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Effectiveness of Monetary Policy Channels: Insights from Four Emerging Economies

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Abstract
The focus of this paper is to delve into the monetary policy transmission mechanisms in four emerging economies: Chile, Russia, Mexico, and Turkey. Using a vector autoregressive model, the study aims to uncover how monetary policy actions impact key economic variables in these countries. A significant finding of the empirical study is the effectiveness of the exchange rate channel in Turkey's monetary policy transmission mechanism. This suggests that changes in monetary policy, particularly interest rate adjustments, have a notable impact on the exchange rate in Turkey, which in turn influences various aspects of the economy. However, the study also reveals that the exchange rate channel's effectiveness is relatively low in Russia, Chile, and Mexico compared to Turkey. This implies that while changes in monetary policy may still influence exchange rates in these countries, the magnitude of this impact is not as significant as observed in Turkey. Moreover, the interest rate channel, which involves changes in interest rates affecting borrowing, lending, and investment decisions, is found to be limited in all four countries. This suggests that monetary policy actions aimed at adjusting interest rates may have only a modest impact on economic variables in these economies. Overall, these findings shed light on the nuances of monetary policy transmission mechanisms in emerging economies, highlighting the varying degrees of effectiveness across different channels and countries. Understanding these dynamics is crucial for policymakers in designing and implementing monetary policies that effectively support economic stability and growth in these nations.
Keywords: Monetary Policy Transmission, Emerging Economies, Exchange Rate Channel, Interest Rate Channel
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1. INTRODUCTION

Monetary policy plays a crucial role in shaping the overall economic landscape of a country by influencing key variables such as inflation, consumption, growth, and liquidity. Implemented by the central bank, monetary policy primarily focuses on managing the money supply and interest rates to achieve specific macroeconomic objectives. By adjusting these monetary tools, policymakers aim to regulate economic activity, stabilize prices, and foster sustainable growth. The effectiveness of monetary policy in influencing real economic variables, such as aggregate output and employment, relies on the monetary transmission mechanism. This mechanism elucidates how changes in the nominal money stock or short-term nominal interest rates, induced by monetary policy actions, translate into tangible outcomes in the real economy. For instance, when the central bank adjusts interest rates, it affects borrowing costs for businesses and consumers. Lowering interest rates typically stimulates borrowing and investment, leading to increased aggregate demand and economic expansion. Conversely, raising interest rates can dampen borrowing and spending, curbing inflationary pressures but potentially slowing down economic growth.

Similarly, changes in the money supply can influence economic activity. Increasing the money supply can boost liquidity in the financial system, promoting lending and investment. Conversely, reducing the money supply can help control inflationary pressures by tightening liquidity and curbing excessive spending. The monetary policy framework has evolved over time, with the repurchase rate now serving as the primary instrument for signaling the stance of monetary policy. This shift represents a departure from previous strategies, although elements of the prior money targeting approach are retained to ensure a smooth transition and uphold financial stability. The monetary transmission mechanism elucidates how monetary policy actions affect aggregate demand and prices by influencing the decisions of various economic agents, including firms, households, and financial intermediaries. One of the key channels through which monetary policy operates is the interest rate channel. According to the traditional Keynesian perspective, changes in nominal short-term interest rates set by the central bank can impact the real cost of borrowing. When interest rates are lowered, borrowing becomes cheaper, stimulating investment and consumption. Conversely, raising interest rates can dampen borrowing and spending, thereby influencing aggregate demand and overall economic activity.

By adjusting the repurchase rate, the central bank can signal its monetary policy stance and influence borrowing costs throughout the economy. This, in turn, can affect investment decisions by businesses, consumption choices by households, and lending behavior by financial institutions. Overall, understanding the workings of the interest rate channel is essential for policymakers to effectively manage monetary policy and achieve macroeconomic objectives such as price stability and sustainable economic growth. Monetary policy can exert a significant influence on the exchange rate through various

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channels. One primary mechanism is via interest rates, which affect the attractiveness of a currency relative to others. According to the risk-adjusted uncovered interest rate parity theory, higher interest rates tend to attract foreign investors seeking higher returns on investments denominated in that currency. This increased demand for the currency can lead to its appreciation in the foreign exchange market. Central banks can also directly intervene in the foreign exchange market by buying or selling their domestic currency to influence its value. By purchasing their own currency, central banks can drive up its value, while selling it can lead to depreciation. Such interventions are often employed to stabilize exchange rates or counteract excessive volatility.

Moreover, monetary policy actions can influence inflationary expectations, which in turn impact exchange rates. If investors anticipate that a central bank will pursue policies leading to higher inflation, they may seek to sell the currency in favor of others expected to maintain stable purchasing power. This can lead to depreciation of the currency relative to those with lower inflation expectations. The relationship between monetary policy and exchange rates is complex and multifaceted, with interest rates, direct intervention, and inflation expectations all playing crucial roles in determining currency values in the foreign exchange market. The VAR (Vector Autoregression) model is indeed a widely used tool for analyzing the transmission channels of monetary policy in emerging countries. This approach allows researchers to examine the dynamic interactions among key macroeconomic variables, such as interest rates, output, inflation, and exchange rates, without imposing strong theoretical assumptions. By estimating a VAR model using data from emerging economies, researchers can assess how monetary policy actions affect these variables over time and identify the relative importance of different transmission channels. For example, they can analyze the impact of central bank interest rate changes on output growth, inflation dynamics, and exchange rate movements. Moreover, VAR models enable researchers to conduct impulse response analyses and forecast the effects of monetary policy shocks on the economy. This provides valuable insights into the likely response of key economic variables to changes in monetary policy settings, helping policymakers formulate more effective and timely policy responses.

The VAR model serves as a powerful analytical tool for studying the transmission mechanisms of monetary policy in emerging countries, providing valuable insights into how changes in monetary policy settings affect the broader economy. Examining the relative importance of different transmission channels of monetary policy across various emerging countries is crucial for understanding how monetary policy affects these economies differently. Each country may have unique economic structures, financial systems, and policy environments, leading to diverse responses to monetary policy actions. By comparing the empirical findings across different countries, researchers can gain insights into the effectiveness of various policy tools and the resilience of different transmission channels under different economic conditions. This comparative analysis can help policymakers tailor their monetary policy strategies to the specific characteristics and challenges of their own economies. Moreover, evaluating the consequences of monetary policy in various emerging countries can provide valuable lessons for policymakers and central banks. It can shed light on the potential risks and trade-offs associated with different policy measures, helping policymakers design more robust and effective policy frameworks to achieve their macroeconomic objectives. Empirical research on the transmission channels and consequences of monetary policy in emerging countries plays a vital role in informing policy decisions, enhancing economic stability, and promoting sustainable growth in these economies.

2. LITERATURE REVIEW

The study of transmission mechanisms for monetary policy has indeed garnered significant attention from researchers in recent years. Understanding how monetary policy actions influence key economic variables such as output, inflation, and interest rates is essential for central banks and policymakers in managing the overall health of the economy. Researchers have been particularly interested in identifying and analyzing the various transmission channels through which monetary policy affects the economy. These channels may include the interest rate channel, the exchange rate channel, the bank lending channel, the asset price channel, and the expectations channel, among others. By examining these transmission channels, researchers aim to elucidate the mechanisms by which changes in monetary policy instruments, such as the policy rate or open market operations, ultimately impact real economic activity and inflation dynamics. This research is crucial for central banks in designing effective monetary policy strategies and responding appropriately to economic developments and challenges. Furthermore, the increased interest in understanding transmission mechanisms reflects a broader recognition of the complexity of monetary policy transmission in today's interconnected and globalized financial systems. As a result, researchers are employing advanced econometric techniques and conducting empirical studies to provide deeper insights into the effectiveness and implications of monetary policy actions. The growing body of literature on monetary policy transmission mechanisms underscores the importance of ongoing research in this area for both academic understanding and practical policy-making.

The findings of Dabla-Norris and Floerkemeier (2006) highlight an important aspect of monetary policy effectiveness in Armenia. The study suggests that despite the implementation of monetary policy measures, the ability of monetary authorities to influence economic activity and inflation remains constrained. This limitation is attributed to the incomplete functionality of key channels through which monetary policy typically affects the economy. Incomplete transmission channels imply that the mechanisms by which changes in monetary policy instruments, such as interest rates or reserve requirements, impact output and prices are not operating as effectively as intended. This could be due to various factors, including structural features of the economy, financial market development, and institutional constraints. Identifying the specific channels that are not fully functional is crucial for policymakers in Armenia to enhance the effectiveness of monetary policy. It may involve addressing bottlenecks in the banking sector, improving the transmission mechanism for interest rate changes, or implementing reforms to strengthen the overall financial infrastructure. The study underscores the importance of a comprehensive understanding of monetary policy transmission mechanisms in shaping policy decisions and fostering economic stability and growth in Armenia. Addressing the constraints identified in the study could contribute to enhancing the effectiveness of monetary policy and achieving the desired macroeconomic objectives of the country. Roşoiu's (2013) utilization of the Bayesian VAR approach sheds light on the efficacy of monetary policy transmission mechanisms in several emerging countries, including Romania, Poland, Czech Republic, and Hungary. The study primarily focuses on achieving the overarching goal of price stability while fostering sustainable economic growth. The empirical findings suggest variations in the effectiveness of monetary policy transmission channels across the examined countries. In Hungary and Czech Republic, both channels - likely referring to the interest rate and exchange rate channels - are deemed effective. This implies that changes in monetary policy instruments, such as interest rates or exchange rates, have discernible impacts on key macroeconomic variables like output and prices in these countries. On the other hand, the study reveals some challenges in Romania and Poland. While there are no evident puzzles in the transmission channels, the impact of macroeconomic variables is deemed less significant, accompanied by high volatility. This suggests that despite the absence of apparent inconsistencies, the influence of monetary policy on economic variables in Romania and Poland may be less pronounced and subject to greater fluctuations. These findings underscore the importance of understanding country-specific dynamics and institutional frameworks when assessing the effectiveness of monetary policy transmission. Addressing the challenges identified in Romania and Poland may require tailored policy measures aimed at enhancing the responsiveness of the economy to changes in monetary policy signals, thereby promoting stability and sustainable growth.

Perera's (2013) study delves into the effectiveness and relative significance of various transmission channels of monetary policy in Sri Lanka. By analyzing both monthly and quarterly aggregate data, as well as disaggregated data, the research aims to uncover insights into the country's monetary transmission mechanism. Employing both unrestricted and structural vector autoregressions (VAR), the empirical estimates offer valuable insights into the dynamics of monetary policy transmission in Sri Lanka. The findings indicate that changes in the economic and financial landscape contribute to heightened sensitivity of output and prices to interest rate adjustments. This suggests evolving dynamics in the monetary transmission process, possibly influenced by shifts in economic conditions, financial market developments, or policy frameworks. The implications of these results extend to central banks in emerging economies, including the Central Bank of Sri Lanka. Understanding the evolving nature of monetary transmission channels is crucial for policymakers in crafting effective monetary policy strategies. The findings underscore the importance of adaptability and responsiveness in monetary policy frameworks to navigate changing economic environments and ensure the stability and resilience of the financial system.

Cevik and Teksoz (2012) delve into the efficacy of monetary policy transmission within the Gulf Cooperation Council (GCC) countries through the lens of a structural vector autoregressive model. Their analysis yields significant insights into the mechanisms through which monetary policy influences economic variables in this region. Their findings suggest that both the interest rate channel and the bank lending channel wield considerable influence over non-hydrocarbon output and consumer prices within the GCC countries. This implies that adjustments in interest rates and lending practices by financial institutions can significantly impact economic activity and inflation levels in these nations. However, the study highlights a contrasting observation regarding the exchange rate channel. Despite its theoretical importance in monetary policy transmission, particularly in influencing exports, imports, and inflation through currency valuation changes, the exchange rate channel appears to have limited significance in the GCC countries. This is attributed to the prevalent pegged exchange rate regimes adopted by these nations, which effectively limit the flexibility and autonomy of monetary policy to influence exchange rate dynamics. Cevik and Teksoz's research underscores the nuanced interplay between monetary policy instruments and economic variables within the unique context of the GCC countries. It emphasizes the need for policymakers in these nations to carefully consider the effectiveness and limitations of different transmission channels when formulating monetary policy strategies, particularly in light of their exchange rate arrangements.

Hamid et al. (2013) employed vector autoregression (VAR) models, a widely recognized methodology, to investigate the Monetary Transmission Mechanism. Their empirical analysis uncovered intriguing insights into the monetary policy frameworks and practices in various countries. Specifically, the study highlighted shifts in monetary policy strategies within certain countries, such as Kenya, Tanzania, and Rwanda. These countries have increasingly turned to changes in the policy rate as a primary tool for steering monetary policy. Concurrently, they have continued to utilize direct instruments, such as adjustments in reserve requirement ratios, to influence monetary conditions. This dual-pronged approach reflects a nuanced strategy aimed at achieving specific policy objectives while adapting to evolving economic dynamics. Moreover, the research indicated instances where monetary policy was conducted by simultaneously adjusting both prices and quantities, particularly during certain episodes or within specific country contexts. This multifaceted approach underscores the complexity of monetary policy implementation and the need for policymakers to adopt flexible strategies tailored to the prevailing economic conditions and policy objectives. By employing VAR models and analyzing the monetary transmission mechanism across different countries, Hamid et al. shed light on the diverse approaches to monetary policy formulation and implementation. Their findings contribute valuable insights to the broader discourse on monetary policy effectiveness and the challenges associated with achieving macroeconomic stability in varying economic environments.

Misati et al. (2010) employed single equation methods, including autoregressive distributed lag (ARDL) and two-stage least squares (2SLS), to examine the relationship between various monetary factors and the output gap. Their study covered the period from January 1996 to February 2007 and focused on variables such as the real interest rate, measures of financial innovation (such as the ratio of bank assets to GDP and the ratio of M3 to M1), and the output gap. The results of their analysis revealed several key findings. Firstly, the coefficient on the real interest rate was negative and statistically significant, suggesting contractionary effects of monetary policy on the output gap. This implies that increases in real interest rates led to a reduction in economic output. Secondly, Misati et al. found that the coefficient on the interaction between the real interest rate and measures of financial innovation was positive and statistically significant. This indicates a moderating effect of financial innovation on the negative impact of real interest rates. In other words, the presence of financial innovation mitigated the contractionary effects of increases in real interest rates on the output gap. The study highlights the importance of considering the interplay between monetary policy instruments, financial innovation, and economic output when analyzing the effectiveness of monetary policy in influencing macroeconomic variables such as the output gap. Montiel et al. (2012) conducted a study using time series data to analyze the relationship between three macroeconomic variables—exchange rate, reserve money, and price level—in Tanzania over the period from December 2001 to May 2010. Their analysis focused on the effects of a positive shock to reserve money, which represents an expansionary monetary policy. The authors employed vector autoregression (VAR) models to assess the impact of this shock on the price level and output. The findings of the study indicated that a positive shock to reserve money led to an increase in the price level in both recursive models. These effects were found to be statistically significant, although not economically significant, suggesting that the expansionary monetary policy influenced prices but to a limited extent. However, the study did not find any significant impact on output in either VAR model. This implies that the expansionary monetary policy did not have a discernible effect on the level of economic output during the period under consideration. The research provides insights into the transmission mechanism of monetary policy in Tanzania and underscores the importance of considering the dynamics between reserve money, prices, and output when evaluating the effectiveness of monetary policy interventions.

3. ESTIMATION METHODS

The estimation process of the VAR model parameters involved a series of sequential steps, each designed to ensure the accuracy and reliability of the results. Initially, the Augmented Dickey–Fuller test was conducted to assess the presence of a unit root in the time series data. This test is pivotal for determining the stationarity of the data, a fundamental assumption in time series analysis. By employing the augmented version of the Dickey–Fuller test, a more comprehensive evaluation of the time series models was achieved, enhancing the robustness of the subsequent analyses. Following the assessment of stationarity, the Johansen cointegration test was performed to investigate the existence of long-term relationships among the variables. Cointegration analysis is essential for identifying stable equilibrium relationships between variables, particularly in the context of monetary policy dynamics. If cointegration is detected, it implies the presence of a stable long-term relationship among the variables, necessitating the estimation of a vector error correction model (VECM) to capture these dynamics accurately. Upon completing the cointegration analysis, the VAR model was estimated using the time series data. The focus of the VAR model estimation was on expressing the consumer price index (CPI) as a function of other relevant variables directly linked to monetary policy, such as interest rates and money supply. This step allowed for the exploration of the dynamic interactions between monetary policy instruments and consumer prices, providing valuable insights into the transmission mechanisms of monetary policy. Subsequently, the Granger causality test was employed to investigate the causal relationships between the variables. By assessing whether one time series variable helps in forecasting another, the Granger causality test enables researchers to discern the direction of influence among the variables, shedding light on the underlying causal mechanisms driving the observed dynamics. Finally, impulse response analysis was conducted to examine the dynamic effects of shocks to one variable on the others within the system. This analysis allows for the exploration of how each variable responds over time to shocks in other variables, providing valuable insights into the magnitude and persistence of these effects and their implications for monetary policy formulation and implementation.

The table 1 presents unit root tests for various economic indicators in different countries, including Mexico, Turkey, Russia, and Chile. These tests assess the order of integration of each variable, which is crucial for determining their time-series properties and potential use in econometric modeling. For Mexico, the unit root tests reveal mixed results across different variables. Exchange rate variables and some monetary indicators like M2 exhibit statistically significant results, indicating non-stationarity. However, variables like GDP and consumer price index (CPI) show mixed results across different specifications. Similarly, for Turkey, the unit root tests show mixed outcomes. Exchange rate variables display mixed results, while some monetary indicators like M2 exhibit non-stationarity. However, variables like GDP show relatively stable properties. In the case of Russia, most variables display non-stationary behavior, as indicated by statistically significant results in the unit root tests. Exchange rate variables, monetary indicators, and some economic indicators like GDP exhibit non-stationary behavior. For Chile, the results again show mixed outcomes. Exchange rate variables and some economic indicators like GDP display non-stationary behavior, while others like consumer price index (CPI) show mixed results. Overall, the unit root tests provide insights into the time-series properties of various economic indicators across different countries, aiding in the assessment of their potential use in empirical analysis and policymaking.

Table 1: Unit Root Test

	Statistique	(1)	(2)	(3)	Order of integration
Mexico	Exchange rate	-3,53*			0
	MMIR	-2,16	-1,85	-1,90	1
	D MMIR	-	-	-8,22*	0
	IRGB	-0,95	-1,59	-2,59*	0
	CPS	-1.51	-1 ,52	-0,73	1
	D CPS	-1.76	-2	-2,06*	0
	M2	-1,54	-1 ,64	-1, 39	1
	D M2	-	-	-4,81*	0
	CPI	-	-2,37	4,51	1
	D CPI	-2 ,37	4,51	-5,81*	0
	GDP	-2 ,08	-2,29	-1,28	1
	D GDP	-2,50	-2,47	-2,62*	0
Turkey	Exchange rate	-1 ,84	-1 ,61	0,47	1
	D Exchange rate	-2,66	-2 ,56	-2,08*	0
	MMIR	-2,46	-0,78	-1 ,62	1
	D MMIR	-	-	-3,65*	0
	IRGB	-	-	-5,06*	0
	CPS	-1,87	-1,68	-0,41	1
	D CPS	2,06	2,51	-2,34*	0
	M2	-1 ,49	-1,50	-2,57*	0
	CPI	-1,33	-1,16	-1,81	1
	D CPI			-4,42*	0
	GDP	-2,08	-2,29	-1 ,28	1
	D GDP	-2,50	-2,47	-2 ,62*	0
Russia	Exchange rate	-1,59	-2,06	0,21	1
	D Exchange rate	-2,85	-2,20	-1,97*	0
	MMIR		-2,46	-2,98*	0
	IRGB			-3,56*	0
	CPS	-1,45	-2,36	-1,54	1
	D CPS	0,25	-0, 62	-2,15*	0
	M2			-4,14*	0
	CPI			-3,80*	0
	GDP			-3,59*	0
	Exchange rate	-1 ,72	-2.13	-0.04	1
	D Exchange rate	-2.30	-1.88	-1.99*	0
	MMIR	-1.42	-0.62	-0.34	1
	D MMIR			-2.47*	0
	IRGB	-1.43	-0.61	-0.34	1
Chili	D IRGB			-3.42*	0
	CPS			-3.53*	0
	M2		-3.39*	-3.10*	0
	CPI	-2.35	-2.46	-1.39	1
	D CPI	-2.30	-2.45	-2.64*	0
	GDP		3.75	-2.87*	0

The table 2 presents the results of the Trace Test for unit root testing in the context of panel data for four different countries: Mexico, Turkey, Russia, and Chile. The Trace Test is commonly used to assess the presence of unit roots in panel data, which is crucial for determining the stationarity of variables and the appropriate modeling approach. For Mexico, Turkey, Russia, and Chile, the Trace Test results indicate that there are no unit roots present in the panel data at lag 0 for all countries, as the test statistics exceed the critical values at the 5% significance level. This suggests that the variables included in the panel data for these countries are stationary at lag 0. At lag 1, the Trace Test results vary across countries. For Mexico, Turkey, and Russia, the test statistics at lag 1 are lower than the critical values at the 5% significance level, indicating the presence of unit roots in the panel data at lag 1. However, for Chile, the test statistic at lag 1 exceeds the critical value, suggesting that the variables in the panel data for Chile are stationary at lag 1. Similarly, at lag 2, the Trace Test results also vary. For Mexico, Turkey, and Russia, the test statistics at lag 2 are lower than the critical values at the 5% significance level, indicating the presence of unit roots in the panel data at lag 2. However, for

Chile, the test statistic at lag 2 exceeds the critical value, suggesting that the variables in the panel data for Chile are stationary at lag 2. Overall, the Trace Test results provide insights into the stationarity of variables in panel data for these countries, which is essential for conducting reliable econometric analyses and making informed policy decisions.

Table 2: The Trace Test

	n	Test Trace	Critical value at 5%
Mexico	0	1,21	68.52
	1	0,87	47.21
	2	0 ,63	29.68
Turkey	0	1,36	68.52
	1	1,022	47.21
	2	0, 6873	29.68
Russia	0	1,12	68.52
	1	0,77	47.21
	2	0,41	29.68
Chili	0	1,74	68.52
	1	0, 97	47.21
	2	0,26	29.68

The table 3 presents the Akaike Information Criterion (AIC) and Schwarz Criterion (SC) values for different orders of Vector Autoregression (VAR) models for four countries: Mexico, Turkey, Russia, and Chile. These criteria are commonly used for model selection to determine the optimal number of lags in VAR models. For Mexico, the AIC and SC values decrease as the order of the VAR model increases from 1 to 3, indicating that the model fit improves with higher-order lags. However, the change in AIC and SC values is relatively small between the second and third orders. Similarly, for Turkey, the AIC and SC values decrease from the first to the second order but increase for the third order. This suggests that the optimal number of lags may be two for Turkey, as it provides the best balance between model fit and complexity. For Russia, the AIC and SC values decrease from the first to the second order but increase slightly for the third order. The decrease in AIC and SC values is more substantial for the first to second order compared to Turkey, indicating that the optimal number of lags may be two for Russia. For Chile, the AIC and SC values decrease from the first to the second order but increase for the third order. Similar to Turkey and Russia, the optimal number of lags may be two for Chile based on the AIC and SC criteria. Overall, the selection of the optimal number of lags in VAR models varies across countries and depends on balancing model fit with complexity. The AIC and SC criteria provide useful guidance for determining the appropriate lag structure in VAR models.

Table 3: choice of the number of Lag `p ':

Pays	The ordre of VAR	1	2	3
Mexico	AIC	-11.72	-10.58	-10.47
	SC	-10.98	-9.86	-9.46
Turkey	AIC	-9.86	-9.98	-8.16
	SC	-9.58	-10.12	-9.76
Russia	AIC	-8.15	-7.08	-7.56
	SC	-8.97	-8.61	-8.46
Chili	AIC	-10.15	-8.63	-9.75
	SC	-10.45	-9.72	-9.06

The table 4 presents the estimated coefficients of the Vector Autoregression (VAR) model for Mexico, denoted as VAR for Mexico. Each row corresponds to a lagged variable, and each column represents the coefficient estimate for the respective lagged variable in the model. The values in parentheses represent the standard errors of the coefficient estimates. For example, the coefficient estimate for the lagged variable D(LER (-1)) is 0.061, and its standard error is 0.855. This indicates the impact of the lagged exchange rate (LER) variable at lag 1 on itself. Similarly, the coefficient estimate for the lagged variable D(LMMIR (-1)) is 0.362, and its standard error is 0.732. This indicates the impact of the lagged monetary market interest rate (LMMIR) variable at lag 1 on itself. The table also includes a constant term for each variable, denoted as "Constant." These constant terms represent the intercepts of the VAR model. Overall, the table provides a detailed overview of the estimated coefficients of the VAR model for Mexico, allowing for the analysis of the relationships between the different variables included in the model across different lags.

Tableau 4: Estimate VAR model VAR for Mexico

	D (LER)	D (LMMIR)	D(LIRGB)	D(LCPS)	D(LM2)	D(LCPI)	D(L GDP)
D(LER (-1))	0,061	-0,090	-0,061	0,120	-0,002	0,037	-0,095
	(0,855)	(0,169)**	(0,531)	(0,195)**	(0,935)	(0,671)	(0,220)
D(LMMIR (-1))	0,362	0,515	0,314	0,115	0,207	-0,332	0, 396
	(0,732)	(0,025)*	(0,321)	(0,680)	(0,034)*	(0,247)	(0,118)**
D(LIRGB (-1))	0,394	0.49	0.451	0.120	0.158	-0.382	0.354
	(0,704)	(0.027)*	(0.159)**	(0.659)	(0.082)**	(0.181)**	(0.148)**
D(LCPS(-1))	0.596	-0.412	-0.052	0.525	-0.014	0.653	-0.004
	(0.629)	(0.096)**	(0.882)	(0.131)**	(0.882)	(0.067)**	(0.986)
D(LM2(-1))	-0.784	-0.640	-1.782	-0.160	-0.449	3.690	0.004
	(0.833)	(0.363)	(0.127)**	(0.870)	(0.156)**	(0.004)*	(0.568)
DL(CPI (-1))	0.105	0.478	-0.221	0.167	0.050	0.285	0.066
	(0.877)	(0.004)*	(0.284)	(0.366)	(0.371)	(0.137)**	(0.662)
DL(GDP (-1))	3.067	0.242	0.153	-0.538	0.188	0.004	0.298
	(0.055)*	(0.364)	(0.709)	(0.173)**	(0.120)**	(0.990)	(0.354)
Constant	9.673	-7.103	-7.290	3.627	27.385	-3.790	-27.182
	(0.023)	(0.532)	(0.513)	(0.781)	(0.496)	(0.606)	(0.098)

The table 5 presents the estimated coefficients of the Vector Autoregression (VAR) model for Russia. Each row corresponds to a lagged variable, and each column represents the coefficient estimate for the respective lagged variable in the model. The values in parentheses represent the standard errors of the coefficient estimates. For example, the coefficient estimate for the lagged variable D(LER(-1)) is 0.790, and its standard error is 0.011. This indicates the impact of the lagged exchange rate (LER) variable at lag 1 on itself. Similarly, the coefficient estimate for the lagged variable D(LMMIR(-1)) is -1.267, and its standard error is 0.032. This indicates the impact of the lagged monetary market interest rate (LMMIR) variable at lag 1 on itself. The table also includes a constant term for each variable, denoted as "Constant." These constant terms represent the intercepts of the VAR model. Overall, the table provides a detailed overview of the estimated coefficients of the VAR model for Russia, allowing for the analysis of the relationships between the different variables included in the model across different lags.

Table 5: Estimate VAR model for Russia

	D(LER)	D(LMMIR)	D(LIRGB)	D(L CPS)	D(LM2)	D(LCPI)	D(LGDP)
D(LER(-1))	0.790	-0.012	0.087	0.093	0.015	-0.059	2.771
	(0.011) *	(0.863)	(0.264)	(0.581)	(0.906)	(0.523)	(0.791)
D(LMMIR(-1))	-1.267	0.037	0.041	0.107	0.133	-0.063	34.635
	(0.032)*	(0.799)	(0.783)	(0.752)	(0.620)	(0.734)	(0.132)**
D(LIRGB(-1))	-0.555	0.479	0.734	-0.142	-0.137	-0.476	28.918
	(0.003)	(0.000)	(0.000)	(0.157)**	(0.092)**	(0.000)	(0.000)
D(LCPS (-1))	-0.374	-0.087	-0.080	0.964	0.060	0.023	13.974
	(0.000)	(0.002)	(0.005)	(0.000)	(0.144)**	(0.402)	(0.001)
D(LM2(-1))	1.212	-0.000	0.362	-0.267	0.108	-0.096	-2.115
	(0.041)*	(0.997)	(0.042)*	(0.449)	(0.690)	(0.617)	(0.922)
D(LCPI(-1))	2.194	0.671	0.874	0.402	0.377	-0.887	-77.058
	(0.005)	(0.004)	(0.001)	(0.333)	(0.251)	(0.003)	(0.013)*
D(LGDP(-1))	0.512	-0.021	0.068	-0.063	0.138	-0.058	-12.452
	(0.075)**	(0.774)	(0.392)	(0.715)	(0.325)	(0.544)	(0.271)

The table 6 displays the estimated coefficients of the Vector Autoregression (VAR) model for Turkey. Each row corresponds to a lagged variable, and each column represents the coefficient estimate for the respective lagged variable in the model. The values in parentheses denote the standard errors of the coefficient estimates. For instance, consider the coefficient estimate for the lagged variable D(LER(-2)). It is 0.341, and its standard error is 0.576. This indicates the impact of the lagged exchange rate (LER) variable at lag 2 on itself. Similarly, the coefficient estimate for the lagged variable D(LMMIR(-2)) is -24.884, with a standard error of 0.348. This implies the impact of the lagged monetary market interest rate (LMMIR) variable at lag 2 on itself. Furthermore, the table includes a constant term for each variable, denoted as "Constant." These constants represent the intercepts of the VAR model. In summary, the table provides comprehensive information about the estimated coefficients of the VAR model for Turkey, facilitating the examination of the relationships between different variables across various lags.

Table 6: estimate VAR model for Turkey

	D(L ER)	D(LMMIR)	D(IRGB)	D(LCPS)	D(LM2)	D(LCPI)	D(LGDP)
D(LER(-2))	0.341	-0.032	0.028	0.000	0.004	-0.000	0.856
	(0.576)	(0.151) * *	(0.081)**	(0.941)	(0.580)	(0.993)	(0.301)
D(LMMIT(-2))	-24.884	-2.730	2.155	-0.009	0.312	1.285	38.805
	(0.348)	(0.013)*	(0.008)	(0.986)	(0.369)	(0.039)*	(0.273)
D(LIRGB(-2))	-14.509	-3.043	2.488	-0.387	0.388	1.118	35.535
	(0.704)	(0.044)*	(0.025)*	(0.648)	(0.446)	(0.186)**	(0.486)
D(L CPI(-2))	-0.219	0.248	-0.219	0.891	0.000	-0.185	9.127
	(0.982)	(0.481)	(0.390)	(0.003)	(0.999)	(0.390)	(0.499)
D(LM2(-2))	-58.635	-1.763	1.172	-0.175	0.043	0.909	105.242
	(0.125)**	(0.174)**	(0.203)	(0.822)	(0.925)	(0.241)	(0.048)*
D(LCPI(-2))	-17.473	-0.935	0.739	0.444	0.324	0.756	9.773
	(0.217)	(0.071)**	(0.051)*	(0.163)**	(0.096)**	(0.024)*	(0.586)
D(LGDP (-2))	9.195	0.127	-0.214	-0.288	0.129	-0.055	-0.916
	(0.555)	(0.811)	(0.578)	(0.410)	(0.530)	(0.865)	(0.964)

The table 7 presents the estimated coefficients of the Vector Autoregression (VAR) model for Chile. Each row represents a lagged variable, and each column contains the coefficient estimate for the respective lagged variable in the model. The values in parentheses denote the standard errors of the coefficient estimates. For example, the coefficient estimate for the lagged variable D(LER(-1)) is 0.820, with a standard error of 0.020. This indicates the impact of the lagged exchange rate (LER) variable at lag 1 on itself. Similarly, the coefficient estimate for the lagged variable D(LMMIR(-1)) is -0.022, with a standard error of 0.086. This suggests the impact of the lagged monetary market interest rate (LMMIR) variable at lag 1 on itself. Moreover, the table includes a constant term for each variable, denoted as "Constant." These constants represent the intercepts of the VAR model. Overall, the table provides detailed information about the estimated coefficients of the VAR model for Chile, facilitating the analysis of relationships between different variables across various lags.

Table 7: Estimate VAR model for Chili

	D(LER	D(LM*MIR)	D(LIRGB)	D(LCPS)	D(LM2)	D(LCPI)	D(LGDP)
D(L ER(-1))	0.820	10.833	116.319	1.799	1.128	-19.433	0.618
	(0.020)*	(0.269)	(0.421)	(0.519)	(0.166)**	(0.481)	(0.943)
D(LMMIR (-1))	-0.022	0.285	-6.774	-0.109	0.002	0.725	-0.074
	(0.086)**	(0.461)	(0.259)	(0.342)	(0.929)	0.515	0.832
D(LIRGB (-1))	-0.000	-0.043	-1.596	0.013	0.000	0.194	0.003
	(0.691)	(0.466)	(0.102)**	(0.447)	(0.940)	(0.270)	(0.955)
D(L CPS (-1))	-0.010	-0.985	0.631	0.969	0.020	2.066	-0.299
	(0.743)	(0.379)	(0.969)	(0.113)**	(0.814)	0.517	(0.767)
D(LM2(-1))	0.130	6.356	14.073	1.489	-0.303	-10.370	5.906
	(0.372)	(0.200)	(0.841)	(0.295)	(0.431)	(0.450)	(0.199)**
D(LCPI (-1))	-0.007	-0.159	-7.169	0.006	0.007	0.886	0.167
	(0.614)	(0.725)	(0.313)	(0.958)	(0.845)	(0.505)	(0.692)
D(LGDP (-1))	-0.014	-0.740	-6.563	-0.214	-0.011	0.777	-0.134
	(0.174)**	(0.049)*	(0.206)	(0. 051)*	(0.649)	(0.417)	(0.656)
Constant	-773.402	63.596	14.682	39.013	-282.727	47.323	71.548
	(0.385)	(0.102)**	(0.025)*	(0.699)	(0.517)	(0.279)	(0.042)*

4. CONCLUSION

To reach our objectives, we undertook the estimation of VAR models, considering various methodological aspects such as the validation of the co-integration hypothesis and the implementation of the VAR model itself. This approach was essential for ensuring the robustness and reliability of our analysis, as it enabled us to account for the potential presence of long-term relationships among the variables and to capture the dynamic interactions within the system. By rigorously testing the hypothesis of co-integration, we were able to ascertain whether the variables in our model exhibited stable long-term relationships, which is crucial for accurate modeling of the underlying economic dynamics. Subsequently, the implementation of the VAR model allowed us to capture the complex interdependencies among the variables over time, providing a comprehensive framework for analyzing the transmission mechanisms of monetary policy and their impact on key macroeconomic indicators. Our methodological approach encompassed a rigorous validation process to ensure the appropriateness of the chosen model specifications and the reliability of the estimated results. This comprehensive analysis framework enabled us to gain deeper insights into the dynamics of monetary policy transmission and their implications for economic performance, thereby contributing to the existing body of knowledge in this field. In conclusion, our analysis suggests that the effectiveness of the interest rate channel is notably constrained across all countries in our sample. Contrary to theoretical expectations, we observed an increase in the consumer price index following an interest rate shock, a phenomenon commonly referred to as the "price puzzle" in the literature. This unexpected finding underscores the complexity of monetary policy transmission mechanisms and highlights the need for further research to better understand the underlying dynamics at play. Additionally, our study emphasizes the importance of considering country-specific factors and economic conditions when analyzing the effectiveness of monetary policy tools, as these factors can significantly influence the transmission process and its outcomes. Our findings contribute to advancing the understanding of monetary policy effectiveness and provide valuable insights for policymakers seeking to enhance the efficacy of their policy interventions in achieving macroeconomic objectives. In our analysis, we found that the effectiveness of the exchange rate channel varies across the three countries studied. Specifically, the exchange rate channel appears to be more active in Turkey compared to Chile, Russia, and Mexico. Conversely, in Russia, Chile, and Mexico, this channel exhibited relatively lower effectiveness. Additionally, our results indicate that the interest rate channel is notably limited in all countries in our sample. This suggests that changes in interest rates may have less pronounced effects on economic variables compared to other channels of monetary policy transmission. Overall, our findings underscore the importance of considering country-specific factors and economic conditions when assessing the effectiveness of different monetary policy channels.

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