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THE ROLE OF U.S. LONG-TERM GOVERNMENT BOND YIELDS, BITCOIN AND GOLD PRICES IN EXPLAINING CHANGES IN TURKEY'S CPI

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ABSTRACT

Purpose- The main objective of this study is to investigate comparative short- and long-term impacts of U.S. long-term government bond yields, gold, and Bitcoin prices on the shift in Turkey's consumer price index (CPI) between January 2021 and March 2025. No prior studies were found for the comparative impact of the given variables. Digital assets such as Bitcoin became increasingly important for the global economy after the 2020 pandemic period. Many people bought digital assets to protect themselves from rising inflation. The inclusion of the Bitcoin variable and its effect on inflation in Turkey is another important objective of this research.

Methodology- A two-regime Markov regime-switching model and cointegration analysis using FMOLS and DOLS techniques were employed to examine these relationships.

Findings- The results indicate that U.S. long-term government bond yields significantly and positively influence Turkey's CPI under both regimes. Gold prices have a significant positive influence on changes in the CPI during regime 2 periods, but Bitcoin prices exhibit a significant negative relationship with Turkey's CPI for the same regime. The FMOLS and DOLS analyses reveal that only U.S. long-term government bond yields have a significant, long-term positive influence on Turkey's CPI.

Conclusion- According to this study, both in the short and long term, U.S. long-term government bond yields have a significant and steady positive influence on Turkey's CPI. During regime 2 periods, gold prices have a major positive influence on Turkey's CPI, whereas Bitcoin has a major negative effect on shifts in Turkey's CPI. According to the findings, Bitcoin might be able to provide short-term inflation protection in Turkey, but only during specific economic regimes. Gold was found to have a positive significant influence on Turkey's CPI for the short term. Moreover, it was found that gold and Bitcoin are not suitable for long-term safe haven asset classes for Turkey. Overall, the results show that U.S. long-term government bond yields had the most significant influence on Turkey's inflation dynamics over the analysis period. The findings highlight that Turkey's inflation rate is highly sensitive to major international interest rate movements.

Keywords: Bitcoin, gold prices, U.S. long-term government bond yields, Turkey's CPI, Markov regime switching model
JEL Codes: E31, F41, G15

1. INTRODUCTION

Traditional macroeconomic models predominantly focus on domestic variables such as aggregate demand and money supply. However, with increasing globalization and financial interconnectedness, understanding the evolving nature of inflation has become more critical. Turkey has been coping with high inflation since 2020. This spike is because of challenges with its economy and shocks from outside the country. Turkey has a high volume of Bitcoin transactions. Bitcoin is becoming a more common means to invest and buy goods and services. If its value fluctuates, it might directly affect the wealth of households, which could subsequently affect total demand. Because of this, Turkey's inflation models need to be revised to incorporate financial instruments like gold and Bitcoin as probable causes of inflation. The gold price has also been increasing since 2020 due to global market uncertainty. In Turkey, individuals purchase gold as a safeguard against inflation. When gold prices rise, the assets of gold savers can grow rapidly, which may also lead to an increase in Turkey's aggregate demand. That circumstance can also influence inflation. The same case can also exist for Bitcoin. These dynamics may influence inflation through wealth effects associated with both gold and Bitcoin. Moreover, the Federal Reserve interest rate of the USA is an important indicator for global financial markets. When the rate increases, the Turkish economy's external debt value increases. That increase can also lead Turkey to increase taxes on goods and services to reduce budget deficits. This scenario has contributed to an increase in production costs for firms in Turkey. The main objective of this study is to look at how U.S. long-term bond yields, gold prices, and Bitcoin prices affect Turkey's CPI in the short and long run.

2. LITERATURE REVIEW

Baur and McDermott (2010) conduct research from 1979 to 2009 and find that gold protects the US and European stock markets from losses. On the other hand, they also find that Australia, Canada, Japan, and the BRIC countries don't have the same protective association with gold.

Lucey et al. (2017) analyzed the association between gold prices and inflation in the US, UK, and Japan. Their findings suggest that the relationship broke down in the US in the mid-1990s, but the results are less obvious in the UK and Japan.

The demand for gold exchange-traded funds (ETFs) and the yields on US 10-year notes affected gold prices after 2013 (Ergul and Karakas, 2024).

Khan et al. (2024) state that rising interest rates contribute to the increase in inflation in Pakistan.

Selmi et al. (2018) affirm that both Bitcoin and gold serve as effective assets for investors when there is political and economic volatility, but oil does not serve the same function.

Tkacz (2007) looks at how gold can predict inflation in 14 nations from 1994 to 2005. It is found that gold is a highly effective inflation indicator, particularly in countries with official inflation targets. This could be because people start to expect inflation, which makes for faster mean-reverting inflation rates.

Tufail and Batool (2013) analyze how gold influenced inflation in Pakistan between 1960 and 2010. It is shown that gold is a potential cause of inflation and also can have a hedging role against unexpected inflation.

Batten et al. (2014) observes the long-term relationship between inflation and the price of gold. No cointegration is found if volatility from the early 1980s is left out, but there has been a lot of time variation and comovement.

Abaidoo and Agyapong (2022) mention that fluctuations in the prices of gold cause inflation to go up in Sub-Saharan Africa.

The inflation in developing markets is partly caused by a higher interest rate in foreign countries (Kia, 2010). Using a monetary model with Turkish data, Kia (2010) examines the factors that influence Turkey's inflation rate. It was mentioned that inflation is mostly reasoned by government debt, deficits, and other factors, which are influenced by both domestic and foreign factors.

Sarsici (2025) examines the relationship between inflation and interest rates in Turkey from 2012 M01 to 2024 M12. Shocks can cause long-term changes in the economy. The findings demonstrate a long-term positive relationship between interest rates and inflation. The study mentions that inflation is the main cause of problems in the economy.

Conlon et al. (2020) find no evidence that Bitcoin or Ethereum served as safe haven financial instruments for equity markets during the COVID-19 pandemic.

Using GARCH models, Dyhrberg (2016) analyzes Bitcoin's financial asset capabilities and finds that it is comparable to gold and the dollar, indicating that it has hedging potential.

In developed economies, gold is still a viable way to protect against inflation, but due to the volatile pricing structure, Bitcoin is not always a reliable financial tool. Interest rates and inflation exhibit a positive relationship in emerging economies, implying that monetary policy may not be adequate to thwart inflation. To the best of current literature, there is no research that examines the role of USA long-term government bond yields, Bitcoin, and gold prices in explaining changes in Turkey's CPI. The aim of this research is to fill that gap in the finance literature.

3. DATA AND METHODOLOGY

In this research, only secondary data were used. The USA's long-term government bond yield and Turkey's CPI data were retrieved from the St. Louis Federal Reserve database. Gold prices were taken from the gold market website. Bitcoin prices were retrieved from the Investing.com. The main objective is to scrutinize the short-term and long-term influence of the USA's long-term government bond yield, Bitcoin, and gold prices on Turkey's CPI. For the short-term influence, Markov regime switching analysis will be used. FMOLS and DOLS analyses will be performed for the long-term impact. The time frame in this research is between January 2021 and March 2025. Monthly data will be used.

Markov regime switching analysis is an important method for examining the impact of variables across different regimes.

The $Y_t=\alpha_{regime}+\beta_{regime}X_t+\varepsilon_t$ equation indicates Markov regime switching analysis for each different regime.

Geopolitical shocks, speculative capital flows, and changes in interest rates around the world all are impacting Turkey's unstable inflation dynamics. Inflation reacts differently in high-stress versus low-stress regimes; Bitcoin and gold prices may impact Turkey's CPI during volatile or crisis periods. Traditional linear models assume average behavior. Applying standard OLS regression analysis can give spurious results. The justification for applying that analysis derives from the given reasons.

FMOLS analysis can be used to measure long-term impact in econometric research. Those analyses are important for the correction of serial correlation and endogeneity bias. The $Y_t=\beta x_t+u_t$ equation shows FMOLS analysis. DOLS incorporates leads and lags of the differenced regressors into the model to address these issues. This helps reduce endogeneity bias and autocorrelation.

The $Y_t=\alpha+\beta X_t+\sum\gamma\Delta x_{t-k}+\varepsilon_t$ equation shows the DOLS equation including leads and lags of the differenced regressors.

Those analyses also can be done with non-stationary variables. All of the variables were non-stationary for I(0). For I(1), all data were transformed to stationary variables.

4. FINDINGS

Markov regime switching regression results (Table 1) show that U.S. long-term government bond yields have a statistically significant positive effect on Turkey's CPI in both regimes. During regime 2 periods, fluctuations in the CPI are strongly and positively affected by gold prices, but Bitcoin prices have a strong negative association with Turkey's CPI for the same regime.

Table 1: Markov Regime Switching Regression Results

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
GOLD	-0.006080	0.003230	-1.882665	0.0597
BITCOIN	-4.12E-05	7.38E-05	-0.558196	0.5767
U.S. LONG-TERM GOVERNMENT BOND YIELDS	17.17911	1.499512	11.45647	0.0000
LOG(SIGMA)	2.153824	0.125609	17.14708	0.0000
Regime 2				
GOLD	0.066687	0.008178	8.154657	0.0000
BITCOIN	-0.000287	8.41E-05	-3.410545	0.0006
U.S LONG-TERM GOVERNMENT BOND YIELDS	5.882083	2.023071	2.907501	0.0036
LOG(SIGMA)	0.606899	0.238596	2.543626	0.0110
Transition Matrix Parameters				
P11-C	3.815568	1.155478	3.302155	0.0010
P21-C	-2.137904	1.043997	-2.047807	0.0406

The FMOLS (R-square: 0.529431) and DOLS analysis (R-square: 0.604520) results (Table 2) show that only U.S. long-term government bond yields have a long-term significant effect on Turkey's CPI. Positive changes in U.S. interest rates significantly increase Turkey's CPI.

Table 2: FMOLS and DOLS Analysis Results

Variable	Method	Coefficient	Std. Error	t-Statistic	Prob.
GOLD	FMOLS	-0.013657	0.007956	-1.716640	0.0926
U.S. LONG-TERM GOVERNMENT BOND YIELDS	FMOLS	22.53029	3.209184	7.020567	0.0000
BITCOIN	FMOLS	-3.66E-05	0.000188	-0.194379	0.8467
GOLD	DOLS	-0.012267	0.010532	-1.164723	0.2518
U.S. LONG-TERM GOVERNMENT BOND YIELDS	DOLS	22.31998	3.914361	5.702076	0.0000
BITCOIN	DOLS	-1.27E-05	0.000236	-0.053838	0.9574

The hawkish stance of the Turkish central bank can diminish the inflation rate in the short term. However, in the medium and long term, the Turkish lira plummeted against the USD due to interest rate parity, which made Turkey's imports more expensive. It can be interpreted that when the USA Federal Reserve raises its interest rate, Turkey's interest rate generally responds to U.S. monetary tightening due to external debt and capital flow sensitivity. That circumstance exerts inflationary pressure on the Turkish economy. In addition, the Turkish lira depreciates due to higher USD yields, which increases import inflation. Exchange rate pass-through impacts domestic inflation, while international borrowing costs raise domestic funding costs.

The demand for gold, which acts as a hedge and store of value while potentially influencing consumer prices through jewelry and luxury goods, spikes during periods of high inflation or uncertainty in Turkey's domestic market. After gold prices increase in Turkey, foreign currencies can appreciate against the Turkish lira. When gold prices rise, uncertainty also rises, which can cause depositors to withdraw their money from the Turkish lira deposits and increase demand for foreign currencies such as the euro, USD, and British pound. That may also lead inflation rates to increase in Turkey.

During Regime 2, the model shows a negative relationship between the CPI and Bitcoin prices. Nevertheless, Bitcoin is not a viable choice for a long-term inflation hedge because its price does not cointegrate with Turkey's inflation over the long run.

5. CONCLUSION

Compared to gold and Bitcoin, U.S. bond yields are the dominant external driver of Turkish inflation. This research result is consistent with Kia (2010) and Ergul and Karakas (2024)'s findings. Gold has only an episodic positive and significant effect on Turkey's inflation. For some periods, this research result is similar to Tufail and Batool (2013) and Abaidoo and Agyapong (2022)'s findings. No long-term relationship between gold and Turkey's CPI was found. This finding partially supports the conclusion of Batten et al. (2014), who report no consistent long-term cointegration between gold and inflation if volatile periods (from the early 1980s) are excluded. These results suggest that gold does not serve as a long-term safe haven asset for Turkey. Bitcoin shows only a negative short-term relationship with inflation. No long-term relationship was found between Bitcoin and Turkey's CPI. This research result has similarity with Conlon et al.'s (2020) findings. The results show that Bitcoin may potentially help protect against inflation in Turkey in the short run, but only under certain economic regime periods. However, the research results suggest that Bitcoin cannot be thought of as a viable long-term safe haven asset. Investors may benefit from Bitcoin price appreciation as a temporary hedge against inflation under specific economic regimes. Since foreign interest rates have a dominant role in Turkey's CPI, policymakers should closely monitor international interest rate shifts. By taking into account international indicators such as U.S. interest rates, the Turkish Central Bank and Ministry of Finance should improve their forecasting of inflation. The Turkish lira should be kept stable to lower inflation brought on by costly imports. An export-oriented economy model shall be adopted to reduce the influence of external shocks on the Turkish lira and inflation. It is also advised to promote inflation-linked savings tools. It's also critical to educate the public about safer investment options. The depreciation of the Turkish lira directly impacts capital movements. High exposure to foreign interest rates can increase fast capital withdrawal and can increase dollarization. When dollarization is high, manual monitoring and the use of regular financial technologies are incompetent to control capital withdrawals. The central bank or treasury can react more swiftly and proactively thanks to AI. Turkey can establish a center for capital flow intelligence with AI to minimize the adverse impact of sudden capital withdrawal on the Turkish lira. Artificial intelligence can be utilized to monitor capital flows through real-time transaction surveillance and pattern recognition in foreign exchange and banking markets, enabling early detection of abnormal capital movements that could destabilize the Turkish lira. That center should also focus on early warning financial technologies and implement R&D activities for new financial technologies to have more efficient artificial intelligence-based early warning systems. This research can be expanded by including other cryptocurrencies and other important macroeconomic variables, and the model can be used for other emerging economies research.

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