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ASSESSING MONETARY POLICY EFFECTS ON THE FINANCIAL SYSTEM STABILITY OF ARMENIA

This paper focuses on the impact of the monetary policy of the Central Bank of the Republic of Armenia on the stability of the Armenian financial system. This study aims to investigate and assess the relationship between monetary policy and the financial stability index, which we have constructed. The Principal Components Analysis (PCA) method was used to obtain the financial stability index. We used the Vector Autoregressive (VAR) modeling methodology based on annual data for the assessments. An impulse response function was constructed to evaluate how inflation shocks affect the financial stability index over time. By assessing the response of the financial stability index, we modeled the inflation shock, considered an intermediate tool of monetary policy, for the years 2013-2023; we noted that price stability policy has an impact on financial stability policy in Armenia. Specifically, with VAR modeling, the financial stability index responds positively to a one-time inflation shock, with the effects felt for about four years. However, the financial stability index deteriorates after that, assuming negative values. The results indicate that in an inflationary environment, when the economy is in an upward phase, financial stability will be at a high level for several years, but this will be followed by a phase of decline and instability, which many countries worldwide have faced.

Keywords: *Monetary policy, Financial Stability Index, Central Bank of Armenia, PCA, VAR, impulse response analysis.*
JEL: E52, E58, G28
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INTRODUCTION. The 2008 financial crisis demonstrated that central banks' goals of price stability and economic growth can be seriously undermined under conditions of financial instability. Additionally, traditional monetary policy's limitations largely ignored financial stability issues.

To ensure an effective combination of price stability and financial stability, it is necessary to carry out in-depth studies and quantitative assessments. According to the new Constitution of the Republic of Armenia, which came into force in 2018, the primary goals for the Central Bank of Armenia were defined as ensuring both price stability and financial stability simultaneously. To assess the results of combining price and financial stability, it is necessary to conduct research in this direction. For this purpose, a comprehensive analysis of the impact of monetary policy on Armenia's financial system stability is vital and relevant. The purpose of this research is to study and evaluate the impact of monetary policy on the financial system stability of Armenia.

LITERATURE REVIEW. The literature presents two main viewpoints on the role of monetary policy in financial stability.

The first viewpoint includes the "Conventional wisdom" hypothesis (Mester, 2016), in which a monetary policy focused on price stability mitigates financial market imbalances and ultimately achieves financial stability. At the micro level, low inflation, which is an indicator of price stability, reduces uncertainty and extends the investment horizon, thereby ensuring financial stability. The proponents of this hypothesis believe that monetary policy can impact the determinants of financial imbalances through the influence of credit, liquidity, and information. According to the proponents of this theory, inflation targeting can lead to increased financial stability. The second viewpoint includes those researchers who explain the negative role of price stability in financial stability by the 2008 financial crisis. In recent years, there has been a lot of discussion about how price stability alone is not enough to achieve financial stability. According to Rajan (2005), in certain economic situations, price stability leads to financial instability. Low inflation and low interest rates can encourage higher leverage in financial markets. This is evidenced by the fact that the regime of consistently low interest rates in the years preceding 2008 contributed to the growth of investors' portfolios, leading to higher returns, which caused a boom or "bubble" in the financial market and, later, a financial crisis.

Investors prefer to make high-risk investments with the expectation of high returns to avoid the negative consequences of low interest rates. Countries with low interest rate policies are more likely to experience financial instability.

To investigate the impact of monetary policy on the occurrence of financial instability, Taylor began a quantitative study in 2009, looking at the dynamics of housing prices between 2001 and 2009. He proved that if the central bank's interest rates are lower than predicted by Taylor's rule, a dangerous upward trend

is registered in the housing market. However, if monetary policy maintained the interest rate predicted by the Taylor rule, the housing market decline could have been avoided. These studies clearly show that monetary actions aimed solely at price stability have decreased financial stability. Using house prices and the house price-to-rent ratio as two indicators of financial stability, Frappa and Mésonnier (2015) find that inflation-targeting policy increases financial market instability. Comparing data from eighteen countries with and without inflation targeting, they concluded that inflation targeting had a considerable positive impact on house prices and the price-to-rent ratio. This indicates that countries with inflation targeting may face a housing "bubble," which is considered a serious threat to financial market stability.

Setting price stability as a primary objective can cause financial instability, as investors make riskier investments to obtain higher returns, given the lower return on deposits. This cycle is risky because central bankers do not react to financial instability with price stability as their only primary objective.

Sometimes, a financial imbalance arises not from the banking sector but from the private corporate sector, and in such cases, the price stability-financial stability transmission mechanism does not work. In 2015, Blot et al. studied Schwartz's "Conventional wisdom" hypothesis, which states that price stability can lead to financial stability in the United States and the Europ. Their studies show that price stability can have negative and positive impacts on financial stability, depending on the components used in measuring it. Using two financial indices for the U.S. and European areas within the framework of VAR modeling, they show that a positive inflationary shock increases financial vulnerability, suggesting that price stability can contribute to financial stability. However, when stock prices, considered an observable variable, are taken as an indicator representing financial stability, the VAR result shows a negative correlation between price stability and financial stability. In other words, central banks that consider price stability as the sole goal of monetary policy may face the undesirable consequences of financial instability.

RESEARCH METHODOLOGY. To assess the impact of monetary policy on the financial stability of the Republic of Armenia, we first constructed an index[1] characterizing Armenia's financial system stability. This index includes variables describing Armenia's external economic, internal macroeconomic, and financial systems.

To enhance the practical significance of the financial stability index, it becomes necessary to assign appropriate weights (coefficients) to the nine variables included in the model. There is no best method for the precise selection of these weights. To address this issue, central banks sometimes use the Expert

[1] The details of the index's calculation are presented in "The efficiency of ensuring the financial security of Armenia in the new approaches" article. In this paper we modified some Index's variables to improve its composition.

evaluation method, which does not take into account the possible correlations between individual variables. Another method used is Complex, multifactor analysis. Since in the article "The efficiency of ensuring the financial security of Armenia: New approaches," we used the Expert evaluation method to assess the Financial Security Index, we will use the Principal Components Analysis (PCA) method in this paper to ensure the comprehensiveness of the analysis. This methodology is used by the Central Bank of the Republic of Turkey, the National Bank of Albania, and the National Bank of the Czech Republic, as well as by numerous researchers such as Kosisova (2015), Morales and Estrada (2010), and others.

For the analysis using PCA, we have performed the following steps:

1. Obtained the standardized data for the variables.
2. Derived the covariance matrix.
3. Obtained the estimates of the principal components.
4. Calculated the ratio of the Eigenvectors constructed for the variables and the principal components.

Thus, the Function of the Financial Stability Index[2] looks like this:

$$\mathbf{FSI} = \mathbf{f}(\mathbf{0.36D} + \mathbf{0.26ND} + \mathbf{0.19I} + \mathbf{0.1UE} + \mathbf{0.56IR} + \mathbf{0.1PBD} + \mathbf{0.086CE} + \mathbf{0.057BA} + \mathbf{0.011BP})$$

Where: FSI- Financial Stability Index,
D- State budget deficit /GDP, %,
ND- State debt / GDP, %,
I- Annual actual inflation rate, %,
UE- Unemployment rate, %,
IR- International reserve / GDP, %,
PBD- Balance of Payments Deficit/ GDP, %,
CE- Common equity Tier 1 capital/ Risk-weighted assets, %,
BA- Bank Asset/ GDP, %,
BP- Liquid assets/ Demand deposits, %.

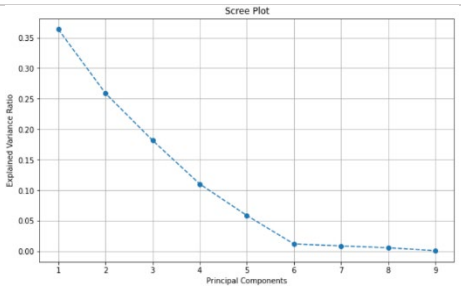
To analyze the response of the Financial Stability Index (FSI) to inflation shocks, we used the vector autoregressive (VAR) modeling methodology and performed the following steps:

1. For 2013 to 2023, the values of the Financial Stability Index and the actual inflation values during the same period were studied.
2. Removed inflation values from the components of the Financial Stability Index to avoid misleading results.
3. Used the Statsmodels library of the Python 3.13 programming language for VAR modelling.

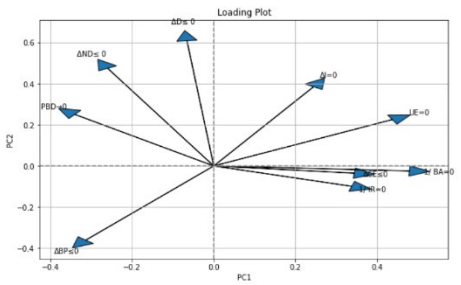
[2] According to our designations in “The efficiency of ensuring the financial security of Armenia. in the new approaches” article financial stability will be highly effective if $K_{FS} \leq 0$, but to increase the perception of the index, we have multiplied it by -1 and made an additional designation calling it FSI.

4. Constructed an Impulse response function to observe how inflation shocks impact the FSI over time.
5. The impulse response function was constructed using the Gholesky one standard deviation principle.

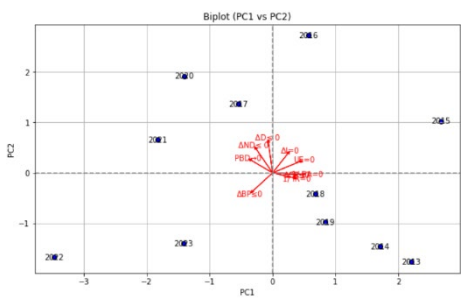
RESULTS. We have visualized the PCA results to better understand how the principal components capture the variance in the data.



Scree Plot: This plot shows the explained variance ratio of each principal component. Most of the variance in the data is explained by the first two principal components. A significant part of the data deviations is explained by the first two main components that condition the data deviations.



Loading Plot: This plot visualizes the loadings (coefficients) of the first two principal components. Each arrow represents a feature, and its direction and length indicate how much that feature contributes to the principal components. Features that are close to each other are correlated.



Biplot (PC1 vs PC2): This plot combines the scores of the data points (years) and the loadings of the features. The positions of the data points show how they are projected onto the first two principal components, while the arrows indicate the contributions of the original features.

Figure 1 ***Dispersion of the main components of the financial stability index***[3]

[3] The data are based on PCA method using Python 3.13 PL.

We calculated the Financial Stability Index according to the variables included in the model and their coefficients for the years 2013–2023, keeping in mind that financial stability will be high if FSI ≥ 0.

Table 1

Dispersion of the principal components of the Financial Stability Index

Year	*FSI*
2013	0.830
2014	0.652
2015	-0.601
2016	-0.894
2017	-0.459
2018	0.095
2019	0.217
2020	-0.989
2021	-0.252
2022	0.953
2023	0.448

Source: *Author's calculations*

As we can see from the Table 1 data, the FSI reached its highest value in 2022, at 0.953. The lowest value was recorded in 2020, at -0.989. A similar value was also observed in 2016, at -0.894. In both cases, the economy experienced a decline, the national debt significantly increased, and the banking system saw a certain decrease in liquidity levels. The deterioration of the index observed since 2015-2016 is due to the shocks caused by the sharp depreciation of the Ruble and the decline in global oil prices from the fourth quarter of 2015, which also affected the Armenian economy. The April Four-Day War in 2016 might have also had a negative impact, leading to some outflow of deposits from the banking system. The worst value of the index in 2020 is attributed to the negative effects of the COVID-19 pandemic and the Forty-Four Day War.

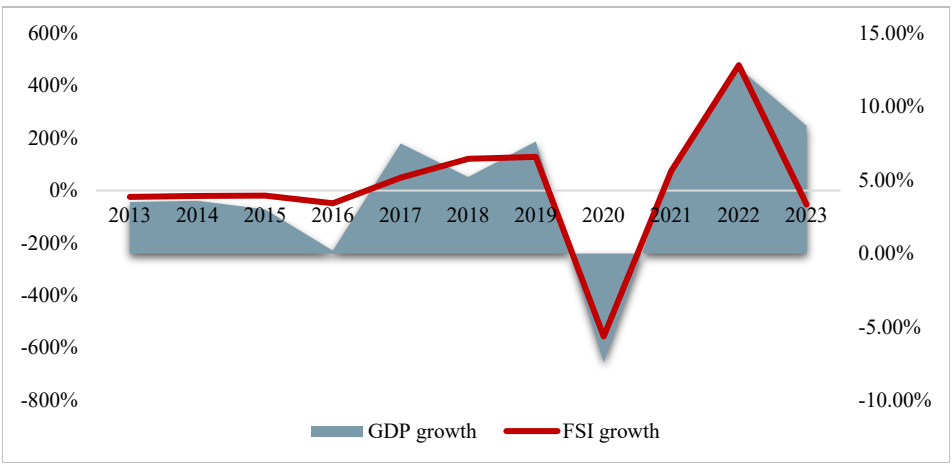


Figure 2. ***Dispersion of the principal components of the Financial Stability Index***[4]

[4] Created by the author

In Figure 2, we have presented the dynamics of the FSI and GDP change from 2013 to 2023. As can be seen from the figure, together with the GDP growth rate, the FSI is also changing in the same direction.

The PCA method's weighting of variables improves the results of modeling the Financial Stability Index and explains more economic situations.

Now, let us consider the FSI's response to inflation shocks, which is considered an intermediate tool of monetary policy. The following Figure presents the FSI's impulse response function in response to inflation rate shocks over ten-time steps (over a period of ten years).

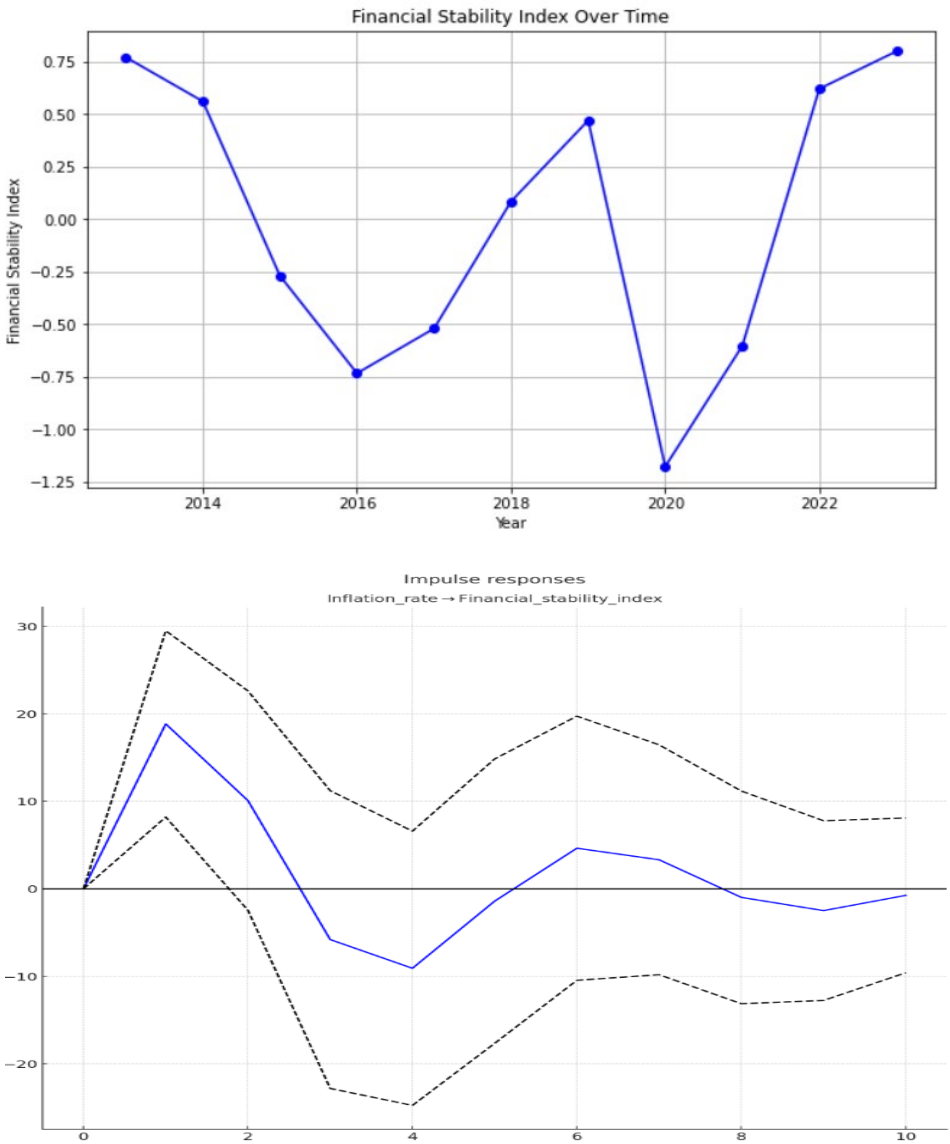


Figure 3. ***The impulse response function of the Financial stability index to Inflation shocks (Response to One S.D. Innovations ± 2 S.E.)***[5]

[5] Charts were drawn on VAR model estimation and impulse response analysis using Python 3.13 PL.

The first chart shows the dynamics of the Financial Stability Index, while the second chart represents the index's response to an inflation shock. In the second chart, the blue line depicts the Impulse Response Function (IRF). This function represents the Financial Stability Index's response to a one-time inflation rate shock. It shows how the index evolves over time following the shock. The dashed lines above and below zero represent the confidence interval of the Impulse Response Function, indicating the probable range of actual fluctuations in the Financial Stability Index. The horizontal axis of the chart shows the observed 10-year period.

Thus, the FSI response to inflation over the entire period can be divided into three groups:

1. **Immediate Response**: FSI's initial response to an inflation shock is positive, indicating that FSI increases after the shock.
2. **Subsequent Periods**: After the initial rise, the FSI declines sharply, moving into negative territory around the fourth period. Then, it starts to recover but shows fluctuations around the zero line in later periods.
3. **Stabilization**: The effect of the initial shock diminishes over time, stabilizing over time and hovering around the zero line.

We also conducted an elasticity assessment, looking at the change in the financial stability coefficient in response to a 1% change in inflation.

In the next table, we present the results of the elasticity assessment.

Table 2

Elasticity estimation results for RA financial stability index and actual inflation: 2013-2023[6]

Year	*FSI*	*Adjusted Inflation rate (%)*	*Change FSI (%)*	*Change Adjusted Inflation rate (%)*	*Elasticity*
2014	0.560	5.6	-27.27	-15.15	1.80
2015	-0.270	0.9	-1478.21	-83.93	1.77
2016	-0.734	-0.10	171.85	-111.11	-1.55
2017	-0.521	3.6	-29.02	-3700.00	0.01
2018	0.084	3.5	-116.12	-2.78	41.80
2019	0.469	2.4	458.33	-37.43	-14.58
2020	-1.178	2.2	-351.17	-8.33	42.14
2021	-0.604	8.2	-48.73	272.73	-0.18
2022	0.620	9.6	-202.65	17.07	-11.87
2023	0.798	3.0	28.71	-68.75	0.42

Source: *Author's calculations*

The Financial Stability Index and its response to a 1% change in Inflation are as follows.

[6] Author's calculations

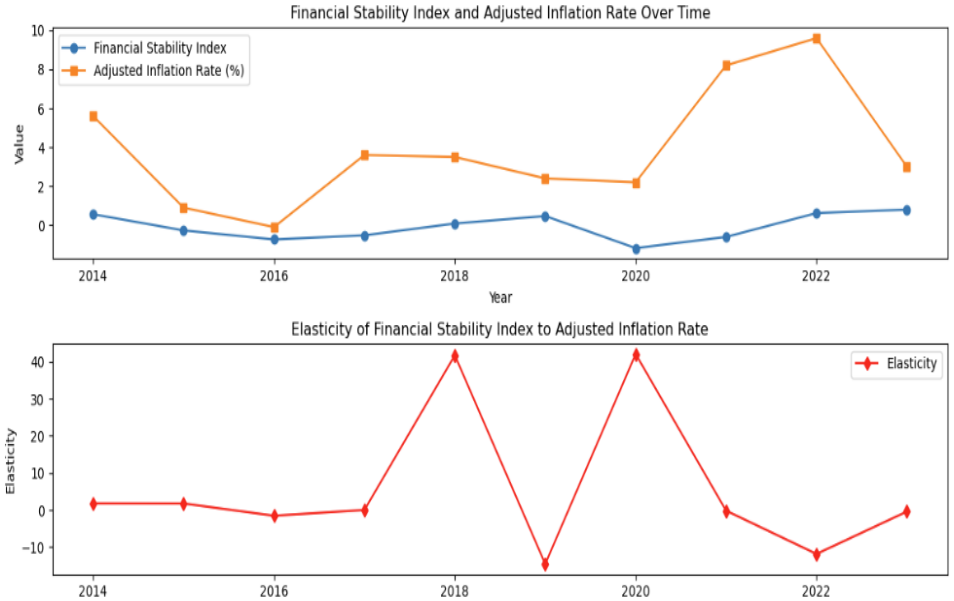


Figure 4. ***Elasticity of RA Financial Stability Index from actual Inflation: 2013-2023***[7]

As a result of elasticity assessment, the following judgments can be made:

1. **High Variability in Elasticity:** The elasticity values remain highly variable, indicating an unstable relationship between the financial stability index and the adjusted inflation rate.
2. **Periods of High Elasticity:** Years like 2018 and 2020 still show extremely high elasticity values (41.80 and 42.14, respectively). This suggests that small changes in the adjusted inflation rate caused substantial changes in the financial stability index in these years.
3. **Negative Elasticity Values:** Several years (e.g., 2016, 2019, 2022) exhibit negative elasticity, indicating an inverse relationship where an increase in the adjusted inflation rate corresponds with a decrease in the financial stability index.
4. **Anomalies**: The year 2017, with an elasticity of 0.01, stands out as an anomaly, indicating almost no sensitivity of the financial stability index to the adjusted inflation rate.

CONCLUSIONS. The purpose of this study is to investigate and assess the relationship between monetary policy and the financial stability index we have constructed.

The price stability policy has a certain impact on the financial stability policy in Armenia. This is evidenced by both the results of VAR modeling and the Elasticity assessment results. In the VAR modeling, the Financial Stability Index positively responds to a one-time inflation shock, with its effect felt for about four years, after which the FSI deteriorates and turns negative. The results

[7] The data are based on Elasticity assessment using Python 3.13 PL.

indicate that in a high inflation environment, when the economy is in an uptrend, financial stability remains high for several years, but this is followed by a phase of decline and instability, which many countries have experienced.

The results of the elasticity assessment for the FSI and actual inflation also showed that during the studied 10 years, the FSI was mostly high and had positive elasticity to a +1% inflation shock. This implies a high sensitivity of financial stability to upward changes in inflation, meaning that price increases can significantly impact financial stability, requiring stronger economic management strategies. However, the varying elasticity values highlight the complex interrelationship between inflation and financial stability.

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