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TÜRKİYE'DE ENFLASYON, TAŞIT VE KONUT SATIŞLARI ARASINDAKİ İLİŞKİNİN İNCELENMESİ[1]

INVESTIGATION OF THE RELATIONSHIP BETWEEN INFLATION, VEHICLE AND HOUSING SALES IN TÜRKİYE

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ÖZ: 2008 yılında dünyayı etkileyen küresel ekonomik krizin ardından ortaya çıkan ekonomik sorunlar ve bölgesel çatışmalar, ülkemiz ekonomisi açısından zorlu dönemlerin yaklaştığını hissettirmekteydi. 2016 yılında gerçekleşen darbe teşebbüsü ve ülke içinde yaşanan bazı olaylar, yüksek dış borçlar vb. nedenlerle dövizde meydana gelen ani yükselişler, enflasyonda çok hızlı bir artışa neden olmuştur. 2019 yılının sonlarına doğru ortaya çıkan Covid-19 salgını ile de küresel ve ulusal anlamda tedarik sorunları ortaya çıkmış, bozulan parasal istikrar nedeniyle de küresel anlamda enflasyon sorunu hissedilmeye başlamıştır. Bu süreçte, Türkiye'de yaşayan kişilerin yüksek enflasyon karşısında elde nakit tutmadan ziyade farklı enstrümanlara yatırım yaptığı gözlemlenmiştir. Bu çalışmada, son 5 yıl içerisinde fiyatlarında fahiş artışların gözlemlendiği konut ve otomobil satışlarının enflasyon ile nasıl bir etkileşim içerisinde olduğu ekonometrik yöntemlerle analiz edilmektedir. Elde edilen sonuçlar, konut satışlarından enflasyona doğru istatistiksel olarak nedensellik ilişkisinin olmadığını göstermektedir. Enflasyon oranından taşıt satış oranlarına doğru tek yönlü bir nedensellik ilişkisi tespit edilmiştir. Ayrıca, çalışmaya kontrol değişken olarak eklenen asgari ücretten konut satışlarına ve enflasyona doğru tek yönlü nedensellik ilişkisi bulunmuştur.

Anahtar Kelimeler: Enflasyon, Konut, Taşıt, Yapısal Kırılma

ABSTRACT: In 2008, the economic problems and regional conflicts that emerged after the global economic crisis that affected the world made us feel that difficult times were approaching for our country's economy. In 2016, the coup attempted and some domestic events, high foreign debts, etc. caused a sharp rise in foreign exchange rates, which led to a very rapid increase in inflation. Towards the end of 2019, the Covid-19 pandemic caused global and national supply problems, and the global inflation problem started to be felt due to the deteriorating monetary stability. In this process, it was observed that people living in Türkiye invested in different instruments rather than holding cash in the face of high inflation. In this study, the interaction between inflation and housing and automobile sales, which have seen exorbitant price increases in the last 5 years, is analysed by econometric methods. The results show that there is no statistically significant causality relationship from housing sales to inflation. A unidirectional causality relationship is found from inflation rate to vehicle

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sales rates. In addition, a unidirectional causality relationship was found from the minimum wage, which was added to the study as a control variable, to housing sales and inflation.

Key Words: Inflation, Housing, Vehicle, Structural Break

EXTENDED ABSTRACT

Following the 2008 global economic crisis and subsequent regional conflicts, Türkiye faced challenging economic conditions. Events such as the 2016 coup attempted and high foreign debts led to sharp increases in exchange rates and inflation. The COVID-19 pandemic in late 2019 exacerbated global and national supply issues, further destabilizing monetary systems and intensifying inflationary pressures. Amid high inflation, Turkish residents shifted from holding cash to investing in other assets. This study aims to analyze the relationship between inflation and the sales of housing and automobiles, both of which saw significant price increases.

Inflation, defined as a general increase in prices, reduces purchasing power, which can alter consumption behaviors. Two primary hypotheses explain the effects of inflation expectations on consumption: the intertemporal substitution effect, which changes consumption behaviors due to real interest rate impacts, and the effect on expected real wealth. High inflation often leads to increased consumption of durable goods like housing and vehicles, driven by both investment motives and the anticipation of future price rises. Türkiye's inflation rates have been in double digits since 2017, peaking at 85.5% annually in October 2022. This period saw significant increases in the sales and prices of durable goods, as consumers sought to invest in assets that would preserve value amid rising inflation.

The literature on the relationship between inflation and durable goods is extensive, with numerous studies focusing on housing but fewer on vehicles. Key findings include:

Housing and Inflation: Studies in various countries, including the US and Türkiye, indicate that housing prices often serve as a hedge against inflation. However, the impact of inflation on housing prices and sales varies by region and over time.

Vehicles and Inflation: Research on car sales in several countries shows a correlation between macroeconomic variables like GDP, inflation, and interest rates with vehicle sales. In Türkiye, exchange rate increases have been shown to reduce automotive sales.

Wages and Inflation: Studies suggest a bidirectional causality between inflation and wages, with changes in the minimum wage impacting inflation and vice versa.

The study uses monthly data from January 2013 to February 2024, sourced from the Central Bank of the Republic of Türkiye's Electronic Data Distribution System. The econometric model includes inflation as the dependent variable and housing sales, vehicle sales, and minimum wage as independent variables. Stationarity of the series is tested using the ADF Unit Root Test and the Zivot-Andrews test, accounting for structural breaks. The Gregory-Hansen cointegration test and Granger causality analysis are then applied to examine the relationships between the variables.

The ADF Unit Root Test results indicate that all series are non-stationary at their level values, suggesting the need for further analysis to determine their suitability for the econometric model. The study finds no causality from housing sales to inflation but identifies a unidirectional causality from inflation to vehicle sales rates. Additionally, there is a unidirectional causality from the minimum wage to both housing sales and inflation. These findings suggest that while housing sales do not directly influence inflation, inflation does

impact vehicle sales, and changes in the minimum wage affect both housing sales and inflation.

The study provides valuable insights into the complex relationships between inflation and the sales of durable goods in Türkiye. The results highlight the importance of considering inflationary pressures and their broader economic impacts when analyzing the housing and vehicle markets. Policymakers should be aware of these dynamics to implement measures that can mitigate the adverse effects of inflation on the economy and support stable growth in these sectors. Further research could explore additional variables and longer timeframes to deepen the understanding of these relationships.

1. INTRODUCTION

Inflation means an increase in the general level of prices of goods and services. This increase reduces the purchasing power of people. This decrease in purchasing power may cause people to change their consumption behaviour. Hypotheses about the effects of inflation expectations on consumption at the microeconomic level are tried to be explained with two arguments. The first one is that since inflation expectations affect the real interest rate, they may cause a change in consumption behaviour due to intertemporal substitution effect. The other hypothesis is that it may affect consumption because it affects expected real wealth (Lieb and Schuffels, 2022). In other words, when the real interest rate is low, people may tend to consume instead of saving, or they may tend to buy things they will buy in the future now, thinking that their purchasing power will decrease in the future.

Türkiye has been experiencing double-digit inflation rates since 2017, reaching its highest level in October 2022 with an annual inflation rate of 85.5% (CBRT, 2024). These record high inflation rates led to a process in which both hypotheses mentioned in the first paragraph can be observed. During these periods of high inflation figures, consumers increased their demand for certain goods even more, and perhaps for this reason, the increase in inflation entered a cycle with the inclusion of demand inflation. Sales of durable goods such as vehicles and houses increased abnormally, and the prices of these goods also increased abnormally. Low real interest rates may also lead people to different investment instruments. It is observed that the prices of durable consumer goods, which should normally depreciate as they are used, have increased over the years on a nominal basis due to the high price increases in zero products. The house price index, which was around 100 in 2017, reached one million in early 2023 (CBRT House Price Index, 2024).

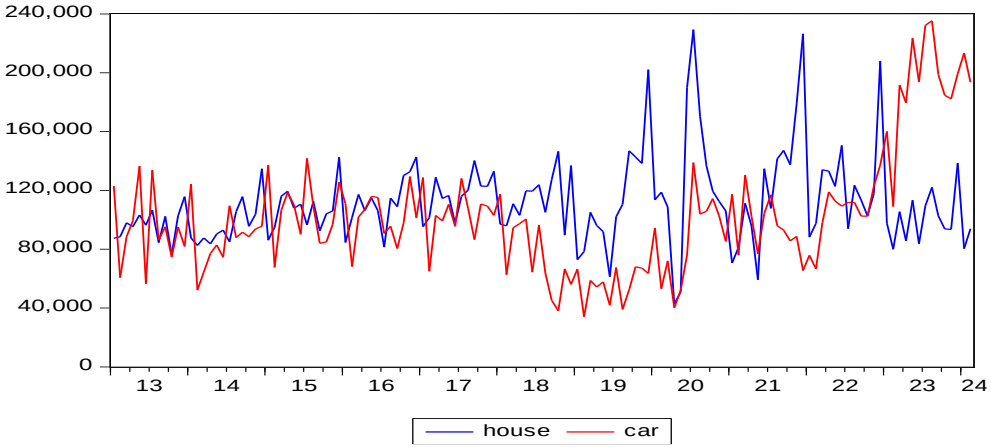

Figure 1: Vehicle and Housing Sales in Türkiye (2013-2023)
Source: CBRT EDDS

Figure 1 shows the amount of house and vehicle sales in Türkiye between 2013 and 2024. It can be said that a very serious volatility has emerged especially in the amount of housing sales since the end of 2018, when inflation rates reached 20 per cent. It can be said that vehicle sales have also increased significantly since 2020, as inflation has started to be taken for granted. Towards the end of 2023, in addition to the high interest rates and monetary tightening policies implemented by the CBRT, there is a noticeable decrease in the sales of both goods with the restrictions imposed on housing and vehicle loans.

Housing is an important requirement for human beings to meet their need for shelter. People need a place to shelter in order to be protected from weather conditions and various dangers. While caves were used as an alternative to meet this need in ancient times, today this problem is usually solved with reinforced concrete buildings. In addition to basic needs, housing can also be considered as an investment. Both the value it gains over time and the income obtained as a result of rental allow it to be evaluated as an investment tool. The budgets that people allocate for owning a house have a significant share in their total income. The expenditures that people make from their wealth in order to own a house are higher than other consumption expenditures. Anari and Kolari (2002) state that individuals in the US spend one third of their wealth to own a house. From this point of view, housing expenditures can be considered as investment expenditures as well as consumption expenditures.

Vehicles are one of the durable consumer goods used by humanity for transport and transport. As with housing, people prefer vehicles in order to meet their daily needs faster. However, nowadays, just like housing, vehicles are also considered as investment goods. The fact that vehicles can be rented or their

depreciation can be prevented thanks to their rising prices allows vehicles to be considered as investment goods. In addition, the fact that many vehicles can be purchased at more affordable prices compared to housing prices may suggest that the possibility of becoming a popular investment instrument has increased. After the rapid price increases experienced after the pandemic in Türkiye, second-hand vehicle prices began to exceed zero vehicle prices. As a result of the inflation expectation becoming continuous, it was observed that while it was said that there were no zero vehicles in the dealers, serious stocks were kept in the warehouses and not sold. In some cases, it was even stated that vehicle prices would rise even higher in the following month and that vehicle sales were realised at prices far above the list price (İHA, 2024). The Ministry of Trade took action following these complaints and amended the "Regulation on Second-Hand Motor Land Vehicles" on 6 July 2023, ruling that the prices of second-hand vehicles could not be higher than the prices of zero vehicles and that zero vehicles could be sold after at least 6 months or 6000 km (T.R. Ministry of Trade, 2024).

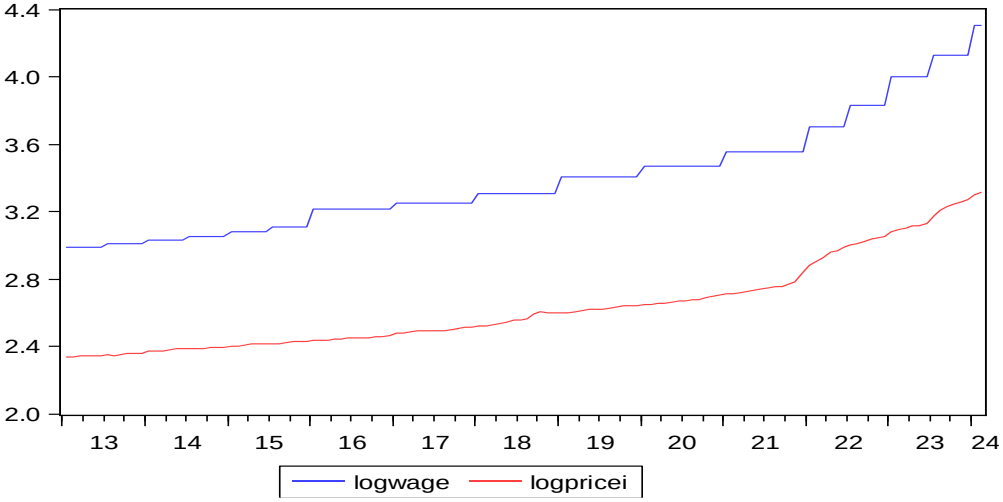

Figure 2: Inflation and Minimum Wage in Türkiye (Logaritmic)
Source: CBRT EDDS

As seen in Figure 2, although the CPI and minimum wage increased until 2018, the rate of increase accelerated slightly in 2018 and entered a very rapid increase process after October 2021, when the effects of the pandemic began to be felt. The increase in the CPI also caused the minimum wage to increase rapidly. While the prices in 2010 were constant, the CPI was 216.74 in January 2013, and it increased to 2073.88 in February 2024. While the minimum wage was 978.6 TL in January 2013, it increased to 20002 TL in February 2024.

In light of the above-mentioned issues, it has been a serious question whether inflation rates in Türkiye affect the demand for durable goods such as vehicles and housing. This study seeks to answer this question. While the studies in the literature generally examine the relationship between inflation and housing sales, it has been observed that very limited studies have examined the relationship with inflation in the vehicle sector. This study investigates whether both durable goods are used as investment instruments or consumption goods. Minimum wage is preferred as the control variable. In particular, it was aimed to observe whether low-income citizens have a relationship or interaction with any variable in this process.

In the following part of the study, the studies in the related literature are analysed by classifying the studies conducted for each variable. In the third section, econometric methods will be introduced and the results of the analyses will be presented. In the last section, evaluations and discussions will be presented based on the results obtained.

2. LİTERATURE REVİEW

In the field of economics, there is a vast literature diversified around inflation. Studies analysing both macro and micro factors add great richness to the field. Within the scope of the variables analysed in this study, studies have been encountered at varying rates. While the number of studies analysing the relationship between inflation and housing is high, the number of studies analysing the relationship between inflation and vehicles is relatively low. In the literature review section, firstly the studies analysing the relationship between inflation and housing sales, and then the studies analysing the relationship between inflation and vehicles and inflation and minimum wage are discussed.

Fama and Schwert (1977) analysed the relationship between inflation and house prices with data covering the period 1953-1971 for the USA. They conclude that house prices protect investors against inflation. Goetzmann and Valaitis (2006) analysed the relationship between house prices and inflation in the US with quarterly data covering the period 1978-2004. The results of the study show that house prices protect homeowners' money against inflation in the short run. Öztürk and Fitöz (2009) conducted a study on the determinants of housing supply and demand in Türkiye for the period 1968-2006 and concluded that the CPI has an effect on the amount of housing sales. Dokko et al. (2011) argue that the main determinant of housing demand and house prices in the US is the credit expansion, resulting in a bubble in house prices. Paksoy, Yöntem and Büyükçelebi (2014) analysed the relationship between house price index and inflation for TRC1, TRC2 and TRC3 regions in Türkiye. As a result of this study, which was carried out with monthly data between the periods 2010-2014, it was found that the house price index caused inflationary pressure in TRC1 and TRC2 regions, while no such effect was detected in Türkiye as a whole. Islamoğlu and Nazlıoğlu (2019) concluded that house prices

in Istanbul, Ankara and Izmir have unit elasticity with respect to the inflation rate and that the inflation rate and house prices affect each other. Karadaş and Salihoğlu (2020) concluded that the CPI had a negative effect on house prices in Türkiye between 2012-2018. Çolak (2021) found a unidirectional causality relationship from CPI to the housing sales index between the periods 2013-2019. Hatipoğlu (2021), on the other hand, concluded that housing prices have no effect on inflation in Çankırı, Kastamonu and Sinop, regardless of short or long term. Özçim (2022) concluded that the increase in the house price index has a positive effect on house sales in Türkiye, while the CBRT policy interest rate has a negative effect. These results indicate that housing demand in Türkiye is driven by investment motive. Şanlı and Peker (2023) analysed the effects of inflation, exchange rate and interest rate on the amount of housing sales between 2013-2021. The results of the study show that an increase in inflation also increases housing sales.

Muhammad et al. (2012) analysed the effect of macroeconomic variables on car sales in Malaysia, Thailand, Philippines, Taiwan and Singapore. The results of the study show that GDP, inflation, unemployment and credit rate have a long-run correlation with car sales in these countries, while in the short run, different variables are correlated with car sales in these countries. Shahabudin (2009) analysed the effect of variables such as unemployment rate, income level and interest rate on domestic and foreign car sales. Although the results reveal that all variables affect automobile sales, the problem of varying variance negatively affected the validity of the model. Işık, Yılmaz and Kılınç (2017) analysed the effect of exchange rate on automobile sales in Türkiye. Monthly data for the period 2011-2016 were used. The result of the study revealed that the increase in the exchange rate decreased automotive sales. Çetin (2020) found that the increase in the exchange rate between the periods 2015-2020 decreased the sales of imported cars and light commercial vehicles in Türkiye. Under the assumption that the increase in the exchange rate may also increase inflation, it can be said that inflation may indirectly reduce automobile sales. Çınar and Yalçın (2022) found that the increase in inflation rates during the pandemic period increased automotive sales in 22 EU countries including Türkiye.

Rissman (1995) analysed the relationship between inflation and wages in 10 sectors in the US for the period 1964-1994 and found a unidirectional causality relationship from inflation to wages in most sectors. Bardsen, Hurn and McHugh (2002) found a bidirectional causality relationship between wages and inflation in Australia between 1986-1999. Korkmaz and Çoban (2006) analysed the relationship between inflation, minimum wage and unemployment in Türkiye between 1969-2006. The results of the study reveal that there is a long-run reciprocal causality relationship between inflation and minimum wage. Tüleykan (2019) analysed the effects of the minimum wage increase on inflation and unemployment for Türkiye between 1988-2018 periods and found an increasing interaction between the

minimum wage increase rate and inflation in the long run. Akgül and Bükey (2020) found a bidirectional causality relationship between inflation and minimum wage between 1987-2018. Similar results were also found in the studies of Korkmaz and Çoban (2006). Gümüş and Akgüneş (2020) found a unidirectional causality relationship from inflation rates to minimum wage in Türkiye. Sevinç (2022) concluded that minimum wage increases were not the cause of inflation between the 2005-2021 periods.

While reviewing the literature, the studies on the variables to be analysed in this study were handled separately. However, no study was found that included all of the variables mentioned above. For this reason, this study, in which inflation is modelled as the dependent variable, vehicle and housing sales and minimum wage as independent variables, will contribute to the literature by choosing a model that will allow the relationship between the related variables to be examined.

3. DATA AND METHODOLOGY

The main starting point of the study is the effect of inflation rates on vehicle and house sales. The minimum wage variable is also included in the model in terms of both control and affecting other variables. Türkiye was preferred as the sample country and the period of the study was determined as monthly data between 01/2013-02/2024. All variables are obtained from the Electronic Data Distribution System (EDDS) of the Central Bank of the Republic of Türkiye. In order to minimise the effect of measurement differences between the series, the natural logarithm of the variables is taken.

Table 1: Variables

Variables	***Full Names***		***Cited Sources***
loginflation	Logarithmised Inflation Rates	Monthly	CBRT EDDS
loghouse	Logarithmised House Sales	Monthly	CBRT EDDS
logvehicle	Logarithmised Number of Vehicles Registered to Traffic	Monthly	CBRT EDDS
logwage	Logarithmised Minimum Wage	Monthly	CBRT EDDS

In the study, inflation is the dependent variable while housing sales, vehicle sales and minimum wage are independent variables. The econometric model is presented in equation 1 below;

$$loginflation = \beta_0 + \beta_1 loghouse + \beta_2 logvehicle + \beta_3 logwage + \varepsilon \quad (1)$$

The graphs of the variables used are presented in Figure 3. It is observed that almost all variables have an increasing trend. It can be said that the increasing trend in minimum wage and inflation variables is almost continuous. When the graph of

the minimum wage is analysed in detail, it is seen that it resembles a ladder. In periods when inflation is not very high, the minimum wage is determined once a year. After the period when inflation starts to rise, the horizontal rungs of the ladder are shorter since the minimum wage is increased every six months.

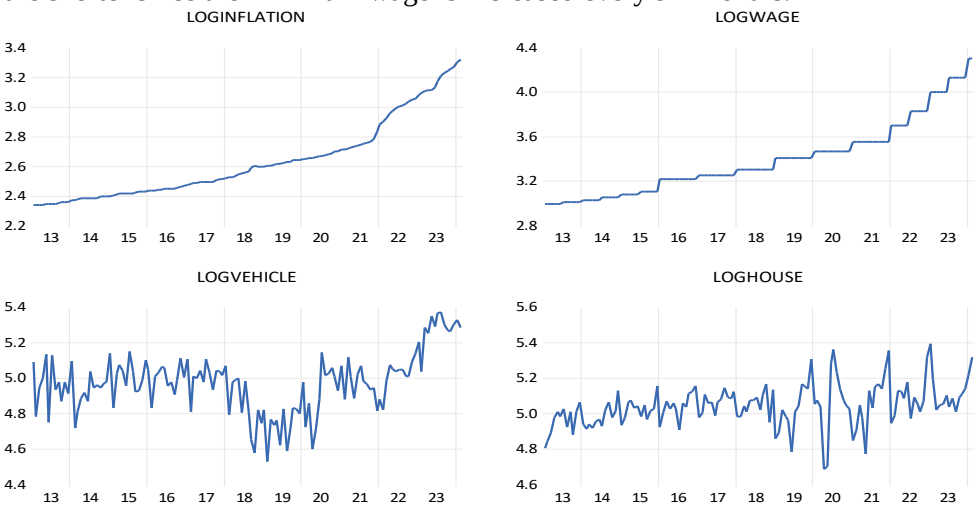

Figure 3: Series Graphs

Before starting the analysis, it is useful to examine whether the series are stationary or not. Series may deviate from the mean due to endogenous or exogenous shocks. These deviations may return to the mean after a certain period of time or may not approach this mean for a long time. When the series are stationary, it is accepted that the shocks experienced are temporary and the series will approach the mean value again. If regression analysis is performed with non-stationary series, the results obtained may be misleading (Yurdakul, 2020: 22). For this reason, the stationarity of the series should be tested first. For this purpose, firstly, whether the series are stationary in level or difference will be examined with the ADF Unit Root Test developed by Dickey and Fuller (1979). It should also be taken into consideration that there may be structural breaks in the series that show sharp transformations in some periods. Reasons such as a sudden change in government policies, an unfavourable and sudden development in the country may cause the variables to change direction suddenly. When these structural changes are not taken into account, stationarity tests may be erroneous. While the series may contain a unit root when analysed in one piece, it may not contain a unit root when analysed according to the model with structural breaks (Tatoğlu; 2009:313). Therefore, both ADF Unit Root Test and Zivot-Andrews (1992) unit root test with structural break will be applied during the unit root analysis. Then, Gregory-Hansen cointegration test, which also takes into account the structural break, will be performed. Finally,

Granger causality analysis will be performed to see whether there is a causality relationship between the variables and if there is, how its direction is.

4. FINDINGS

Before examining the relationship between the variables, observing whether the series are suitable for the analysis will guide the choice of the model. The fact that the series are stationary at the same degree or stationary at different degrees will cause the cointegration analysis to be chosen to differ. For this purpose, firstly, ADF unit root test was performed for the level values of the series. The results are presented in Table 2.

Table 2: ADF Unit Root Test Results for Level Values of Series

Variable	Model	ADF Test Statistics
Loginflation	Constant	3,867 (1)
	Constant+Trend	1,277 (1)
Loghouse	Constant	2,187 (0)
	Constant+Trend	2,398 (0)
Logvehicle	Constant	-1,619 (12)
	Constant+Trend	-1,717 (12)
Logwage	Constant	1,532 (12)
	Constant+Trend	-0,112 (12)

Note: The values in parentheses indicate the number of lags.

The ADF unit root test results for the level values of all four variables indicate that the null hypothesis that all series contain unit roots cannot be rejected. In other words, all of the series are non-stationary at level values. These results require the unit root test to be repeated after taking the first difference of the series.

Table 3: ADF Unit Root Test Results for First Difference of Series

Variable	Model	ADF Test Statistics
Δloginflation	Constant	-3,211** (2)
	Constant+Trend	-6,466*** (0)
Δloghouse	Constant	-6,633*** (12)
	Constant+Trend	-6,595*** (12)
Δlogvehicle	Constant	-7,807*** (4)
	Constant+Trend	-7,899*** (4)
Δlogwage	Constant	-6,241*** (12)
	Constant+Trend	-6,210*** (12)

Note: The values in parentheses indicate the number of lags.
* Critical value at 10% significance level
** Critical value at 5% significance level
*** Critical value at 1% significance level

The results of the ADF unit root test applied after taking the first difference of all variables reject the null hypothesis that the series contain unit root at 1% significance level in all series except the model with constant applied for the inflation variable. In the model with constant for inflation variable, the null hypothesis is rejected at 5% significance level. That is, when the first difference of the series is taken, the series become stationary.

Table 4: Zivot-Andrews Structural Break Unit Root Test Results for Level Values of Series

Variables	Loginflation	Loghouse	Logvehicle	Logwage	%1 C.V	%5 C.V	%10 C.V.
Model 1	-3,512 (4) (12/2021)	-3,937 (1) (01/2019)	-4,362 (1) (02/2018)	-1,112 (4) (01/2022)	-5,34	-4,93	-4,58
Model 2	-3,967 (4) (02/2021)	-3,989 (1) (05/2021)	-4,349 (1) (10/2019)	-2,301 (1) (06/2022)	-4,80	-4,42	-4,11
Model 3	-3,670 (4) (12/2020)	-4,241 (1) (01/2019)	-4,413 (1) (08/2018)	-4,861 (4) (08/2021)	-5,57	-5,08	-4,82

Note: Values in parentheses indicate the number of lags. Dates in brackets indicate the break date.
Model 1: Break in Level
Model 2: Break in Slope
Model 3: Break in Level and Slope

According to the results of the Zivot-Andrews structural break unit root test for the level values of the series, the vehicle sales variable in Model 2 is larger in absolute value than the critical value at the 10% significance level. A similar situation is observed for the minimum wage variable in Model 3. Except for these two cases, the t statistic values in all series are smaller in absolute value than the critical values at all significance levels. In other words, the level values of the series cannot reject the null hypothesis that the series contain unit root under structural break. It can be said that the series are non-stationary at 5% significance level.

Table 5: Zivot-Andrews Unit Root Test Results for First Difference of Series

Variables	ΔLoginflation	ΔLoghouse	ΔLogvehicle	ΔLogwage	%1 C.V	%5 C.V	%10 C.V.
Model 1	-6,093 (4) (11/2021)	-7,920 (4) (06/2021)	-8,355 (4) (10/2019)	-7,739 (4) (03/2021)	-5,34	-4,93	-4,58
Model 2	-4,531 (4) (03/2020)	-7,768 (4) (02/2021)	-8,113 (4) (09/2018)	-6,206 (4) (12/2018)	-4,80	-4,42	-4,11
Model 3	-6,586 (4) (12/2021)	-7,912 (4) (06/2021)	-8,431 (4) (03/2019)	-7,764 (4) (10/2021)	-5,57	-5,08	-4,82

Note: Values in parentheses indicate the number of lags. Dates in brackets indicate the break date.
Model 1: Break in Level
Model 2: Break in Slope
Model 3: Break in Level and Slope

When the results of the Zivot-Andrews unit root test with structural break after taking the first difference of the series are analysed, it is observed that the inflation variable in Model 2 is greater in absolute value than the critical values at 5% and 10% significance levels, while all other variables are greater in absolute value than all critical values at 1%, 5% and 10% significance levels. These results allow the rejection of the null hypothesis that the series contain unit root under structural break when the first difference of the series is taken. That is, all variables are stationary under structural break in the first difference of the series. These results indicate that the Zivot-Andrews unit root test results support the ADF unit root test results.

Table 6: Gregory - Hansen Cointegration Analysis Results

	Break Date	**T Statistics**	**%1 C.V**	**%5 C.V**	**%10 C.V**
Model 1	08/2021	-8,165*	-5.13	-4.61	-4.34
Model 2	08/2021	-8,252*	-5.45	-4.99	-4.72
Model 3	10/2021	-7,987*	-5.47	-4.95	-4.68

Model 1: Break in constant
Model 2: Break in trend
Model 3: Regime change

The t statistics obtained as a result of Gregory-Hansen cointegration analysis are compared with the table values in Gregory and Hansen (1996) to check whether the series are cointegrated. All of the t statistics obtained are greater in absolute value than the critical values at 1%, 5% and 10% significance levels than the table values given in the aforementioned study. These results allow the rejection of the null hypothesis that the series are not cointegrated under structural break. That is, all variables are cointegrated under structural breaks in all three models. The fact that all of the series are cointegrated indicates that there may be at least one causality relationship between the series.

As a result of the unit root and cointegration analyses, Granger causality analysis was performed to determine whether there is a causality relationship between the series and if there is a relationship, to determine the direction of this relationship. Before this analysis, the VAR model was constructed and the appropriate number of lags was tried to be determined. According to AIC, SCI and HQ information criteria, a model with 2 lags was created. The White test and Durbin-Watson test were used to check whether the model contains changing variance and autocorrelation problems and both test results showed that there is no changing variance and autocorrelation problem in the model. The results of the Granger causality analysis performed with the VAR model are presented in Figure 4.

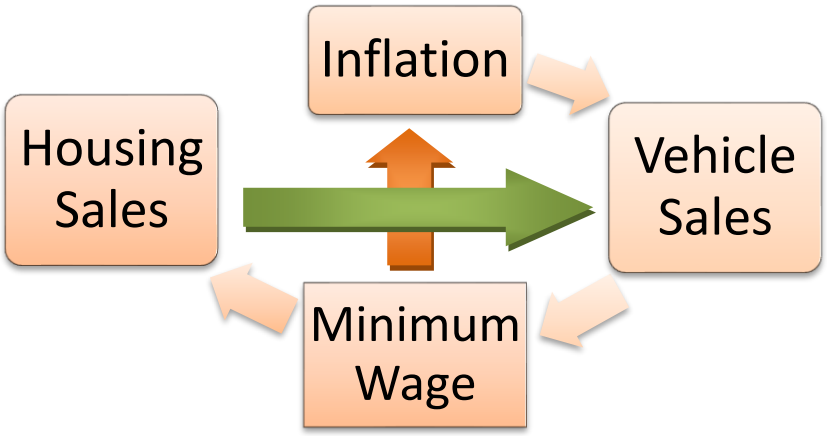

Fıgure 4: Granger Causality Results

According to the results of the Granger causality analysis, unidirectional causality relationships were found from minimum wage to inflation and housing sales variables, from inflation variable to vehicle sales, from housing sales to vehicle sales and from vehicle sales to minimum wage.

5. RESULTS AND EVALUATIONS

In this study, the relationship between inflation, vehicle sales, housing sales and minimum wage in Türkiye using monthly data between 01/2013-02/2024 is analysed with structural break tests and finally the direction of the relationship is tried to be determined by Granger causality analysis. The results indicate the existence of unidirectional causality from minimum wage to inflation and housing sales, from inflation and housing sales to vehicle sales, and from vehicle sales to minimum wage.

The fact that increases in the minimum wage have inflationary consequences shows that the wage-inflation spiral is a possible situation. These results coincide with the results of Sevinç (2022) for some regions. Increasing the minimum wage in periods of high inflation will lead to an increase in inflation. Considering these results, it would be an unfair approach to say that minimum wage earners should be crushed against inflation. In order to break this spiral, it would be more reasonable to increase the general welfare level of the country by producing high value-added products and to implement fiscal policies that eliminate income inequality. In addition, the increase in the minimum wage can also be prevented from increasing the demand for housing through policies that increase the supply of housing.

When the effect of the increase in inflation rate, which is chosen as the main starting point in this study, on housing and vehicle sales is analysed, it is seen that

the increase in the inflation rate does not affect housing sales, but it affects vehicle sales. If these results are evaluated in the light of current developments, it can be said that the monetary and fiscal policies implemented to reduce the high inflation rates in our country have made themselves felt especially in the housing sector. As a result of the increase in interest rates, which is the first step of contractionary monetary policy implementations, the decrease in the use of vehicle loans can be stated as one of the reasons for this result. Özçim (2022), who presents a result close to this result, also states similar findings in his study. Similar results were found with Hatipoğlu (2022).

The fact that the increase in the inflation rate increases the sales of vehicles may help us to state that vehicles are traded as an investment instrument in our country. The fact that vehicle prices are lower than housing prices can be shown as one of the reasons why vehicles are more accessible. Therefore, there is an increase in demand for vehicles with relatively lower prices, which may indirectly lead to an increase in inflation.

In the light of the findings obtained in this study, this issue can be further expanded and a comprehensive study can be obtained. Moreover, a similar study can be conducted with a larger data set after the end of 2024. The main step that the government should take is to strengthen the supply side of the economy in order to keep inflation under control and thus ensure a gradual reduction in inflation.

Ethical Declaration

In this study, all the rules stated in the "Higher Education Institutions Scientific Research (Türkiye) and Publication Ethics Directive" were followed.

Ethics Committee

Approval The author declare that the research is one of the studies that does not require ethical committee approval.

Conflict of Interest and Funding

No conflict of interest and funding has been declared by the author.

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