, corporate bond, and stock market indicators and compared them to the actual values. The projection horizon was spanning from January 2022 to December 2023. We utilized a static-stochastic forecast solution with 95% confidence bounds. Moreover, we plotted an alternative forecasting scenario with more aggressive interest rate hikes, increasing the rate by 0.5 percent throughout the prediction range. We based our baseline and alternative forecasts on static-deterministic solutions and compared them with the actual values of the indicators. In addition to the forecasts, we conducted impulse response functions and forecast error variance decomposition analysis to investigate the relationship between the monetary policy and capital market variables included in the model more thoroughly.

RESULTS. The Central Bank of Armenia (CBA) is responsible for ensuring the stability of the republic's prices and financial stability. To achieve its primary goals, the Central Bank has designed and implemented monetary policy. The main instrument of monetary policy is the key refinancing rate. In this paper's framework, we consider it the main indicator of the Central Bank's monetary policy changes.

To investigate the capital market and its possible response to the monetary policy in Armenia, we segmented it into the following markets: government bond market, corporate bond market, and stock market. The government bond market was represented by the weighted average monthly yields of all maturity government bonds placed in the local market. To show the dynamics of the corporate bond market, we considered it more suitable to use the monthly value traded on the Armenia Securities Exchange. The monthly values of the stocks traded on the stock exchange were taken as the indicators of the stock market movements in Armenia. Table 1 represents some of the descriptive statistics measures for the abovementioned indicators describing the capital market in Armenia.

Table 1

Descriptive statistics measures for the capital market indicators[1]

	Government bond	*Corporate bond*	*Stock*
Mean	10.12	368.17	14202.96
Median	10.6	4.42	0.00
Maximum	14.84	22042.78	652260.4
Minimum	5.95	-99.97	-100.00
Std. Dev.	2.32	2258.527	63260.13

Corporate bond and stock market indicators can be considered very volatile, as neither market has been developed enough to register relatively steady monthly changes in trading values, especially at the beginning of the observed timeframe. Despite this, other alternative indicators with regular monthly data and the longest possible sample period, representing corporate bond and stock market situation, were not available to be included in the model construction, analysis and forecasting.

Along with the Central Bank's interest rate and the parameters defining the segments of the capital market, we utilized the M2X monetary aggregate and the consumer price index (CPI) to ensure we did not overlook information that may have influenced the relationships between monetary policy and the observed financial markets. The M2X monetary aggregate represents the money supply and includes both the M2 aggregate and foreign currency deposits loans.Based on the abovementioned six variables, which represent the monetary policy and the capital market in Armenia, we constructed a structural vector autoregressive model. Instead of absolute values of the M2X aggregate, corporate bond trades, and stock trades, the monthly percentage changes were taken. The variables' order in the model was the following: the CBA refinancing rate (R), M2X (m2x_change), consumer price index (cpi), government bond yields (gb), corporate bond value traded (cbvalue_change), and stock value traded (stockvalue_change).

For better model specification, we performed stationarity analysis, using Augmented Dickey-Fuller, Phillips-Perron, and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. The unit root tests' results revealed that corporate bond and stock market indicators were stationary at level (I(0)). The interest rate, consumer price index, M2X, and government bond yields were stationary at the first difference (I(1)). Additionally, a lag length analysis was conducted to determine the most appropriate lag quantity to improve model specification. According to the lag identification criteria (Schwarz information criterion, Akaike information criterion, Hannan-Quinn information criterion) examination and the common lag selection for the monthly frequency dataset, we applied 12 lags to our VAR model. Autocorrelation tests found no serial correlation at lag 12, which satisfied the lag length specification's main requirement. We tested

[1] The data are based on our calculations.

our VAR model for stability. The stability condition diagnostics' outcome suggested that the model was stable since all inverse roots of the characteristic AR polynomial were inside the unit circle.

We solved our model and made short-term forecasts to investigate the behavior of capital market variables and to assess the ability of the model to predict the movements of the indicators. We forecasted for the horizon spanning from January 2022 to December 2023. We selected a static-stochastic solution for the forecast, considering the possible uncertainty. The computed values were compared to the actual values of the observed indicators to assess the performance of the model.

As Figure 1 shows, over the projection period, actual values and the means of the forecasted values (GB_F_m) were considerably close to each other. The model forecast predicted the main directions of movement in the government bond market. During the forecasting horizon, all actual values of the RA government bond yields were between higher (GB_F_h) and lower (GB_F_l) confidence bounds.

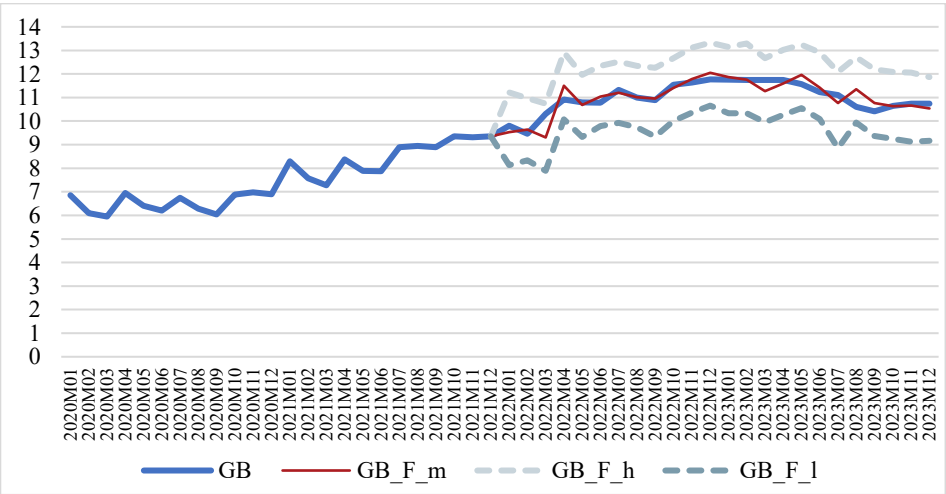

Figure 1. ***Government bond yields' actual and forecasted values with the confidence bounds in the RA (%)***[2]

Figure 2 illustrates the forecasted and actual values of corporate bonds traded on the stock exchange in Armenia. The forecast results are worse than those of the government bond market. Though the actual parameters (CB_F_h and CB_F_l) were within the higher and lower bounds, they were significantly muted compared to the forecasted fluctuations over the projection horizon.

[2] The actual values are calculated based on the data from the Central Bank of Armenia, Monetary and Financial Statistics, https://www.cba.am/en/sitepages/statmonetaryfinancial.aspx. The forecasted values are based on our model estimation and extracted from EViews software.

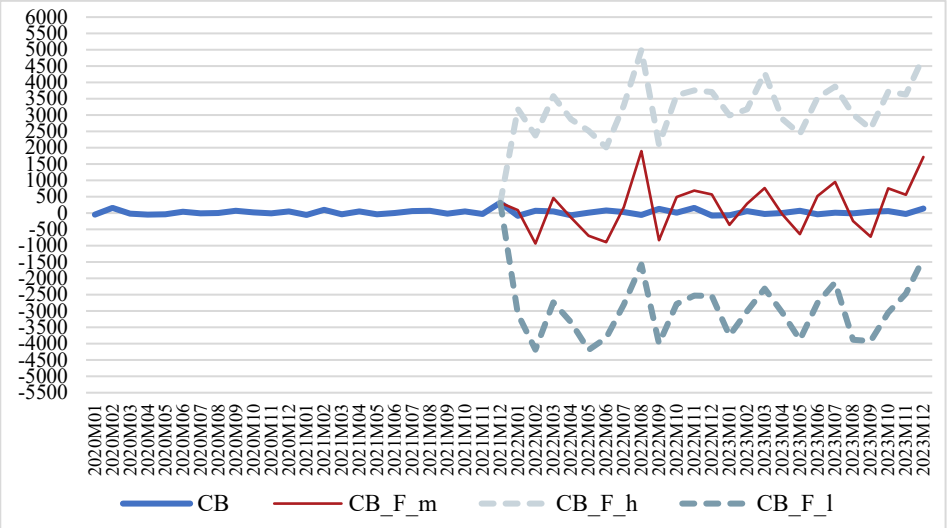

Figure 2. ***Corporate bond trade actual and forecasted values with the confidence bounds in the RA (%)***[3]

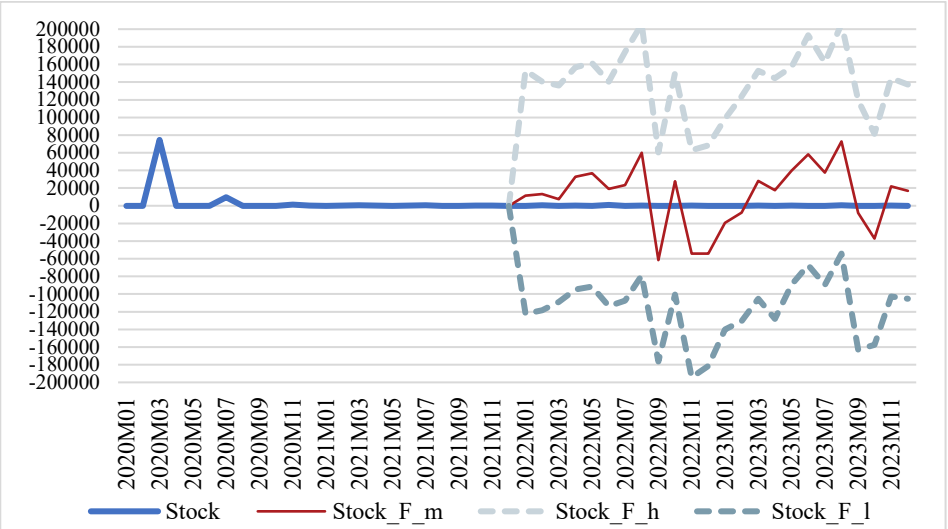

Figure 3. ***Stock trade actual and forecasted values with the confidence bounds in the RA (%)***[4]

Figure 3 shows the forecasted and actual values of stocks traded on the Armenian stock exchange. The forecasting results are quite similar to those of the corporate bond market. However, the model predictions were more volatile than the actual changes in the stock market. Although during the projection horizon, the actual indicators lay within a 95% confidence interval (between Stock_F_h and Stock_F_l), the stock market's forecasting performance cannot be considered good.

[3] The actual values are from the Armenia Securities Exchange, Monthly Bulletins, https://amx.am/en/guides_and_insights. The forecasted values are based on our model estimation and extracted from EViews software.

[4] Ibid.

For further investigation of the relations between monetary policy and the segments of the capital market in Armenia within the framework of our model, we plotted an alternative forecasting scenario with a more aggressive monetary policy. To examine the shifts in government and corporate bond and stock markets during a more contractionary monetary policy period, we raised the CBA interest rate at a greater and faster pace. The projection horizon was the same as for the baseline scenario (January 2022 to December 2023) to allow comparing the forecasting results of both baseline and alternative scenarios to the actual values of the observed markets. We used static-deterministic simulation for the projection.

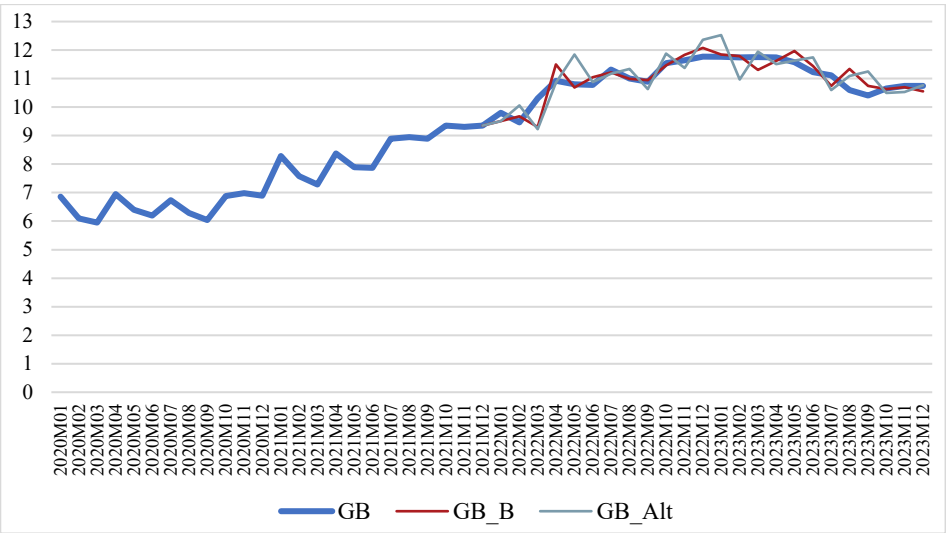

Figure 4. ***Government bond actual yields, baseline, and alternative forecasted values in the RA (%)***[5]

Figure 4 shows the actual, baseline, and alternative forecast values of the government bond yields in the RA. When comparing alternative forecast scenario results to the baseline forecasts and the actual indicators, it can be noted that a more aggressive interest rate policy led to higher variability in the government bond yields. In general, throughout the plotting period, both forecasting scenario values were close to the actuals. This indicated the capability of the model to predict the main trends and movement directions of the government bond market in Armenia.

Corporate bond market forecasting results were worse compared to the actual values, as could be expected based on the previous outcome (see Figure 5). At the same time, it can be concluded that a more aggressive monetary policy implemented by the Central Bank of Armenia would lead to higher volatility in the corporate bond market, based on our model estimations.

[5] The actual values are calculated based on the data from the Central Bank of Armenia, Monetary and Financial Statistics, https://www.cba.am/en/sitepages/statmonetaryfinancial.aspx.
The forecasted values are based on our model estimation and extracted from EViews software.

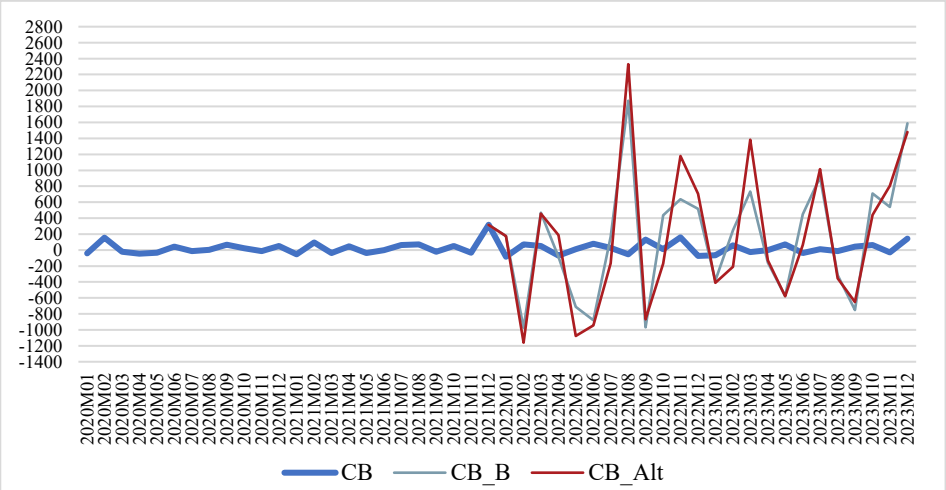

Figure 5. ***Corporate bond actual, baseline, and alternative forecasted trade values in the RA (%)***[6]

The situation regarding stock market forecast performance was similar to that of the corporate bond market (see Figure 6). Both forecasted values significantly differed from the market's actual parameters. However, the alternative scenario with a more aggressive interest rate hike resulted in sharper and higher fluctuations in the stock market.

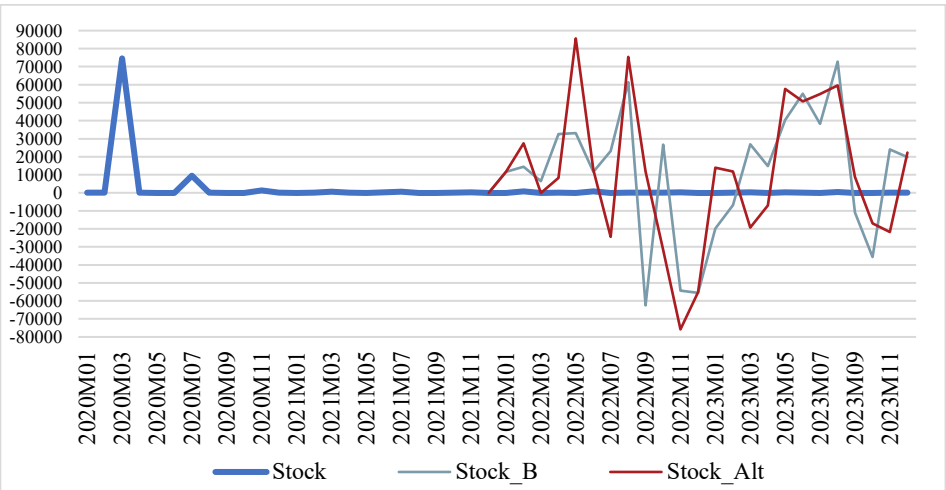

Figure 6. ***Stock actual, baseline, and alternative forecasted trade values in the RA (%)***[7]

[6] The actual values are from the Armenia Securities Exchange, Monthly Bulletins, https://amx.am/en/guides_and_insights. The forecasted values are based on our model estimation and extracted from EViews software.

[7] The actual values are from the Armenia Securities Exchange, Monthly Bulletins, https://amx.am/en/guides_and_insights. The forecasted values are based on our model estimation and extracted from EViews software.

To investigate the interactions between monetary policy changes and their possible impact on different sectors of the capital market in Armenia, we conducted an impulse response analysis. In the frame of our VAR model, monetary policy changes are represented as shocks to the Central Bank's main refinancing rate. The interest rate was considered to be an exogenous variable. We studied the reactions of other endogenous variables included in the model to the one-standard deviation shocks of the interest rate. Figure 7 illustrates the results of the impulse response analysis. The analysis was plotted for 24 months.

According to the results of the analysis, the interest rate's response to its shock was quite significant and positive, as could be expected. In the case of the M2X monetary aggregate, the immediate reaction was positive, but it reduced gradually, becoming negative and reaching its peak within the second lag. The interest rate's positive shock started to hurt consumer prices belatedly but kept its impact for quite a long period. Government bond yields reacted positively to the CBA interest rate positive shock almost immediately, reaching its maximum within the second month after the shock. However, this positive effect started to fade away faster, becoming negative within the third month. Corporate bonds showed a negative response to the interest rate rise, which quickly became inconsiderable throughout the projection period. In the case of the stock market, the interest rate's positive shock started to have little positive influence on the stock value traded on the stock exchange, but the overall reaction to the shock throughout the whole plotting horizon can be considered insignificant.

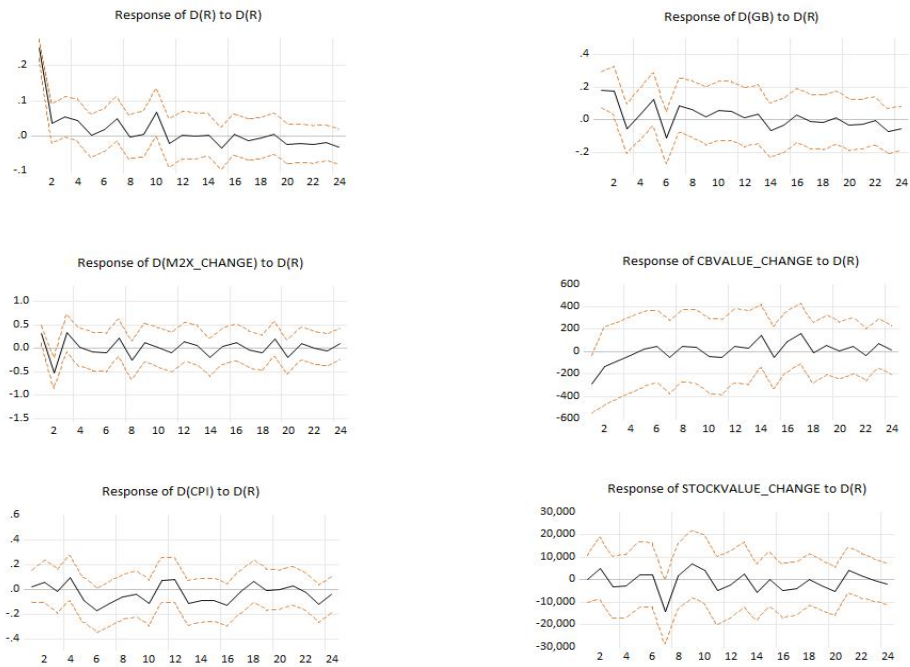

Figure 7. ***Responses to Cholesky One S.D. (d.f. adjusted) innovations ± 2 S. E.***[8]

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

Furthermore, we performed forecast error variance decomposition analysis to examine the interrelations between the variables included in the model. This analysis was plotted for 24 months as well, using Cholesky decomposition. When studying the outcome, it can be noted that the interest rate variability could mainly be explained by the shocks to itself, though by the end of the plotting period the effect reduced to around 51%. Along with this, other sources of interest rate changes were CPI, the government bond market, and the stock market, the influence of which grew over time. In the case of M2X, the main sources of fluctuations were shocks to M2X itself, interest rates, consumer prices, and the government bond market. The changes to the indicator itself could mainly explain consumer price variability. Other variables affecting inflation were the CBA refinancing rate and M2X monetary aggregate, whose impact strengthened over time. Government bond yield variability was caused by the shocks to the indicator itself and the interest rate. Moreover, the influence of interest rate has been quite strong since the beginning of the projection horizon. Stock market and consumer prices also had an impact on government bond yields, according to our estimations. Corporate bond market analysis results revealed that the volatility could mainly be explained by the changes to itself and also over time by the changes to the consumer prices. Lastly, the stock market value fluctuations were related to the shocks to the indicator itself. Along with this, the influence of consumer prices, government, and corporate bond markets increased by the end of the plotting period.

CONCLUSION. In this paper, our primary goal was to investigate the effects monetary policy might have on the capital market in Armenia, in particular, the interactions between monetary indicators and the government bond, the corporate bond, and the stock markets. Based on our vector autoregressive model estimations and analysis results, some conclusions can be made, which are stated below.

First, the model generally predicted the main trends in the observed financial markets. In the case of the government bond market, the forecasted values were significantly close to the actual indicators over the projection horizon spanning from January 2022 to December 2023. The model forecasting performance was worse for corporate bond and stock markets. This result could be expected since both markets are less developed compared to the government bond market. Particularly, the stock market is the least developed capital market segment in Armenia, where there are only 11 listed companies on AMX (as of January 2024);transactions are random and often arranged between the particular investors.

When analyzing the results of the comparison between the actual values and both baseline and more aggressive alternative forecast scenarios, it can be concluded that a more contractionary monetary policy, which assumed a higher refinancing rate, would have led to higher volatility in the government, corporate bond, and stock markets. During this research, the government bond

market again performed better than the other sectors of the capital markets in Armenia.

Impulse response functions analysis revealed that the Central Bank's interest rate rise had a positive effect on the government bond yields almost immediately but did not maintain its influence for a long period. In the case of corporate bond and stock markets, the refinancing rate's positive shock impact could be considered insignificant for a longer horizon, although some weak reactions were registered at the beginning of the plotting period.

Lastly, forecast error variance decomposition analysis suggested that all variables' fluctuations could be explained by the shocks to the indicators themselves. Changes in government bond yields were also conditioned by interest rate shocks. Consumer price changes were another source of corporate bond and stock market variability.

In conclusion, it can be noted that based on our estimations, among the observed segments of the Armenian capital market, the strongest relations with the Central Bank's monetary policy were registered in the government bond market. In the case of corporate bond and stock markets, the interactions with the monetary policy could be considered weak and underdeveloped, as both markets themselves underperformed the government bond market.

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