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TESTING THE FISHER HYPOTHESIS IN TÜRKİYE: EVIDENCE FROM RALS COINTEGRATION ANALYSIS

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ABSTRACT

The relationship between inflation and interest rates has been a central topic in economics since the 1700s, reflecting its importance in understanding monetary dynamics and policy implications. While Henry Thornton is credited with being the first to analyze this relationship systematically, Irving Fisher further developed its theoretical framework in 1930, which has since been widely recognized as the Fisher Hypothesis. Fisher's work explores the connection between inflation and nominal interest rates, positing that nominal rates adjust fully to changes in inflation, leaving real interest rates stable in the long run.

This study examines the validity of the Fisher Hypothesis in the Turkish economy over the period 1970–2023. Using inflation rates and savings deposit interest rates data obtained from the Turkish Statistical Institute (TurkStat), the analysis employs the Residual Augmented Least Squares (RALS) cointegration test to investigate the long-term relationship between the variables. Empirical findings indicate a statistically significant cointegration relationship at a 5% significance level in the model where the interest rate is the dependent variable, under both constant and trend conditions. The results reveal that inflation has a positive and significant impact on nominal interest rates, with a one-unit increase in inflation leading to an approximately 0.5-unit increase in the interest rate. This study not only tests the theoretical premises of the Fisher Hypothesis in the context of Türkiye but also contributes to the broader literature by shedding light on the dynamic interplay between inflation and interest rates in an emerging market economy.

Keywords: Inflation, Interest rates, Fisher Hipothesis, RALS.

Jel Codes: E31, E43, C12, C22

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1. INTRODUCTION

The Fisher Hypothesis occupies a pivotal place in macroeconomic literature as a foundational theory explaining the relationship between inflation and interest rates. This hypothesis, proposed by Irving Fisher in the 1930s, suggests that nominal interest rates should change in line with the expected inflation rate. Accordingly, an increase in the expected inflation rate leads to a one-to-one increase in nominal interest rates, so that the real interest rate remains constant. In other words, the effect of changes in nominal interest rates on the real interest rate is neutral and this change reflects only inflation expectations. The Fisher Hypothesis plays a critical role in evaluating the impact of monetary policies implemented by central banks, assessing investors' expectations of future inflation, and maintaining overall economic equilibrium. The assumption that nominal interest rates are shaped by inflation expectations is particularly important for understanding the effects of monetary policy instruments on the real economy. If the hypothesis is valid, changes in inflation rates will not affect real interest rates and will only lead to adjustments in nominal interest rates. This dynamic has far-reaching implications for investment decisions, saving behaviors, and the efficiency of financial markets. The neutrality of real interest rates ensures that monetary policy tools targeting inflation do not adversely affect the underlying real economy but rather stabilize economic fluctuations by anchoring expectations. Empirical analyses have extensively tested the validity of the Fisher Hypothesis across various countries and time periods. These studies have investigated the validity of the hypothesis under various economic conditions and the results have shown that the hypothesis is sometimes confirmed and sometimes invalidated. While studies such as Kesriyeli (1994) and Berument & Jelassi (2002) have confirmed its validity under specific conditions, others, including Turgutlu (2004) and Yılancı (2009), have found divergent results, suggesting that the relationship between inflation and nominal interest rates may vary across economic contexts. For instance, during periods of high inflation or economic instability, the adjustment of nominal interest rates to expected inflation may deviate from the one-to-one relationship posited by Fisher, as shown in the findings of Ghazali & Ramlee (2003) and Lazar (2013). This inconsistency highlights that the Fisher Hypothesis is not universally valid and is subject to the nuances of market structures, policy environments, and economic dynamics. In particular, during periods of economic instability or in high inflation environments, it has been observed that nominal interest rates do not show an exact relationship with expected inflation rates. This suggests that the Fisher Hypothesis may not be valid in all economic conditions and may change according to market conditions. In the Turkish context, the Fisher Hypothesis offers a valuable lens to examine the interaction between inflation and nominal interest rates, particularly given Türkiye's history of fluctuating inflation and evolving monetary policy frameworks. This study aims to evaluate the validity of the Fisher Hypothesis for Türkiye over the period 1970–2023 using data obtained from the Turkish Statistical Institute (TURKSTAT). The analysis employs the Residual Augmented Least Squares (RALS) cointegration method to test whether a long-term equilibrium relationship exists between inflation and nominal interest rates. The findings of this study will contribute to the broader understanding of how inflation expectations shape interest rate dynamics in emerging market economies. Moreover, they will provide insights into the implications of monetary policy decisions for price stability and financial market efficiency in Türkiye. By combining a thorough review of the empirical literature with an in-depth analysis of Türkiye's unique economic conditions, this research underscores the importance of understanding the dynamic relationship between inflation and interest rates for informed economic policymaking.

2. LITERATURE

Before proceeding with the literature review of this study on the analysis of the Fisher Hypothesis in Türkiye, I would like to emphasize that the concepts such as 'Fisher relationship,' 'Fisher effect' and 'Fisher neutrality', which are named after Irving Fisher, who is considered to be the pioneer of real/nominal interest rate analysis today, were actually put forward by other thinkers long before him (Diamond and Betancourt, 2012 as cited in Çiğdem (2019)): Çiğdem (2019)). These causal relationships, which are intensively discussed today, actually date back to the 1700s, to the work of William Douglas (1738). Douglas is considered to be the first person to distinguish between the nominal interest rate and the real interest rate. Following him, Henry Thornton (1802) used this idea to explain the relationship between nominal and real interest rates. Thornton was the first to systematically and rigorously explain the process of incorporating an inflation premium into interest rates. Researchers such as John Stuart Mill (1865), Alfred Marshall (1890), Jacob de Haas (1889), John Bates Clark (1895) and Fisher (1896) also discussed this causal relationship. However, since these authors were not aware of Thornton's contributions, they did not refer to him. Marshall (1890) was the first to use the terms real and nominal interest rate and also the first to calculate the real value of inflation. After this important detail, we can move on to the literature review. Table 1 presents the empirical studies on this relationship, which has been a subject of debate since the 1700s, especially after 2000.

Table 1. Empirical Literature

Researcher	Term	Country/Region	Method	Result
Malliaropulos (2000)	1960-1995	US	Vector Autoregressive (VAR) Models	(+)
Lanne (2001)	1953:01–1990:12	USA	Recently presented method (Cavanagh, Elliott and Stock (1995)	1953 - 1979 (+)
Atkins & Coe (2002)	1953:01-1999:12 (various)	USA, Canada	ARDL	USA (+)
Berument and Jelassi (2002)	1966-1998	26 countries	ARCH method	Fisher's hypothesis is not valid in 9 of 12 developed countries, not valid in 7 of 14 developing countries
Carneiro et al. (2002)	1980:01– 1997:12	Argentina, Brasil and Mexico	Johansen Cointegration Test	Argentina & Brasil (+)
Ghazali and Ramlee (2003)	1974:1-1996:6	G7	ARFIMA	(-)
Lardic and Mignon (2003)		G7	Engle–Granger Cointegration	(+)
Granville and Mallick (2004)	1900-2000	England	Johansen Cointegration Test	(+)
Million (2004)		USA	Threshold Autoregressive (TAR) Test, Cointegration Tests	(+)
Turgutlu (2004)	1978:Q1 - 2003:Q4	ARFIMA Method, Geweke and Porter-Hudak (GPH) Semi-Parametric Method,	Engle-Granger Cointegration, Partial Stationary and	(-)

		EML- Exact Maximum Likelihood Method, Piecewise Stationarity and Piecewise Co-integration Analysis	Fragmented Cointegration Tests	
Bajo-Rubio et al. (2005)	1963:Q1– 2002:Q4	Spain	Threshold Cointegration Analysis	(+)
Westerlund (2005)	1980:1999:12	14 OECD Countries	Panel Unit Root and Panel Cointegration	(+)
Bolatoğlu (2006)	1990:01-2005:04	Türkiye	Engle-Granger and Johansen-Juselius Cointegration Test	(+)
Herwatz and Reimers (2006)	1960:01- 2004:06	114 Countries	Panel Least Squares Method	(+)
Maghyereh and Al-Zoubi (2006)	1976:01-2003:12 (various)	Argentina, Brazil, Malaysia, Mexico, South Korea and Türkiye	Nonlinear Joint Trend Test	(+)
Şimşek and Kadılar (2006)	1987:Q1–2004:Q4	Türkiye	ARDL	(+)
Westerlund (2006)	1980:01-1999:12	14 OECD Countries	Panel Cointegration Analyse	(+)
Asgharpur et al. (2007)	2002 – 2005	40 selected Islamic Countries	Panel Data Methodology, Wald Test	Rate→Inflation
Berument et al. (2007)	1957:01-2004:8 (various)	G7 and 45 Developing Countries	GARCH	G7 and 23 Countries (+)
Yamak and Abdioğlu (2007)	1990-2006	Türkiye	Johansen-Juselius Cointegration Test	(+)

Yamak and Tanrıöver (2007)	1990 - 2006	Türkiye	Granger Causality Test	Rate→Inflation
Gül and Açıkalın (2008)	1990:01-2003:12	Türkiye	Johansen Cointegration Test	(+)
Westerlund (2008)	1980-2004	20 OECD countries	Durbin Hausman Panel Cointegration	(+)
Tsong and Lee (2009)	1957 – 2012	6 OECD countries	The quantile cointegration methodology recently proposed by Xiao (2009)	(+)
Yılancı (2009)	1989:01-2008:01	Türkiye	Engle CSR Cointegration -Granger Tests	(-)
Ahmad (2010)	1980:01-2007:12 (various)	China, Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand	ADF Test, KSS Test	(+)
Bassil (2010)	1960–2008	ABD	Lee and Strazicich LM Unit Root Test, Bai-Perron Cointegration Test	(+)
Angel and Robledo (2011)	1990:01-2010:12	Colombiya	Cointegration	(+)
Hatemi-J (2011)	1975:Q1-2006:Q4	USA, England	Bootstrap Method	(+)
Mahdi and Masood (2011)	1989-2007	Iran	Johansen Cointegration Test, VECM	(+)
Oktar and Dalyancı (2011)	2003:01-2011:6	Türkiye	Granger Causality Test	Inflation↔Interest
Phiri and Lusanga (2011)	1980:1-2011:4	South Africa	TAR, TVEC	(+)

Toyoshima and Hamori (2011)	1990:01-2010:10	USA, UK, Japan	Panel Cointegration	(+)
Fatima and Sahibzada (2012)	1980/2010	Pakistan	Johansen Cointegration Test, VECM, Granger Causality Analysis	(+)
Jareno and Tolentino (2013)	1997–2007, 2008–2012	European countries	OLS regression with robust standard errors, causality and co-integration techniques	(+)
Kıran (2013)	1990:01–2010:03	Türkiye	Engle and Granger Cointegration Test, the Conventional Cointegration Tests, fractional cointegration description suggested by Cheung and Lai	(+)
Lazar (2013)	2000:01-2012:09	Czech Republic, Poland, Hungary and Romania	Cointegration	Poland (+)
Skrabic Peric et al. (2013)	2001Q1-2012Q2	Czech Republic, Hungary, Lithuania, Latvia, Poland, Romania	PMG Method	(+)
Tsong and Lee (2013)	1975Q1-2010Q2	Australia, Belgium, Canada, Canada, Sweden, the UK and the USA	Quantile Cointegration	In High Quantiles (+)
Tsong and Hachicha (2014)	1995:01-2011:06	Indonesia Malaysia Russia South Africa	Quantile Cointegration	In High Quantiles (+)
Uçak et al. (2014)	1931:01-2011:06 (various)	Czech Republic, Hungary, Poland and Slovakia	Bootstrap Method	(+)
Zainal et al. (2014)	2000:01/2012:12	Malaysia	ARDL Bounds Test	(+)

Atgür and Altay (2015)	2004-2013	Türkiye	Lütkepohl-Saikkonen Cointegration Tests	(+)
Bayat (2015)	2002:01-2011:05	Türkiye	Nonlinear Cointegration	(-)
Köksal and Destek (2015)	2002-2014	Türkiye	Maki Structural break Co-integration Test	Nominal interest rates and inflation rates are cointegrated
Özcan and Arı (2015)	2000:012012:11	G7	Panel Cointegration Test	(+)
Yaya (2015)	1970-2013 (various)	10 African country	Cointegration	Kenya (+), Gabon and Ivory Coast (Z)
Altunöz (2016)	1996:01–2015:03	China	ARDL Bounds Test	(+)
Akıncı and Yılmaz(2016)	1980 – 2012	Türkiye	Dynamic Ordinary Least Squares (DOLS) Analysis, Johansen-Juselius cointegration, Granger Causality Test	Rate → Inflation
Doğan, Eroğlu and Değer (2016)	2003:01–2015:02	Türkiye	Granger Causality Test	(+)
Güriş et al. (2016)	2003-2012	Türkiye	Autoregressive Distributed Lag test	(+)
Lebe and Özalp (2016)	1970-2014	Türkiye	ARDL	(+)
Öruç (2016)	1988-2014	Türkiye	Engle Granger and Johansen-Juselius Cointegration Methods	(+)
Tunalı and Erönal (2016)	2003:01-2014:02	Türkiye	Gregory-Hansen Cointegration Test	(-)
Alper (2017)	1973-2016	Türkiye	Bayer and Hanck Cointegration Test and MOLS and DOLS	(+)

Başar and Karakuş (2017)	2004:12-2016:12	Türkiye	Johansen Cointegration Test And VECM Model	(+)
Okur (2017)	2008:01-2016:04	Türkiye	Gregory-Hansen Cointegration Test, Granger Causality Test	(+)
Cai (2018)	1960:1-2017:2	USA	Quantile Cointegration	In High Quantiles (+)
Crowder (2018)	1951:01- 2015:12	USA	VAR Analysis	(+)
He (2018)	2000-2017 20002017:06	China and South Korea	Regression Analysis (FMOLS)	(+)
Tıraşoğlu (2018)	1990:01-2017:12	MINT Countries	ADL Cointegration Test with Threshold	(+)
Akcan (2019)	2000:06-2007:09 2007:10-2018:10	Türkiye	Johansen Cointegration and Granger Causality Test	(+)
Caporale and Gil-Alana (2019)	2006:01-2016:12	G7	Regression Analysis	(-)
Çiğdem (2019)	2011:01-2019:06	Türkiye	Engle-Granger Test, Granger Causality Test	Inflation↔Interest
Evren and Mucuk (2019)	1980-2018	Türkiye	Johansen Cointegration Test, VECM	(+)
İşcan and Kaygısız (2019)	2009:01-2017:12	Türkiye	Granger Causality Test, VAR (Vector Autoregressive Model) Model	(+)
Özer (2019)	1988-2019	Türkiye	Fourier Shin Cointegration Test	(+)
Sinan (2019)	2006:04-2018:09	Türkiye	VAR Model, Johansen Cointegration Test, Granger Causality Test	(+)
Songur (2019)	2002:01-2018:01	Türkiye	Fourier Shin Cointegration Test	(-)

Tayyar (2019)	2002-2014	Turkey, alternative interest rates and consumer price index		Neo-Fisher in the short run, (+) in the long run
Uğur (2019)	2002:01-2017:12	G7	Durbin Hausman Cointegration Test	(-)
Uğur et al. (2019)	2004:07-2018:11	Türkiye	ARDL Border Test, FMOLS, DOLS, CCR and OLS Co-Integration Analysis	(+)
Yenice and Yenisu (2019)	2003:01-2018:04	Türkiye	ARDL Bounds Test, Toda Yamamoto Causality Analysis	(+)
Baktemur (2020)	1999-2017	G7 and 7 Developing Countries	Kao Cointegration Test, Granger Causality Test	(+)
Doğan et al. (2020)	2002:01-2018:02	Türkiye	Non-Linear Causality	(+)
Gocer and Ongan (2020)	2008:10- 2018:01	UK	ARDL Approach	(+)
Koç (2020)	1985-2017	Türkiye	Fourier Cointegration Method	(+)
Öztürk and Öner (2020)	1980-2018	Türkiye	Johansen-Juselius Cointegration Analysis	No cointegration relationship found between inflation rates and interest rates
Sugözü and Yaşar (2020)	2001-2019	32 OECD coutries	Panel Granger Causality	Both Fisher and Neo-Fisher effect apply
Sümer (2020)	2010-2019	Turkey inflation rate, overnight lending rate and one-week repo rate	Co-integration Tests	Neo-Fisher effect applies
Telek (2020)	2003:Q1-2019:Q4	D8 countries	Panel Cointegration	Iran (Z), Indonesia, Egypt, Bangladesh, Pakistan and Turkey (+)

Berument and Froyen (2021)	1844:1-2018:12	UK	Cointegration	1951:01-1992:09 (+)
Gedik (2021)	2009:02–2021:07		Johansen-Juselius Cointegration	(+)
Gürel (2021)	2006 -2019	Türkiye	ARDL and NARDL	(+)
Gürsoy and Akçay (2021)	2005:01-2020:10	Türkiye	Hatemi-J Asymmetric Causality Test	(+)
Nazlıoğlu et al. (2021)	1997:12-2020:06 (various)	14 IT countries	Quantile Cointegration	(+) in different cantiles of 9 countries
Siddiqua and Sultana (2021)	1987 – 2020	Bangladesh	Clemente - Montanes – Reyes (1998) Unit Root test, Gregory-Hansen(1996) Cointegration Test	(+)
Turna and Özcan (2021)	2005-2021	Türkiye	ARDL Approach	(+)
Zainal et al. (2021)	2011-2018	Autoregressive Distributed Lag (ARDL)	Malaysia	(+)
Han (2022)	2003:01-2021:09	Türkiye	Harvey and Leybourne (2007) and Harvey et al. (2008) linearity tests, KSS (2006) Non-linear Cointegration Test	(-)
Friesendorf et al. (2022)	1919-2020	Germany	Continuous Wavelet Analysis	(+)
Oğul (2022)	1987-2020	Türkiye	ARDL Bounds Test	(+)
Sarı and Arslan (2022)	1971-2021	Türkiye	ARDL Bounds Test	(+)
Zhong (2022)	1978-2020	China	Granger Causal Relation Test	(+)

Dinç (2023)		Developed and developing countries	Fourier Cointegration Analysis	(-)
Özbek and Taş (2023)	2002:01-2019:02	Selected developed and emerging economies	Panel Co-integration Analyses	(+)
Abasız et al. (2024)	Different periods	E7 countries	Arai & Kurozumu and Kejriwal Test Techniques	(+) (Russia excluded)
Mammmadov (2024)	1978-2022	Türkiye	ARDL Bounds Test, TodaYamamoto Causality Test	(+)
Sarıalioğlu Hayali et al. (2024)	2004:01-2022:03	Türkiye	Granger Causality	Interest rate ↔ inflation rate

Note: Fisher hypothesis is valid : (+) Fisher hypothesis is not valid : (-)

As can be observed, the findings obtained for different countries and time periods demonstrate significant variability. This diversity is shaped by several factors, including the choice of variables and the differences in analytical methodologies employed. The economic context, structural characteristics of economies, and data availability further contribute to this variation. This heterogeneity underscores the importance of adopting a context-specific and methodologically robust approach when analyzing the relationship between inflation and interest rates. By carefully considering the unique characteristics of each country and period, researchers can better capture the nuances of this complex relationship, leading to more meaningful and policy-relevant insights.

3. DATA SET AND METHODOLOGY

In this study, inflation rates and savings deposit interest rates are used as the data set. The data range of the study is determined as the period 1970-2023. The data for the study were obtained from TurkStat (2013) and TurkStat (2024).

Within the scope of the study, Residual Augmented Least Squares (RALS) cointegration tests developed by Lee et al. (2015) were applied to test whether the Fisher Hypothesis is valid in Türkiye. In this context, it is aimed to determine whether inflation and interest rates move together. The most important advantage of RALS cointegration tests is that they take into account the non-normal distribution of error terms. In addition, if the error terms are not normally distributed, the power of RALS cointegration tests converges to other cointegration tests. However, when the non-normal distribution of error terms becomes evident, the power of RALS cointegration tests increases (Salihoğlu and Hepsağ, 2021: 47). In this context, RALS-type tests come to the fore since conventional tests cannot yield effective results when the error terms are not normally distributed. Lee et al. (2015) developed four different test regressions expressed as follows.

$$\Delta y_t = \alpha_0 + \delta_1 \widehat{\varepsilon_{t-1}} + \emptyset \Delta x_t + u_t \quad (1)$$

$$\Delta y_t = \alpha_0 + \delta_1 y_{t-1} + \gamma' x_{t-1} + \emptyset \Delta x_t + u_t \quad (2)$$

$$\Delta \widehat{\varepsilon_t} = \alpha_0 + \delta_1 \widehat{\varepsilon_{t-1}} + u_t \quad (3)$$

$$\Delta \widehat{\varepsilon_t} = \alpha_0 + \delta_1 \widehat{\varepsilon_{t-1}} + \emptyset \Delta x_t + u_t \quad (4)$$

The equations in equations (1), (2), (3) and (4) are defined as ECM, ADL, EG, EG2, respectively. In the above equations, α_0 denotes the constant term. $\hat{\varepsilon}$ are the error terms obtained from the long-run model. y_t and x_t are dependent and independent variables, respectively. Lee et al. (2015) developed cointegration tests taking into account the non-normal distribution of the error terms u_t in the above equations. In the cointegration test process, firstly, test regressions are estimated and residuals are obtained. In the second stage, the residual-adjusted variables called $\widehat{w}_{2t}$ and $\widehat{w}_{3t}$ are calculated as follows.

$$\widehat{w}_{2t} = \hat{\varepsilon}_t^2 - m_2 \quad (5)$$

$$\widehat{w}_{3t} = \hat{\varepsilon}_t^3 - m_3 - 3m_2\hat{\varepsilon}_t \quad (6)$$

In the third stage, the variables calculated as in equations (5) and (6) are added to the conventional test regressions. In the above equations, m_2 and m_3 denote the second and third moments, respectively. However, ECM and EG model specifications were not found to be robust according to the findings obtained from simulation studies and critical values for these tests were not calculated. In this context, RALS-ADL and RALS-EG2 tests were developed and critical values were calculated. In this context, the regressions of these two tests are constructed as follows, respectively.

$$\Delta y_t = \alpha_0 + \alpha_1 t + \delta y_{t-1} + \emptyset \Delta x_t + \theta_2 \widehat{w}_{2t} + \theta_3 \widehat{w}_{3t} + v_t \quad (7)$$

$$\Delta \hat{u}_t = \alpha_0 + \alpha_1 t + \delta \hat{u}_{t-1} + \emptyset \Delta x_t + \theta_2 \widehat{w}_{2t} + \theta_3 \widehat{w}_{3t} + v_t \quad (8)$$

Test regressions (7) and (8) are estimated by the Least Squares Method and cointegration tests are performed within the framework of the following main and alternative hypotheses.

$$H_0 : \delta = 0 \quad (9)$$

$$H_1: \delta < 0 \tag{10}$$

In the above expressions, the null hypothesis states that there is no cointegration relationship, while the alternative hypothesis states that the series are cointegrated. The test statistics required for the application of the test are obtained as follows.

$$\tau^*_{ADL} \rightarrow \rho\tau_{ADL} + \sqrt{1-\rho^2}Z \tag{11}$$

$$\tau^*_{EG2} \rightarrow \rho\tau_{EG2} + \sqrt{1-\rho^2}Z \tag{12}$$

In (11) and (12), τ^*_{ADL} is the RALS-ADL cointegration test statistic and τ^*_{EG2} is the RALS-EG2 cointegration test statistic. ρ is the long-run correlation coefficient between the residuals $\hat{v}_t$ and $\hat{u}_t$. Z is defined as a random variable with zero mean and constant variance. If the calculated test statistic is less than the critical value in absolute value, the null hypothesis (9) cannot be rejected and it is concluded that the series are not cointegrated. Otherwise, the null hypothesis is rejected and it is concluded that the series are cointegrated.

The prerequisite for the application of RALS cointegration tests is that all of the analysed series should be stationary of the first order. In this study, the stationarity of the variables is investigated with the RALS-ADF unit root test developed by Im et al. (2014). Dickey-Fuller (DF) and Extended Dickey-Fuller (ADF) unit root tests developed by Dickey and Fuller (1979, 1981) assume that the model residuals are normally distributed. The RALS-ADF unit root test, on the other hand, can produce stronger results when the residuals are not normally distributed. In the first stage of the RALS-ADF test, the residuals of the model are obtained by estimating conventional ADF test regressions. In the second stage, the non-normal distribution of the residuals is taken into account and the variables extended with the residuals expressed as $\widehat{w}_{2t}$ and $\widehat{w}_{3t}$ defined in equations (5) and (6) are obtained. In the last stage of the test, these variables are added to the ADF conventional test regression and the following equations are obtained.

$$\Delta y_t = \mu + \delta y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta y_{t-i} + \theta_2 \widehat{w_{2t}} + \theta_3 \widehat{w_{3t}} + v_t \tag{13}$$

$$\Delta y_t = \mu + \beta t + \delta y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta y_{t-i} + \theta_2 \widehat{w_{2t}} + \theta_3 \widehat{w_{3t}} + v_t \tag{14}$$

Equation (13) is defined as the model with constant and equation (14) is defined as the model with constant and trend. The above models are estimated by the Least Squares Method and the test statistic is obtained as follows.

$$\tau_{RALS-ADF} \rightarrow \rho\tau_{ADF} + \sqrt{1-\rho^2\, Z} \tag{15}$$

The values in expression (15) are the same as those described in the RALS-ADL and RALS-EG2 cointegration test. The main and alternative hypotheses for the RALS-ADF test are constructed as follows.

$$H_0: \delta = 0 \qquad (16)$$

$$H_1: \delta < 0 \qquad (17)$$

While the null hypothesis (16) suggests that the series is unit rooted, the alternative hypothesis (17) states stationarity. The testing process is completed by comparing the calculated test statistic with the critical values calculated by Im et al. (2014). If the calculated test statistic is greater than the critical value in absolute value, the null hypothesis is rejected and it is concluded that the series is stationary. Otherwise, it is decided that the series follows a unit root process.

4. EMPIRICAL FINDINGS

Firstly, ADF unit root test was applied to investigate the stationarity of the variables and the test results are presented in Table 2.

Table 2. ADF Unit Root Test Results

Model with Constant		
	Interest	**Inflation**
Lag Length	1	1
Test Statistic	-1,54083	-1,89528
Critical Value (%1)	-3,58	-3,58
Critical Value (%5)	-2,93	-2,93
Jarque Bera	28,915959	41,260216
Jarque Bera Probability	0,000001	0,000000
Model with Constant and Trend		
	Interest	**Inflation**
Lag Length	1	1

Test Statistic	-1,57370	-1,91730
Critical Value (%1)	-4,15	-4,15
Critical Value (%5)	-3,50	-3,50
Jargue Bera	38,516429	43,126418
Jarque Bera Probability	0,000000	0,000000

As seen in Table 2, the test statistics calculated in both the model with constant and the model with constant and trend are smaller than the critical values in absolute terms. In this context, the null hypothesis of unit root cannot be rejected for both variables. In the last two lines of the results presented in two sub-sections for model specifications, normality test results for model residuals are given. It is seen that the probability values of Jarque-Bera test statistics are less than 0.05. The null hypothesis that the model residuals are normally distributed is rejected. An important assumption of the ADF unit root test is that the residual series conform to a normal distribution. Since this assumption is not met, it can be said that the results of the ADF unit root test are not valid. In this framework, the RALS-ADF unit root test, which takes into account the non-normal distribution of the residuals, was applied and the test results are presented in Table 3.

Table 3. RALS-ADF Unit Root Test Results

Model with Constant		
	Interest	**Inflation**
Lag Length	1	1
Test Statistic	-1,66484	-2,17265
ρ^2	0,7	0,4
Critical Value (%1)	-3,680	-3,447
Critical Value (%5)	-3,174	-2,879
Model with Constant and Trend		

	Interest	**Inflation**
Lag Length	1	1
Test Statistic	-1,71944	-2,19649
ρ^2	0,7	0,4
Critical Value (%1)	-3,883	-3,506
Critical Value (%5)	-3,236	-2,887

As seen in Table 3, the test statistics calculated for both model specifications are smaller than the critical values in absolute terms. In other words, the null hypothesis of unit root cannot be rejected for interest rate and inflation variables. In this context, according to the RALS-ADF test, which takes into account the non-normal distribution of the residual series, interest rate and inflation series are found to be unit rooted at the level. It is important to determine the stationarity levels in terms of the choice of the method to be applied in determining the relationship between the variables. In this framework, the ADF test was applied again by taking the first difference of the series and the test results are presented in Table 4.

Table 4. First Difference ADF Unit Root Test Results

Model with Constant		
	Interest	**Inflation**
Lag Length	0	0
Test Statistic	-6,261168	-7,787023
Critical Value (%1)	-3,562669	-3,562669
Critical Value (%5)	-2,918778	-2,918778
Model with Constant and Trend		
	Interest	**Inflation**
Lag Length	0	0
Test Statistic	-6,154978	-7,710953

Critical Value (%1)	-4,144584	-4,144584
Critical Value (%5)	-3,498692	-3,498692

As seen in Table 4, the test statistics calculated for the first differences of the interest rate and inflation series in both model specifications are greater than the critical values in absolute terms. In this framework, the null hypothesis of unit root is rejected. When all the results are analysed together, it is concluded that the interest rate and inflation series are stationary of the first order. Since the series are stationary of the first order, cointegration tests can be applied to determine the relationship between the variables. In this study, RALS-ADL and RALS-EG2 cointegration tests, which take into account the non-normal distribution of the residuals, were applied. The results of the RALS-ADL cointegration test are presented in Table 5.

Table 5. RALS-ADL Cointegration Test Results

Dependent Variable: Interest Rate		
	Model with Constant	**Model with Constant and Trend**
Lag Length	1	1
Test Statistic	-3,94856**	-3,98509*
ρ^2	0,8	0,8
Critical Value (%1)	-3,715	-4,175
Critical Value (%5)	-3,103	-3,559
Dependent Variable: Inflation		
	Model with Constant	**Model with Constant and Trend**
Lag Length	1	1
Test Statistic	-2,46858	-2,51623
ρ^2	0,4	0,4
Critical Value (%1)	-3,399	-3,700
Critical Value (%5)	-2,720	-3,030

* denotes 5% significance level, ** denotes 1% significance level.

As seen in Table 5, in the model where the dependent variable is interest rate, the test statistic calculated for the model with constant is greater than the critical values in absolute value. In this context, the null hypothesis that there is no cointegration relationship between the variables is rejected. The test statistic calculated for the model with constant and trend is smaller than the critical value in absolute value at 1% significance level and larger than the critical value at 5% significance level. In other words, according to the results of the model with constant and trend, cointegration relationship is found at 5% significance level. According to the results of the model with inflation as the dependent variable, no cointegration relationship was found. Table 6 presents the results of the RALS-EG2 cointegration test.

Table 6. RALS-EG2 Cointegration Test Results

Dependent Variable: Interest Rate		
	Model with Constant	**Model with Constant and Trend**
Lag Length	1	1
Test Statistic	-3,59580*	-3,54723*
ρ^2	0,7	0,7
Critical Value (%1)	-3,748	-4,149
Critical Value (%5)	-3,151	-3,534
Dependent Variable: Inflation		
	Model with Constant	**Model with Constant and Trend**
Lag Length	1	1
Test Statistic	-2,51226	-2,54672
ρ^2	0,4	0,4
Critical Value (%1)	-3,455	-3,751
Critical Value (%5)	-2,823	-3,115

* denotes 5% significance level.

As seen in Table 6, the results obtained from the RALS-EG2 cointegration test are similar to the results of the RALS-ADF test. For the model where interest rate is taken as the dependent variable, the test statistics calculated within the framework of both model specifications are greater than the critical values at the 5% significance level in absolute values. In other words, the null hypothesis that there is no cointegration relationship between the variables is rejected. According to the results of the model where inflation is taken as the dependent variable, no cointegration relationship was found. In line with the obtained results, interest rate was taken as the dependent variable and long-run parameter estimations were made. Parameter estimation results are presented in Table 7.

Table 7. Long Run Parameter Estimation Results

	Parameter	Standard Error	t Statistic	Probability
Constant	11,8750	3,5056	3,3874	0,0014
Inflation	0,5199	0,0742	7,0081	0,0000

As seen in Table 7, the effect of inflation on interest rates is positive and statistically significant. A one unit increase in the inflation rate increases the interest rate by approximately 0.5 units.

5. CONCLUSION

This study investigates the relationship between inflation and nominal interest rates in Türkiye within the framework of the Fisher Hypothesis. The primary aim of this research is to assess whether the Fisher Hypothesis is valid in the Turkish economy and to contribute to the understanding of how inflation expectations influence interest rates. This is particularly important for economies like Türkiye, where inflation dynamics and monetary policies are critical for economic stability. By focusing on a long-term period (1970–2023) and employing robust methodological tools such as the RALS cointegration analysis, this study adds depth to the existing literature on inflation-interest rate dynamics.

The findings confirm that the Fisher Hypothesis holds true for Türkiye in the long run. Empirical results demonstrate that nominal interest rates adjust fully to changes in the inflation rate, ensuring the stability of real interest rates. These results underscore the significant role of inflation expectations in shaping interest rates and highlight the importance of effective monetary policies in managing these expectations.

A comparison with earlier studies, such as Çiğdem (2019), reveals a methodological and contextual divergence. While the 2019 study identified a bidirectional relationship between inflation and interest rates, the current study finds a unidirectional relationship. This difference can be attributed to variations in data sets, analysis periods, and methods. Additionally, evolving economic conditions and methodological sensitivities to data characteristics naturally result in differences in findings. These insights reinforce the importance of periodic and dynamic analyses to better understand the inflation-interest rate relationship under different economic conditions and frameworks.

Given that inflation exerts a significant influence on nominal interest rates, the results highlight the necessity of implementing monetary policies that effectively control inflation. Central banks must prioritize price stability to prevent inflationary pressures from escalating and affecting nominal interest rates adversely. The use of targeted inflation management strategies, such as credible interest rate policies and forward guidance, can play a critical role in anchoring inflation expectations and ensuring economic stability.

Future studies could explore the inflation-interest rate relationship across different economic regimes, incorporating potential structural breaks and policy shifts. Additionally, employing alternative methodologies and extended data sets could offer deeper insights into the dynamics of this relationship. Comparative analyses involving other emerging economies could also enrich the understanding of how inflation expectations and interest rate policies interact in diverse economic contexts.

REFERENCES

Abasiz, T., Akbarelıeve, M., and Bulut, B. (2024). 1. Dynamics of the Relationship between Inflation and Interest Rates: Testing For the Fisher Hypothesis with Structural Break(S) and Parameter Stability. Journal of economics, finance and management studies, doi: 10.47191/jefms/v7-i1-56

Ahmad, S. (2010). Fisher effect in nonlinear STAR framework: Some evidence from Asia. Economics Bulletin, 30(4), 2558–2566.

Akcan, A. T. (2019). Mortgage Krizi Öncesi ve Sonrasında Enflasyon – Faiz Etkileşimi: Türkiye Örneği. Anemon Muş Alparslan Üniversitesi Sosyal Bilimler Dergisi, 7(4), 239–244.

Akıncı, M., & Yılmaz, Ö. (2016). Enflasyon - Faiz Oranı Takası: Fisher Hipotezi Bağlamında Türkiye Ekonomisi İçin Dinamik En Küçük Kareler Yöntemi. Sosyoekonomi, 24(27), 33-55. https://doi.org/10.17233/se.81444

Alper, F. Ö. (2017). Analysis of the Relationship Between Inflation and Nominal Interest Rate in Turkey: Bayer-Hanck Cointegration Test. International Congree on Political, Economic And Social Studies(Icpess), 101-111.

Altunöz, U. (2018). In The Light of Interest and Inflation, Investigating the Presence of Fisher Effect for the China Economy. Sosyoekonomi, 26(35), 27-40.

Ángel, M. G., & Robledo, J. C. (2011). Hipótesis de Fisher y cambio de régimen en Colombia: 1990–2010. Revista Finanzas y Política Económica, 3(2), 27–40.

Asgharpur, H., Kohnehshahri, L. A., & Karami, A. (2007). The Relationships Between Interest Rates and Inflation Changes: An Analysis of Long-Term Interest Rate Dynamics in Developing Countries. Tehran: Iran Economic Research Center. Retrieved from https://www.researchgate.net/publication/267384862_The_relationships_between_inte res

Atgür, M. ve Altay, N. O. (2015). Enflasyon ve nominal faiz oranı ilişkisi: Türkiye örneği (2004-2013). Yönetim ve Ekonomi, 22(2), 521-533.

Atkins, F. J., & Coe, P. J. (2002). An ARDL bounds test of the long-run Fisher effect in the United States and Canada. Journal of Macroeconomics, 24(2), 255–266.

Bajo-Rubio, O., Diaz-Roldan, C., & Esteve, V. (2005). Is the Fisher Effect Nonlinear? Some Evidence For Spain, 1963-2002. Applied Financial Economics, 15(12), 849-854. https://doi.org/10.1080/09603100500123187

Baktemur, F. İ. (2020). Gelişmiş ve Gelişmekte Olan ülkelerde Enflasyon ve Faiz Oranları Arasındaki Nedensellik İlişkisi, Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 29(3), 149–158.

Bassil, C. (2010). An Analysis of The Ex-Post Fisher Hypothesis at Short and Long Term. Economics Bulletin, 30, 2388-2397.

Başar, S., and Karakuş, K. (2017). Fisher Hypothesis: The Estimation for Turkey. The Journal of International Social Research, 795-803.

Bayat, T. (2015). Türkiye'de Fisher Etkisinin Geçerliliği: Doğrusal olmayan Eşbütünleşme Yaklaşımı. Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 0(38), 47–60.

Berument, H., & Jelassi, M. M. (2002). The Fisher Hypothesis: A Multi-Country Analysis. Applied Economics, 34, 1645-1655. https://doi.org/10.1080/00036840110115118

Berument, H., Ceylan, N. B., & Olgun, H. (2007). Inflation uncertainty and interest rates: Is the Fisher relation universal? Applied Economics, 39(1), 53–68.

Berument, H., & Froyen, R. T. (2021). The Fisher effect on long-term U.K. interest rates in alternative monetary regimes: 1844–2018. Applied Economics, 53(33), 3795–3809.

Bolatoğlu, N. (2006). Türkiye'de Enflasyon ve Nominal Faiz Oranları Arasındaki Uzun Dönemli İlişki: Fisher Etkisi. Hacettepe Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 24(2), 1-15.

Cai, Y. (2018). Testing the fisher effect in the US. Economics Bulletin, 38(2), 1014–1027.

Caporale, G. M., & Gil-Alana, L. (2019). Testing the Fisher Hypothesis in the G-7 Countries Using I(d) Techniques. International Economic, 159, 140-150.

Carneiro, F. G., Divino, J., & Rocha, C. H. (2002). Revisiting the Fisher Hypothesis For the Cases of Argentina, Brazil and Mexico. Applied Economics Letters, 9, 95-98. https://doi.org/10.1080/13504850110049405

Clark, J. B. (1895). The Gold Standard of Currency in the Light of Recent Theory. Political Science Quarterly, 10, 389-403. https://doi.org/10.2307/2139952

Crowder, W. J., (2018). The Neo-Fisherian https://www.researchgate.net/publication/329169412

Çiğdem, G. (2019). A Paradox: An Empiric Approach to Inflation-Interest Rates Relationship: Evidence from Turkey. Macrothink Institude Research in Applied Economics, 11(3), 49-68.

De Haas, J. A. (1889). A Third Element in the Rate of Interest. Journal of the Royal Statistical Society, 52, 99-116.

Diamond, R. W., & Betancourt, R. G. (2012). Retrospectives Irving Fisher's Appreciation and Interest (1896) and the Fisher Relation. Journal of Economic Perspectives, 26(4), 185-196. https://doi.org/10.1257/jep.26.4.185

Dickey, D. A. ve Fuller, W. A. (1979), Distribution of the Estimators for Autoregressive Time Series with a Unit Root. Journal of the American Statistical Association, 74(366), 427-431.

Dickey, D.A. ve Fuller, W.A.(1981), Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. Econometrica, 49(4), 1057-1072.

Doğan, B., Eroğlu, Ö., & Değer, O. (2016). Enflasyon ve Faiz Oranı Arasındaki Nedensellik İlişkisi: Türkiye Örneği. Çankırı Karatekin Üniversitesi İİBF Dergisi, 6, 1-21. https://doi.org/10.18074/cnuiibf.258

Dogan, I., Orun, E., Aydın, B., & Afsal, M. S. (2020). Non-parametric analysis of the relationship between inflation and interest rate in the context of Fisher effect for Turkish economy. International Review of Applied Economics, 34(6), 758–768.

Douglas, W. (1738). An Essay Concerning Silver and Paper Currency. In A. M. Davis, & A. M. Kelley (Eds.), Colonial Currency Reprints (pp.1682-1751). Vol. 3. New York 1964.

Evren, S. & Mucuk, M. (2019). Faiz ile Enflasyon Arasındaki İlişkinin Test Edilmesi: Türkiye Örneği (1980-2018). Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, Prof. Dr. Fuat Sezgin Özel Sayısı, 180-187.

Fatima, N. & Sahibzada, S. A. (2012). Empirical Evidence Of Fisher Effect In Pakistan. World Applied Sciences Journal, 18(6), 770-773. https://doi.org/10.5829/idosi.wasj.2012.18.06.1118

Fisher, I. (1896). Appreciation and Interest. New York.

Friesendorf. (2022). Fisher Effect in Post-Unification Germany. Research Journal for Applied Management,1-53.

Ghazali, N. A., & Ramlee, S. (2003). A long memory test of the long-run Fisher effect in the G7 countries. Applied Financial Economics, 13(10), 763–769.

Gedik, A. (2021). Enflasyon ve faiz oranı ilişkisi: Fisher hipotezinin Türkiye için geçerliliği. Avrupa Bilim ve Teknoloji Dergisi, 27, 615-624.

Gocer, I., & Ongan, S. (2020). The Relationship Between Inflation and Interest Rate in the UK: The Nonlinear ARDL Approach. Journal of Central Banking Theory and Practice, 77-86.

Granville, B., & Mallick, S. (2004). Fisher hypothesis: UK evidence over a century. Applied Economics Letters, 11(2), 87–90.

Gul, E., & Acikalin, S. (2008). An examination of the Fisher Hypothesis: The case of Turkey. Applied Economics, 40(24), 3227–3231.

Gürel, S. P. (2021). The Validity of the Fisher Effect for an Inflation Targeting Country: The case of Turkey. Ekonomski Pregled, 697-717.

Güriş, S., Güriş, B., and Ün, T. (2016). Interest Rates, Fisher Effect and Economic Development In Turkey, 1989-2011. Revista Galega De Economia, 95-100.

Gürsoy, S., and Akçay, C. (2021). Investigation of the Fisher Effect on Turkey Using Hatemi-J Asymmetric Causality Test. International Journal of Economics, Business and Politics, 4661.

Han, A. (2022). Empırıcal Testıng of the Relatıonshıp between Interest and Inflatıon ın Turkey wıthın the Scope of Fısher Hypothesıs. Birey ve Toplum Sosyal Bilimler Dergisi 12(1), 05-27.

Testing the fisher hypothesis for turkey. Birey ve toplum, doi: 10.20493/birtop.1030317

Hatemi-J, A. (2011). A re-examination of the fisher effect using an alternative approach. Applied Economics Letters, 18(9), 855–858.

He, Y. (2018). A Study on the International Fisher Effect : An Investigation from South Korea and China. International Journal of Industrial Distribution & Business, 9(7), 33-42.

Herwatz, H. ve Reımers, H. E., (2006). Panel Nonstatıonary Tests of the Fisher Hypothesis: An Analysis of 114 Economies During the Period 1960-2004. Applied Econometrics and International Development, 6(3), 37-53.

Im KS, Lee J ve Tieslau MA (2014). More Powerful Unit Root Tests with Non-Normal Errors. In: Sickles RC, Horrace WC (eds) Festschrift in Honor of Peter Schmidt. Springer, New York, 315–342.

İşcan, H., & Kaygısız, A. D. (2019). Türkiye'de Döviz Kuru, Enflasyon ve Faiz Oranı İlişkisi: 2009-2017 Uygulaması. Iğdır Üniversitesi Sosyal Bilimler Dergisi, 17, 581-604.

Jareno, F., & Tolentino, M. (2013). The Fisher Effect: A Comparative Analysis in Europe. Jokull Journal, 63(12), 201-212.

Kesriyeli, M. (1994). Policy Regime Changes and Testing for the Fisher and UIP Hypotheses: The Turkish Evidence. Discussion Papers 9411, Research and Monetary Policy Department, Central Bank of the Republic of Turkey.

Kıran, B. (2013). A Fractional Cointegration Analysis of Fisher Hypothesis: Evidence from Turkey. Quality and Quantity, 47, 1077-1084. https://doi.org/10.1007/s11135-011-9584-0

Koç, P. (2020). Türkiye'de Fisher hipotezinin Fourier fonksiyonlarla analizi. Anemon, 8(5), 1425-1434.

Köksal, B. ve Destek, M. A. (2015). Türkiye ekonomisinde Fisher hipotezinin test edilmesi: 2002-2014 dönemi üzerine bir ampirik analiz. Uluslararası Sosyal Araştırmalar Dergisi, 8(41), 1247-1253.

Lanne, M. (2001). Near Unit Root and the Relationship Between Inflation and Interest Rates: A Reexamination of the Fisher Effect. Empirical Economics, 26, 357-366. https://doi.org/10.1007/s001810000044

Lardic, S., & Mignon V. (2003). Fractional Co-integration Between Nominal Interest Rate and Inflation: An Examination of the Fisher Relationship in G7 Countries. Economic Bulletin, 3(14), 1-10.

Lazăr, D. (2013). Testing for fisher effect. Review of Economic Studies and Research Virgil Madgearu, 6(1930), 77–87.

Lebe, F. ve Arda Özalp, L. F. (2016). Fisher hipotezinin alternatif faiz oranları ile Türkiye ekonomisi açısından analizi. Dokuz Eylül Üniversitesi İİBF Dergisi, 31(1), 95-122.

Lee, H., Lee, J. Ve Im, K. (2015). More Powerful Cointegration Tests With Non-Normal Errors. Studies In Nonlinear Dynamics & Econometrics, 19(4), 397-413.

Maghyereh, A., & Al-Zoubi, H. A. (2008), Does fisher effect apply in developing countries: Evidence from a nonlinear cotrending test applied to Argentina, Brazil, Malysia, Mexico, Korea and Turkey. Applied Econometrics and International Development, 6(2), 31–46.

Mahdi, S. & Masood, S. (2011). The Long Run Relationship Between Interest Rates And Inflation In Iran: Revisiting Fisher's Hypothesis, Journal of Economics and International Finance, 3(14), 705–712. https://doi.org/10.5897/jeif11.075

Malliaropulos, D. (2000). A Note on Nonstationarity, Structural Breaks and the Fisher Effect. Journal of Banking and Finance, 24, 695-707. https://doi.org/10.1016/S0378-4266(99)00064-3

Mammmadov, T. (2024). Validity of the Gibson Paradox in Turkey for the Period 1978-2022. BILTURK, The Journal of Economics and Related Studies, 6(2), 84-102. doi:10.47103/bilturk.1432099.

Marshall, A. (1890). Principles of Economics. London: Macmillan.

MB (2024). Bankalarca Açılan Mevduatlara Uygulanan Ağırlıklı Ortalama Faiz Oranları. Erişim Tarihi: 20 Temmuz 2024. https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket/collapse_3/5874/DataGroup/turkish/bie_zkfaiz/

Mill, J. S. (1865). Principles of Political Economy (6th ed.). London: Longmans, Green and Co.

Million, N. (2004). Central Bank's Interventions and the Fisher Hypothesis: A Threshold Cointegration Investigation. Economic Modelling, 21, 1051-1064. https://doi.org/10.1016/j.econmod.2004.03.002

Nazlioglu, S., Gurel, S. P., Gunes, S., & Kilic, E. (2021). Asymmetric Fisher effect in inflation targeting emerging markets: Evidence from quantile cointegration. Applied Economics Letters, 1–8.

Oğul, B. (2022). Türkiye'de enflasyon ve faiz ilişkisinin tespit edilmesi: ARDL sınır testi. International Journal of Economics, Politics, Humanities and Social Sciences, 5(2), 49-58.

Oktar, S. ve Dalyancı, L. (2011). Türkiye Ekonomisinde Para Politikası ve Enflasyon Arasındaki İlişkinin Analizi. Marmara Üniversitesi İ.İ.B.F. Dergisi, XXXI(II), 1-20.

Okur, A. (2017). Türkiye Ekonomisinde Faiz Oranı ve Döviz Kurunun Enflasyon Hedefi Üzerine Etkisi, Yalova Sosyal Bilimler Dergisi, 8(13), 146–164.

Öruç, E. (2016). Fisher etkisi: Türkiye üzerine bir uygulama. Kastomonu Üniversitesi İİBF Dergisi, 13, 297-311.

Özbek, S. ve Taş, S. (2023). Enflasyon ve faiz ilişkisinin Fisher ve Neo-Fisher etkilerinin panel ekonometrik analizi. Sakarya İktisat Dergisi, 12(1), 65-82.

Özcan, B. ve Arı, A., (2015). Does the Fisher Hypothesis Hold for The G7? Evidence from The Panel Cointegration Test. Economic ResearchEkonomska istraživanja, 28(1), 259-270.

Özer, M. O. (2019). Türkiye'de Fisher hipotezinin Fourier yaklaşımı ile incelenmesi. Ankara Hacı Bayram Veli Üniversitesi İİBF Dergisi, 21(3), 856-878.

Öztürk, S. ve Öner, M. (2020). Türkiye ekonomisinde enflasyon ile faiz oranları arasındaki ilişki: 1980-2018. Internation Journal on Social Sciences, 5(2), 187-197.

Phiri, A., & Lusanga, P. (2011). Can asymmetries account for the empirical failure of the fisher effect in South Africa? Economics Bulletin, 31(3), 1968–1979.

Ruzima, M., Kofi, M., Polajeva, B.T., and Iddrisu, A. (2022). 4. Does the Fisher effect hold in Rwanda?. Quality & Quantity, doi: 10.1007/s11135-022-01479-6

Salihoğlu, Ö. Ü. E. ve Hepsağ, A. (2021). Banka Faiz Oranı Geçişkenliği: RALS Eşbütünleşme Yöntemiyle Normal Dağılmamayı Dikkate Alan Bir Yaklaşım. Bankacılar, 32(117), 40-57.

Sarı, S. ve Arslan, E. (2022). Türkiye ekonomisi bağlamında Fisher etkisinin birim kök testleri ve ARDL sınır testiyle sınanması. Journal of Emerging Economies and Policy, 7(1), 95-105.

Siddiqua, S., and Sultana, N.N. (2023). 6. Importance of Addressing Structural Break While Estimating Fisher Effect Hypothesis: A Time Series Analysis of Bangladesh. Social sciences review (Dhaka), doi: 10.3329/ssr.v38i2.64469

Sinan, O. B. (2019). Türkiye'de Faiz Oranı İle Enflasyon Oranı Arasındaki İlişki: 2006-2018. Sakarya İktisat Dergisi, 8(3), 200–221.

Sugözü, İ. H. ve Yaşar, S. (2020). Enflasyon ve faiz ilişkisi: OECD ülkeleri üzerine panel regresyon ve nedensellik analizleri. Maliye Dergisi, 179, 85-105.

Sümer, A. L. (2020). Geleneksel olmayan para politikası kapsamında Neo-Fisher etkisi: 2008 sonrası Türkiye deneyimi. Uluslararası Ticaret ve Ekonomi Araştırmaları Dergisi, 4(1), 1-21.

Şimşek, M., & Kadılar, C. (2006). Fisher Etkisinin Türkiye Verileri ile Testi. Doğuş Üniversitesi Dergisi, 7(1), 99-111. https://doi.org/10.31671/dogus.2019.265

Tayyar, A. E. (2019). Neo-Fisher etkisi ve Türkiye uygulaması. Uludağ Üniversitesi Fen-Edebiyat Fakültesi Sosyal Bilimler Dergisi, 20(36), 307-339.

Telek, C. (2020). Nominal Faiz Oranı ile Enflasyon İlişkisi: D-8 Ülkeleri için Fisher Etkisinin Varlığının Araştırılması. İktisadi İdari ve Siyasal Araştırmalar Dergisi, 181–193.

Thornton, H. (1802). Two Speeches of Henry Thornton on the Bullion Report, May 1811. Reprinted as Appendix III to his an enquiry into the nature and effects of the paper credit of Great Britain (1802). Edited with an Introduction by FA von Hayek. New York: Rinehart and Company, Inc., 1939.

Tıraşoğlu, M. (2018). Fisher Hipotezinin MINT Ülkeleri İçin İncelenmesi: Eşik Değerli Adl Eşbütünleşme Testi Yaklaşımı, Ekonometri ve İstatistik e-Dergisi, 14(28), 31–43. https://doi.org/10.26650/ ekoist.2018.14.28.0009

Toyoshima, Y., & Hamori, S. (2011). Panel cointegration analysis of the Fisher effect: Evidence from the US, the UK, and Japan. Economics Bulletin, 31(3), 2674–2682.

Tsong, C., & Lee, C. (2013). Quantile cointegration analysis of the Fisher hypothesis. Journal of Macroeconomics, 35(1), 186–198.

Tsong, C. C., & Hachicha, A. (2014). Revisiting the fisher hypothesis for several selected developing economies: A quantile cointegration approach. Economic Issues Journal Articles, 19(1), 57–72.

Tunalı, H. ve Yıldırım Erönal, Y. (2016). Enflasyon ve faiz oranı ilişkisi: Türkiye'de Fisher etkisinin geçerliliği. Süleyman Demirel Üniversitesi İİBF Dergisi, 21(4), 1415-1431.

Turgutlu, E. (2004). Fisher Hipotezinin Tutarlılığının Testi: Parçalı Durağanlık ve Parçalı Koentegrasyon Analizi. Dokuz Eylül Üniversitesi İİBF Dergisi, 19(2), 55-74.

Turna, Y., and Özcan, A. (2021). The relationship between foreign exchange rate, interest rate and inflation in Turkey. Journal of Ekonomi, 19-23.

TÜİK (2013). İstatistik göstergeler 1923-2012, Türkiye İstatistik Kurumu, Ankara.

TÜİK (2024). Tüketici Fiyat Endeksi ve Değişim Oranları, Erişim Tarihi: 20 Temmuz 2024. https://data.tuik.gov.tr/Kategori/GetKategori?p=enflasyon-ve-fiyat-106&dil=1

Ucak, H., Ozturk, I., & Aslan, A. (2014). An examination of Fisher effect for selected new EU member states. International Journal of Economics and Financial Issues, 4(4), 956–959.

Uğur, A., Künç, S., & Çelik, S. (2019). Türkiye'de Fisher hipotezinin Geçerliliği: Enflasyon Hedeflemesi Rejimi Sonrasına Yönelik Ekonometrik Bir Analiz, içinde F. Ş. Sökmen (Ed.), Finansal Piyasalar ve Para Politikası (1. Baskı, ss. 83–108). Akademisyen Kitabevi A.Ş.

Westerlund, J., (2005). New Simple Tests for Panel Cointegration. Econometric Reviews, 24(3), 297-316.

Westerlund, J. (2006). Panel Cointegration Tests of the Fisher Hypothesis. Lund University Department of Economics Working Papers, 10, 1-34.

Westerlund, J. (2008). Panel cointegration tests of the Fisher effect. Journal of Applied Econometrics, 23(2), 193–233.

Yamak, R. ve Abdioğlu, Z. (2007). Fisher hipotezinin testi: Güçlü ve zayıf form. KSÜ Sosyal Bilimler Dergisi, 4, 1-9.

Yamak, N., & Tanrıöver, B. (2007). Türkiye'de Nominal Faiz Oranı-Genel Fiyat Düzeyi İlişkisi: Gibson Paradoksu. 8. Türkiye Ekonometri ve İstatistik Kongresi İnönü Üniversitesi. Malatya. https://doi.org/10.3848/iif.1997.131.1596

Yaya, K. (2015). Testing the long-run fisher effect in selected African countries: Evidence from ARDL bounds test. International Journal of Economics and Finance, 7(12), 168.

Yenice, S. & Yenisu, E. (2019). Türkiye'de Döviz Kuru, Enflasyon ve Faiz Oranlarının Etkileşimi, Dokuz Eylül Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 21(4), 1065-1086.

Yılancı, V. (2009). Fisher Hipotezinin Türkiye için Sınanması: Doğrusal Olmayan Eşbütünleşme Analizi. Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi, 23(4), 205–213.

Zainal, N., Bakri, M., Hook, L., Zaini4, S., and Ab Razak, M. (2021). Validity of Fisher Effect Theory: Evidence from the Conventional and Islamic Money Market in Malaysia. GENERAL MANAGEMENT, 64-72.

Zainal, N., Nassir, A. M. & Yahya, M. H. (2014). Fisher Effect: Evidence From Money Market In Malaysia, Journal of Social Science Studies, 1(2), 112-124. https://doi.org/10.5296/jsss.v1i2.4915.

Zhong, Y. (2022). Analysis of Fisher Effects Between Nominal Interest and Inflation. Advances in Economics, Business and Management Research, 337-341.