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The Foreign Exchange Rate-Femicide Nexus in Turkey: Evidence from the Cointegration Tests Based on Nonlinear and Fourier Functions

Gülgün Çiğdem

Istanbul Gelişim University
Cihangir, Petrol Ofisi Cd. No: 3
34310 Avcılar/İstanbul, Turkey

e-mail: gulguncigdem@gmail.com
ORCID: 0000-0001-5353-8638

Abstract:
The purpose of this study is to look at *femicide* from a different perspective, even though it may seem unrelated at first. Accordingly, it investigated the existence of a link between foreign exchange, which was a major cause of the crises and unemployment, and *femicide*, which was the outcome of violence against women other than murder. The data were acquired from the We Will Stop Femicide Platform and the Central Bank of the Republic of Turkey in light of the study's goal. According to the findings of the investigation, there is a long-term cointegrating association between the foreign exchange rate and *femicide* in Turkey. After 22.6 days, the deviation induced by a 1% change in the currency rate could be balanced. This study is notable for approaching *femicide* from a hitherto overlooked economic perspective, as well as demonstrating that exchange rate changes are "vital" in terms of non-economic reality and public health.
Keywords: femicide, foreign exchange rates, cointegration, fourier function, nonlinearity.

1. Introduction

Femicide is the outcome of a violent engagement that is the killing of a woman or a girl and the extreme and direct form of an interpersonal process. Researchers have suggested that femicide should be considered a specific issue of severe fact, which can be evaluated in a detailed and theoretical structure. Femicide was first used as a concept in 1801, referring to "the murder of a woman" [1]. It was legally recognized in 1848 and published in the Wharton Legal Dictionary, thereby appearing in the English legal terminology. Radford (1992) [2] made a special emphasis by saying, "You cannot mobilize against something with no name." The fact that the violent deaths of individuals belonging to gender have reached non-negligible systematic dimensions has drawn all disciplines' attention. Hence,

studies have been initiated to establish a conceptual framework. When Diana Russel first used it at the International Tribunal for Crimes Against Women in 1976, the term femicide was added to the literature. Radford and Russell [3] later defined femicide as 'the misogynistic killing of women by men.' Furthermore, Radford underlined that femicide is a form of sexual violence. The term homicide, which refers to the murder of a human being, has been restricted with the term femicide [4], a theoretical concept referring to the murder of a woman [5]. Because of the growing number of occurrences, this phenomena has begun to be included in other languages. It has been referred to as "feminicide" in Spanish and "kadın cinayetleri" in Turkish. The term *gendercide* emerged in 1985 to describe the intentional annihilation of people of a particular gender [6].

Femicide is a sociological effort of apprehension that has been prosperous in converting traditional sense, communal cognizance, academic inquiry, and policymaking. This new word is used in the political context to understand women's violent deaths and create changes in the social order. It aims to prevent the confusion of women's violent deaths with the concept of murder, which does not discriminate between genders, draw attention that it is a crime in itself, and raise awareness [7]. Thanks to Radford and Russell [8] and Russell and Harmes [9], the term femicide evolved as a theoretic notion aimed at reversing the structuring forms of patriarchal power.

According to Ertürk [10], the female body is subjected to social control for the social groups to reproduce generations according to specific criteria. Violence against women has been normalized throughout the historical process and has become an "ordinary tool" used to maintain labor division between the genders. The data have demonstrated that this tool has been used all over the world. In particular, in cultures where women are of less worth and provided fewer rights than men, women are more vulnerable to the inevitable violence and death. Inequalities in the gender ratio and the relatively high number of males have potentially destructive outcomes for society [11].

Violence against women and girls is a major public health issue that affects one-third of the world's women (35.6 percent globally) and is a violation of human rights. Based on WHO's data; 30 percent of women have been subjected to physical and/or sexual violence by their partner and 7.2 percent by someone who is not a partner. The prevalence estimates of violence are 23.2 percent in high-income countries, while in the Western Pacific Region, Eastern Mediterranean Region, and Southeast Asia Region, respectively; 24.6 percent, 37 percent, and 37.7 percent. It is seen that 38 percent of femicides, which are the last point of interpersonal violence, are committed by intimate partners [12].

Figure 1 presents the global scale of femicides. There is a great difficulty in accessing data on this sensitive matter, which requires a multidimensional approach. It necessary and of public interest to store the data and make it available to scientists. On the other hand, the available data belonging to the period after 1990 does not include some of the countries' annual data or some of the data of many countries at all. According to available data, the number of women murdered in 2018 in the world is 82,227. Figure 2, which has been created based on the available data, presents the total global values revealing how the femicides have been deliberately and systematically committed.

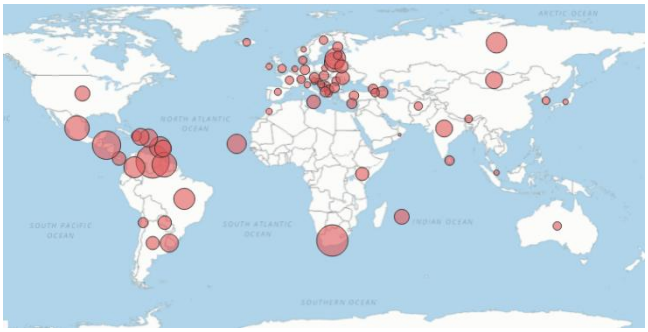

Figure 1: Femicide around the world (2018)

Source: United Nations Office on Drugs and Crime (UNODC)

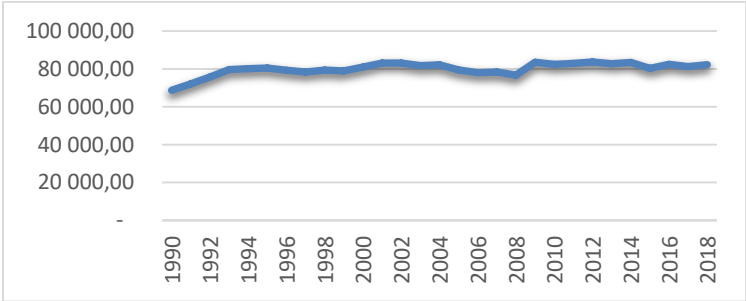

Figure 2: Global Femicide Rate Around the World (2018)
Source: Created by the Author

The increasing violence was associated with the destruction and dissolution resulting from globalization by Friedman [13]. And female movements against the increasing violence have become global and attracted attention. This multifaceted phenomenon requires multidisciplinary studies. According to the literature review, femicide has been studied regarding *i.* feminist, *ii.* sociological, *iii.* criminological *iv.* human rights and *v.* decolonial paradigms; however, it is observed that the investigation of the issue in terms of the economy has been neglected. However, economic conditions affect the psychology and behavior of individuals. Therefore, it is important to investigate femicide from a perspective based on the economy. To prevent future murders, it is vital to determine the causes of gendercide from different perspectives, take the necessary measures, and put the necessary policies into practice.

This study investigates the existence of a relationship between the foreign exchange rate, which has devastating effects when not taken under control, and femicide in Turkey, which has a chronic current account deficit and is dependent on short-term foreign capital. The current and advanced empirical analysis will be used in the study. Before investigating femicide in terms of economy, it would be appropriate to explain why the foreign exchange rate was selected by describing its effects on individuals. A foreign exchange rate is a crucial tool applied in Orthodox anti-inflationary stabilization programs. Its effects are not limited to international trade and capital flows. The policies implemented by the central banks and political authorities, whose primary purpose is to protect the national currency's value, affect all areas of life, starting with the economy. The foreign exchange rate policies implemented in Turkey are observed to be a significant cause of economic crises. The exchange rate, international trade, and unemployment have a linear relationship [14]. Besides, the foreign exchange rate, through imports and exports, impacts the labor market [15]. An increase in imports can affect the relationship between the employer and employee, thereby leading to the termination or change of various rights and regulations regarding wages, labor, and working conditions against the employees. Studies reveal that a 10 percent rise in competition between imported and domestic products results in a 1.6 percent decline in wages and an increase in the unemployment rate [16]. Also, it is known that currency crises have a significant impact on the unemployment phenomenon. For instance, both the foreign exchange rate and unemployment level increased in Mexico during the 1994 Crisis. In the 1997 Asian Crisis, the currency crisis in South Korea led to both unemployment and inflation [17]. Turkey experienced a process starting with the 1978 crisis, and particularly with the crisis created by the threat of unemployment after 1990. Since the establishment of the Republic, there have been five serious crises (1929-32, 1958-61, 1978-83, 1998-2001, and 2008). Before the crises, there have been increases in current account deficits. In 1977, 1987, 1990, 1993, 1997, 2000, and 2008, although the fact that the national currency’s external value should have been corrected against the ongoing inflation problem, it was not reduced. Or, the national currency’s external value was increased. All these were the factors

that increased the current account deficit. Currency explosions constituted the main factor that triggered the crises. In addition to inflation, the current account deficit is the leading cause of crises. Unemployment replaced inflation in the 2008 Global Financial Crisis [18]. The fluctuations of the foreign exchange rate were empirically presented in the study conducted for Turkey by Demir [19] regarding its negative effect on employment.

Recession, unemployment, and poverty caused by the crises adversely affect human psychology [20]. According to Olivera [21]; violence against women is associated with the rise of extreme poverty, unemployment, fragmentation of the peasant economy, and social polarization imposed by neoliberal policies on the poor. The level of violence against his wife and children increases by the man who has lost his job and whose income has decreased. The pressure created by the social division of labor that men have to support the house drives men who cannot fulfill this duty because of unemployment and poverty to violence more [22], [23]. In the case of long-term unemployment, men resort to violence due to mental tension and depression as a result of the decrease in the hope of finding a job [24]. Losing power and feeling helpless in socio-economic life, the man exerts violence on his wife and maintains his domination in the home and thus feels strong [25], [26]. Women who earn more income than their husbands have at least twice the risk of being subjected to violence. Two out of every three women in this situation are subjected to violence [27]. Studies show that women who are subjected to violence by their spouses point to unemployment and poverty as the cause of violence, and accept violence as a "normal domestic situation," whereas, for men, unemployment and poverty serve as a tool to "normalize" violence against women and girls [28], [29], [30], [31], [32]. In a report published by the World Health Organization (WHO) during the days of the COVID-19 pandemic when the risk of violence against women increased, it is observed that the reasons for the increase of violence against women include unemployment, economic problems, prolonged staying at home and stress. The main reason for the increasing domestic violence is the predominant patriarchal order and gender inequality. According to several criminological theories, the long-term presence of the potential aggressor and victim in a specific socio-geographic area sets the foundation for violence [33].

Unemployment has been linked to family breakdowns, alcohol addiction, crime, and violence, according to a study that found a link between a 1% increase in the unemployment rate and the deaths of 37 thousand people, 920 suicides, 650 murders, 4 thousand hospitalizations in mental hospitals, and the imprisonment of 3.3 thousand people, over six years [34]. Empirical studies have demonstrated that the increase in unemployment [35], [36], [37], [38], [39], [40], [41], [42], [43] and income inequality [44], [45] increases crime rates.

Violence against women in Turkey, despite being a phenomenon seen in all socio-economic levels and all levels of education, are more frequent and widespread among the poor, low-educated, and those who do not have occupation [46], [47], [48].

In the studies conducted, it was found that women in lower-income groups were more likely to experience frequency of domestic violence than upper-income groups [49], [50]. Insomuch that, it has been found that women in lower-income groups are seven times more likely to experience domestic violence than women in upper-income groups [51]. Loss of socio-economic status brings about violence and oppression [52], [53].

Men in low socio-economic groups perceive unemployment and loss of income as a threat to male identity. Economically weakened men try to compensate for their socially shaken power with the pressure and violence they inflict on women and girls [54], [55], [56].

The devastation of livelihoods, the increase in male unemployment causes power structures and masculinity to become impotent. Violence against women and girls is on the rise as compensation for the loss of control of masculinity and it is going into crisis [57], [58].

The widespread use of flexible and insecure working patterns and high structural unemployment cause men to be unemployed. On the other hand, the level of anxiety of unemployed men about the responsibility of supporting and managing the house is increasing. The fact that the man

(can) not fulfill the role of supporting the household that is expected of him due to unemployment and poverty causes his power in the family to be shaken. Man increases his pressure to maintain his power and reestablishes his power by using violence "on weak individuals" [59], [60].

Low-income level, crowded households cause tension for men who are experiencing financial difficulties, the feeling of inadequacy caused by the man who is culturally expected to support the family not being able to do so, and the economic difficulties that lead to conflict between spouses, increase violence against women [61], [62]. Straus [63] found that families living below the poverty line were 50 percent more likely than wealthy families to experience violence against women.

In the short term, Nikolaos and Alexandros[64] found a negative association between wage and crime rate. According to Lombardo and Falcone [65], in regions with high divorce rates, youth unemployment, and female employment, the highest rates of crime are observed. Andresen [66] determined that the income had a significant and positive coefficient in the crimes of violence and mentioned that the level of unemployment had a significant and positive coefficient in the crimes of violence in the long run.

Low-income and insufficient income lead to mental tension; limited resources increase the risk of domestic violence; attacks of violence are more common among individuals who are unemployed or work in jobs with low dignity. It has been determined that the risk of domestic violence is doubled if the man has at least two of the stated factors*; i)* unemployed, *ii)* low-educated, *iii)* between the ages of 18-30, *iv)* using illegal drugs and *v)* inadequate family income [67].

Violence against women in the family increases when men with low socioeconomic status are unemployed or in irregular employment [68], [69]; Poverty and the inability to meet basic needs and especially unemployment cause male violence to become permanent in the family. Men with low socio-economic levels use physical violence against their wives and children more intensely. Unemployment and poverty create tension within the family and conflicts trigger violence [70]. Domestic violence is common and persistent in poor families. Also, poverty brings along the acceptance of violence [71]. Man maintains his dominance over women and in the family by using violence against women [72]. Taş et al. [73] discovered a similar link between unemployment and divorce rates. Kavaklı [74] discovered that femicide was predominantly committed in economically underdeveloped areas. Economic development mitigates the risk factor's negative influence.

Although initially seemingly unrelated, exchange rate fluctuations and Femicide can be linked upon closer examination. Exchange rate fluctuations are often associated with economic crises. Especially in fragile economies like Turkey, which runs a current account deficit and is dependent on short-term foreign capital, exchange rate fluctuations can lead to economic crises. These crises, in turn, increase unemployment rates, cause income losses and economic uncertainty, and widen income inequality. Unemployment and economic uncertainty may increase the tendency towards violence, especially in men, by bringing along effects such as decreased hope of finding a job, mental tension and depression. In some studies in the literature, it is stated that men who are economically weakened tend to commit violence due to the feeling of powerlessness caused by the inability to comply with social expectations. The impact of economic factors on the increase in violence against women is of great importance. Poverty, unemployment and loss of income cause violence against women to be experienced more frequently and intensely, especially in families with low socioeconomic status. Women's economic disempowerment may trigger the acceptance and continuation of violence.

There is a clear loop among crisis, unemployment, violence, and murder in light of all this information. This study, which aims to empirically investigate the existence of a relationship between systematic femicide and the exchange rate, an important trigger of crises, will first present the methodology and data sets used and explain the findings. Then, implications will be drawn based on these findings.

2. Methodology and Data

To analyze the existence of the nexus between the foreign exchange rate and femicide in Turkey, the daily *femicide* data belonging to the period between 1 January 2019 and 29 September 2020 were obtained from the We Will Stop Femicide Platform, and the data regarding the daily buying rates of US Dollar in the same period were obtained from the Central Bank of the Republic of Turkey (CBTR) Electronic Data Delivery System (EDDS) (Table 1). These data were examined through various analyses. The analyses consisted of 373 observations. Figures 3 and 4 present the distribution of variables. While an increase was observed in the foreign exchange rate during this process, a systematic *"gendercide"* was also prominent.

Variables	Abbreviation	Source
Femicide	Femicide	We Will Stop Femicide Platform
American Dollar, Buying Rate	Rate	CBTR

Table 1: Data Used in Analysis

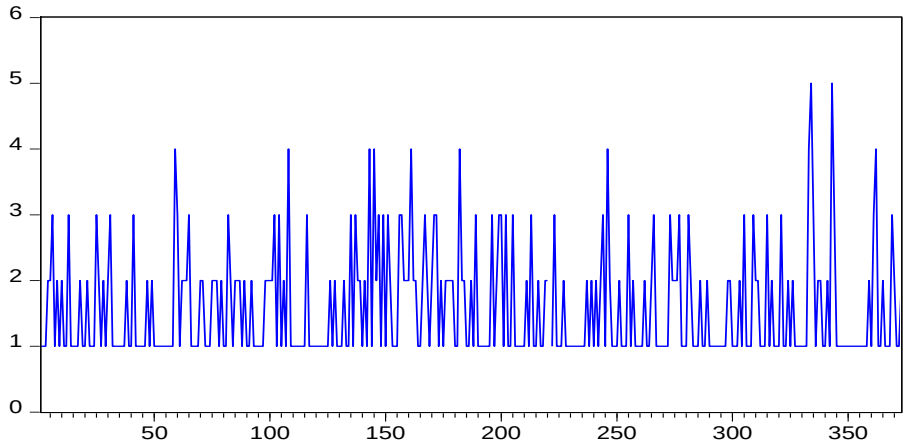

Figure 3: Femicide in Turkey (01.01.2019–29.09.2020)
Source: Created by the Author

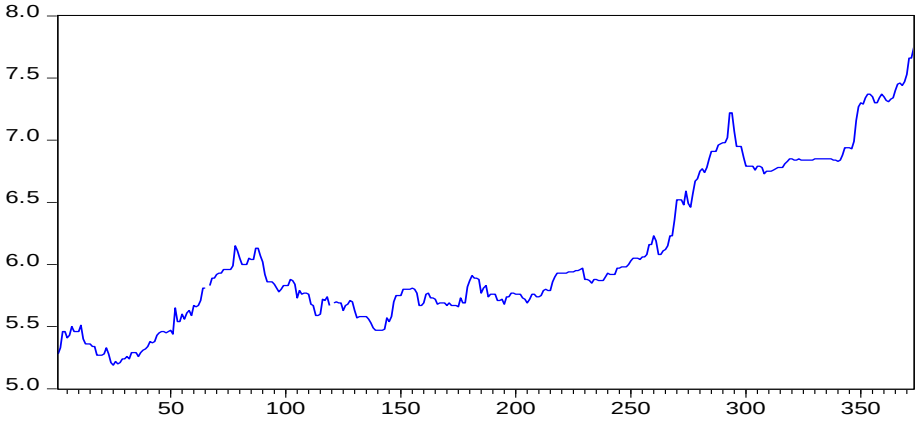

Figure 4: USD/TRY Buying Rate (01.01.2019–29.09.2020)
Source: Created by the Author

Is there a link between the national currency's depreciation and femicide? Before attempting to address this question, the series' linearity was tested using the Harvey and Leybourne [75] and Harvey, Leybourne, and Xiao [76] tests. The stationary tests were then carried out.

2.1. Tests for Linearity

Linearity tests of the series should be performed first since the linear analysis of the series exhibiting nonlinear behaviors would lead to the establishment of false models. Linearity Tests are structured upon the models based on smooth transitions typed the STAR (Smooth Transition Autoregressive). These tests are a priori test for the transition to the STAR type test. Unlike other tests, these tests, which were introduced to the literature by David Harvey, do not have any prerequisites. Considering the main advantage of not being affected by stationarity levels, Harvey and Leybourne [77] and Harvey, Leybourne, and Xiao [78]. Tests were administered for testing the linearity.

2.1.1. Harvey and Leybourne Test

This test, which was introduced to the literature by Harvey and Leybourne [79], does not make any assumptions, I_1 and I_2 it allows the coexistence of processes. This test has a structure with four degrees of freedom, where the following equation is used (1):

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 y_{t-1}^2 + \beta_3 y_{t-1}^3 + \beta_4 \Delta y_{t-1} + \beta_5 (\Delta y_{t-1})^2 + \beta_5 (\Delta y_{t-1})^3 + \varepsilon_t \quad (1)$$

Equation 2 and Equation 3 demonstrate the null hypothesis representing linearity and the alternative hypothesis expressing non-linearity;

$$H_0 : \beta_2 = \beta_3 = \beta_5 = \beta_6 = 0 \quad (2)$$
$$H_1 : \beta_2 \neq \beta_3 \neq \beta_5 \neq \beta_6 \neq 0 \quad (3)$$

Test statistics of Harvey and Leybourne [80] are presented in Equation 4;

$$W_T = \frac{RSS_1 - RSS_0}{RSS_0/T} \quad (4)$$
$$W_T^* = \exp(-b|DF_T|^{-1}) W_T \quad (5)$$

In these equations (Equation 4-5), *b* indicates the non-zero constant, DF_T indicates the standard ADF *t* statistics derived from the restricted regression, T indicates the number of observations, RSS_1, indicates the total of squares of the error term for the H_1 hypothesis. The Harvey and Leybourne [81] test statistics are suitable for the distribution of x_4^2 .

2.1.2. Harvey, Leybourne & Xiao Test

The Harvey, Leybourne, and Xiao [82] Linearity Test, which was developed by enhancing and strengthening the Harvey and Leybourne [83] Test, reviews the state of stationarity and I_1 separately. It has a structure with two degrees of freedom.

To analyze the basic hypothesis of linearity (Equation 6) compared to the alternative hypothesis indicating the nonlinearity (Equation 7), it is suggested to use Equation 8;

$$H_0 : \beta_2 = \beta_3 = \beta_5 = \beta_6 = 0 \quad (6)$$
$$H_1 : \beta_2 \neq \beta_3 \neq \beta_5 \neq \beta_6 \neq 0 \quad (7)$$

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 y_{t-1}^2 + \beta_3 y_{t-1}^3 + \sum_{j=1}^{p} \beta_{4,j} \Delta y_{t-j} + \varepsilon_t \quad (8)$$

Equation 8 can be reorganized using the first-order Taylor expansion, and it can be written as Equation 9;

$$\Delta y_t = \lambda_1 \Delta y_{t-1} + \lambda_2 (\Delta y_{t-1})^2 + \lambda_3 (\Delta y_{t-1})^3 + \sum_{j=1}^{p} \lambda_{4,j} \Delta y_{t-j} + \varepsilon_t \quad (9)$$

In Equation 9, p indicates the number of delays, and Δ indicates the difference operator. The (W_0) test statistics, which are calculated for stationarity, and the (W_1) test statistics, which are calculated for nonstationarity, are calculated by using the Harvey et al. [84] W_λ test statistics. They conform with the distribution of W_λ x_2^2.

2.2. Nonlinear Unit Root Tests

Following the determination of the nonlinearity, the unit root tests produced from nonlinear models were performed.

2.2.1. Leybourne, Newbold and Vougas (LNV) Unit Root Test

Leybourne, Newbold, and Vougas (LNV) [85], who suggested gradual integration of structural changes to the model with a smooth transition instead of instantaneous integration, developed a unit root test as an alternative to the unit root tests with structural breaks. This test, in which structural breakage is taken into account with a logistic function, allows smooth structural transitions and constitutes the beginning of nonlinear tests. Logistic soft transition regressions were created by defining three models;

Model A

$$y_t = \alpha_1 + \alpha_2 S_t(\lambda, \tau) + v_t \quad (10)$$

Model B

$$y_t = \alpha_1 + \beta_1 t + \alpha_2 S_t(\lambda, \tau) + v_t \quad (11)$$

Model C

$$y_t = \alpha_1 + \beta_1 t + \alpha_2 S_t(\lambda, \tau) + \beta_2 t S_t(\lambda, \tau) + v_t \quad (12)$$

In the models, the $S_t(\lambda,\tau)$, indicates the logistic smooth transition, which is presented in Equation 13. In this logistic function, τ defines the midpoint of the transition process, and γ determines the transition speed. Where $\gamma>0$, $S_{-\infty}(\gamma\ \tau)=0$, $S_{+\infty}(\gamma\ \tau)=1$ and $S\tau T(\gamma\tau)=0,5$. If γ is smaller, it would take longer for the logistic smooth transition of $S\tau(\gamma\tau)$ to exceed the interval (0,1). If γ= 0, $S_\tau(\gamma\tau)=0,5$ at all t moments. If γ is greater, $S\tau(\gamma\tau)$ would exceed the (0,1) interval rapidly. If γ converges to +∞, the function's value changes from 0 to 1 momentarily at t= τT.

$$S_t(\gamma, \tau) = [1 + \exp\{-\lambda(t - \ \tau T)\}]^{-1} \quad (13)$$

v_t is the expression of the stationary process with a mean of zero. Hence, the Y initial value for Model A is stationary around a mean that gradually changes between α_1 and $\alpha_1+\alpha_2$. Similar to Model A, there is also a mean gradual change in Model B between α_1 and $\alpha_1+\alpha_2$; however, unlike Model A, there is a constant trend term in Model B. In Model C, the constant ranges from α_1 to $\alpha_1+\alpha_2$, and the trend

ranges from β1 to $\beta_1+\beta_2$ gradually, only once, and at the same speed and time. In this test, there is a constraint that the constant and trend transitions occur at the same time and the same speed.

There are two phases for calculating the test statistics. In the first step, using the Nonlinear Least Squares (NLS), the appropriate model is estimated only with deterministic components, and the residuals are obtained;

Model A

$$\hat{v}_t = y_t - \hat{\alpha}_1 - \hat{\alpha}_2 S_t(\hat{\lambda}, \hat{\tau}) \quad (14)$$

Model B

$$\hat{v}_t = y_t - \hat{\alpha}_1 - \hat{\beta}_1 t - \hat{\alpha}_2 S_t(\hat{\lambda}, \hat{\tau}) \quad (15)$$

Model C

$$\hat{v}_t = y_t - \hat{\alpha}_1 - \hat{\beta}_1 t - \hat{\alpha}_2 S_t(\hat{\lambda}, \hat{\tau}) - \hat{\beta}_2 t S_t(\hat{\lambda}, \hat{\tau}) \quad (16)$$

After the residuals are obtained, the ADF regression is established in the second phase, and the unit root test is performed over this regression (Equation 17).

$$\Delta\hat{v}_t = \delta\hat{v}_{t-1} + \sum_{i=1}^{p} \psi_i \Delta\hat{v}_{t-i} + \varepsilon_t \quad (17)$$

$$H_0: \delta = 0 \quad (18)$$

$$H_1: \delta < 0 \quad (19)$$

The hypotheses to be established in the analysis of the unit root are presented in Equation 18 and Equation 19. This test is performed by testing the statistical significance of $\hat{\rho}$ using the t-test.

2.2.2. Harvey and Mills (HM) Unit Root Test

The unit root test based on soft transition, created by Leybourne, Newbold, and Vougas [86], was extended to two soft transitions and introduced to the literature by Harvey and Mills [87]. Three models were also created for this test;

Model A

$$y_t = \alpha_1 + \alpha_2 S_{1t}(\lambda_1, \tau_1) + \alpha_3 S_{2t}(\lambda_2, \tau_2) + v_t \quad (20)$$

Model B

$$y_t = \alpha_1 + \beta_1 t + \alpha_2 S_{1t}(\lambda_1, \tau_1) + \alpha_3 S_{2t}(\lambda_2, \tau_2) + v_t \quad (21)$$

Model C

$$y_t = \alpha_1 + \beta_1 t + \alpha_2 S_{1t}(\lambda_1, \tau_1) + \beta_2 t S_{1t}(\lambda_1, \tau_1) + \alpha_3 S_{2t}(\lambda_2, \tau_2) + \beta_3 t S_{2t}(\lambda_2, \tau_2) + v_t \quad (22)$$

While there are two transitions for mean in Model A and Model B, unlike Model A, there is a fixed trend in Model B. Model C allows two transitions in both mean and trend.

In the models, $S_{it}(\lambda_1,\tau_1)$ indicates the logistic smooth transition, which is presented in Equation 23. The error term, v_t is the expression of the stationary process with a mean of zero.

τ_1T and τ_2T, indicate the middle points of the transition process; γ_1 and γ_2 indicate the transition speeds. The difference in transition speeds is allowed.

$$S_{it}(\lambda_i, \tau_i) = [1 + \exp\{-\lambda_i(t - \tau_i T)\}]^{-1} \qquad \lambda_i > 0,\ i = 1,2 \quad (23)$$

$$\hat{v}_t = y_t - \hat{\alpha}_1 - \hat{\alpha}_2 S_{1t}(\hat{\lambda}_1, \hat{\tau}_1) - \hat{\alpha}_3 S_{2t}(\hat{\lambda}_2, \hat{\tau}_2) \quad (24)$$

$$\hat{v}_t = y_t - \hat{\alpha}_1 - \hat{\beta}_1 t - \hat{\alpha}_2 S_t(\hat{\lambda}_1, \hat{\tau}_1) - \hat{\alpha}_3 S_{2t}(\hat{\lambda}_2, \hat{\tau}_2) \quad (25)$$

$$\hat{v}_t = y_t - \hat{\alpha}_1 - \hat{\beta}_1 t - \hat{\alpha}_2 S_t(\hat{\lambda}, \hat{\tau}) - \hat{\beta}_2 t S_t(\hat{\lambda}, \hat{\tau}) - \hat{\alpha}_3 S_{2t}(\hat{\lambda}_2, \tau_2) - \hat{\beta}_3 t S_{2t}(\hat{\lambda}_2, \hat{\tau}_2) \quad (26)$$

$$\Delta\hat{v}_t = \delta\hat{v} + \sum_{i=1}^{p} \psi_i \Delta\hat{v}_{t-i} + \varepsilon_t \quad (27)$$

The hypotheses to be established in the analysis of the unit root are presented in Equation 28 and Equation 29.

$$H_0: \delta = 0 \quad (28)$$

$$H_1: \delta < 0 \quad (29)$$

Using the two-step technique proposed by Leybourne, Newbold, and Vougas [88], unit root testing can be achieved. The t statistics of ρ obtained by the classical least squares method of estimation is used as the test statistics.

2.3. Cointegration Tests

The Kapetanios, Shin and Snell (KSS) [89] Cointegration Test from the nonlinear cointegration tests, and the Banerjee, Arčabić and Lee [90] Fourier Cointegration Test from the cointegration tests based on Fourier functions, which were used in the analysis, were explained in this part.

2.3.1. Kapetanios, Shin and Snell (KSS) Cointegration Test

Kapetanios, Shin, and Snell (KSS) [91] enhanced the Engle-Granger Cointegration Test and introduced it to the literature by applying this test to nonlinear models. The alternative hypothesis stating that there is a nonlinear long-term relationship between the variables is tested against the basic hypothesis stating that there is no cointegration relationship.

The KSS Test, in which a smooth transition is modeled using a logistic function, can be used for the variable series of *raw data, demeaned data,* and *detrended data*.

$$\Delta y_t = \text{ø} u_{t-1} + \gamma u_{t-1}\left(1 - e^{-\theta(u_{t-1}^2)}\right) + \psi' \Delta x_t + \sum_{i=1}^{p} \omega_i' \Delta z_{t-i} + \varepsilon_t \quad (30)$$

$$\Delta x_t = \sum_{i=1}^{p} \Gamma_i' \Delta z_{t-i} + \eta_t \quad (31)$$

$$\hat{u}_t = \hat{y}_t - \hat{\beta}_x' x_t \quad (32)$$

$$\Delta y_t = \delta_1 \hat{u}_{t-1} + \delta_2 \hat{u}_{t-1}^2 + \delta_3 \hat{u}_{t-1}^3 + \psi' \Delta x_t + \sum_{i=1}^{p} \omega_i' \Delta z_{t-1} + \varepsilon_t \quad (33)$$

$$H_0: \delta_1 = \delta_2 = \delta_3 = 0 \Rightarrow F_{NEC} \quad (34)$$

$$\Delta y_t = \delta_1 \hat{u}_{t-1} + \delta_3 \hat{u}_{t-1}^3 + \psi' \Delta x_t + \sum_{i=1}^{p} \omega_i' \Delta z_{t-1} + \varepsilon_t \quad (35)$$

$$H_0: \delta_1 = \delta_3 = 0 \Rightarrow F_{NEC}^* \quad (36)$$

2.3.2. Banerjee, Arčabić and Lee Fourier Cointegration Test

This test, which was introduced to the literature by Banerjee, Arčabić, and Lee [92], is a typical cointegration test expanded in Fourier terms that takes the delayed structures of both dependent and independent variables into account. The test is logically based on error correction. As presented in Equation 37 and Equation 38, the test includes constant and trend terms, the delayed value of the independent variable, and the value of its level in the previous period.

$$\Delta y_t = \alpha + \gamma_1 \sin\left(\frac{2\pi k t}{T}\right) + \gamma_2 \cos\left(\frac{2\pi k t}{T}\right) + \delta y_{t-1} + \psi' x_{t-1} + \theta' \Delta x_t + \varepsilon_t \quad (37)$$

$$\Delta y_t = \alpha + \beta_t + \gamma_1 \sin\left(\frac{2\pi k t}{T}\right) + \gamma_2 \cos\left(\frac{2\pi k t}{T}\right) + \delta y_{t-1} + \psi' x_{t-1} + \theta' \Delta x_t + \varepsilon_t \quad (38)$$

$H_0: \delta = 0$ (39)

$H_1: \delta < 0$ (40)

The equation is used to test whether the coefficient (δ) before the variable of y_{t-1} is equal to or less than zero. To put it another way, there is no cointegrating relationship in the null hypothesis, and the alternative hypothesis suggests the existence of a cointegrating relationship. What we need to do is to estimate this model and y_{t-1} test the coefficient before the variable.

3. Empirical Results

This part presents the empirical findings obtained by performing the tests described in the methodology and dataset parts. The linearity test results of the series are reported in Table 2.

Variable	**Harvey &Leybourne (2007)**	**Critical Value**	**Result**
Femicide	11.57	5.991465	H_0 Rejected
Rate	52.72	5.991465	H_0 Rejected
Variable	**Harvey, Leybourne & Xiao (2008)**	**Critical Value**	**Result**
Femicide	9.51	9.487729	H_0 Rejected
Rate	3.49	9.487729	H_0 cannotbe rejected

Table 2: Linearity Test Results

According to the results of both tests, there is nonlinearity in the femicide series. In the foreign exchange rate series, there is nonlinearity, according to the Harvey and Leybourne [93] Test, and linearity, according to Harvey, Leybourne, and Xiao [94] Test. Following the determination of the nonlinearity of the series in the linearity tests, the stationarity of the series was tested using nonlinear unit root tests. In Table 3, the findings of the analysis are presented.

Variables	**Leybourne, Newbold & Vougas (LNV) Unit Root Test**	**Critical Value**	**Result**
Femicide	-1.90520	4.825	H_0 can not be rejected. Unit root.
Rate	-0.46622	4.825	H_0 can not be rejected. Unit root.
Variables	**Harvey & Mills (HM) Unit Root Test (2002)**	**Critical Value**	**Result**
Femicide	-2.19824	6.01	H_0 cannot be rejected. Unit root.
Rate	-1.55240	6.01	H_0 cannot be rejected. Unit root.

Table 3: Stationarity Tests with Nonlinear Unit Root Tests

ADF			
Variables	**T-Statistics**	**%1, %5, %10**	**Result**
Femicide	-15.035	-3.9837, -3.4223, -3.1340	Unit Root
Rate	-16.651	-3.9834, -3.4222, -3.1339	Unit Root
PP			
Variables	**T-Statistics**	**%1, %5, %10**	**Result**
Femicide	-259.7058	-3.9832, -3.4221, -3.1339	Unit Root
Rate	-16.58659	-3.9834, -3.4222, -3.1339	Unit Root

Table 4: Stationarity Tests with Traditional Unit Root Tests

To confirm that the series that were determined to have unit roots by nonlinear unit root tests (Table 3) are stationary in I_1, the ADF and PP tests were applied by taking their first differences (Table 4). Following the determination of the stationarity of the series at I_1, cointegration tests were performed.

F Statistic	**Critical Values**	**Result**
15.24	15.07	H_0 Rejected

Table 5: Kapetanios, Shin and Snell (KSS) Cointegration Test Results

According to the results of the Kapetanios, Shin, and Snell (KSS) [95] Cointegration Test, a long-term synchronized relation was found between the foreign exchange rate and *femicide* (Table 5). Due to the provision of the precondition, which was the determination of the cointegrating relationship, the short-run causality test was performed;

Prob.	Error Correction Coefficient	Result
0.17748550	0.044197075	H_0 can not be rejected*

*0.17748550>0.05.

Table 6: Kapetanios, Shin and Snell (KSS) (2006) Causality Test Result

In the short run, no causality was determined from the exchange rate towards *femicide.* Based on the error correction coefficient (ECC), the system's rebalance ratio can be calculated by dividing the ECC by "1" (1/0.044197075). This value demonstrates that the deviation caused by a 1 percent shock in the foreign exchange rate can be balanced after 22.6 days (Table 6).

F Statistic	Critical Values	Result
-15.61680	4.27	H_0 Rejected

Table 7: Banerjee, Arčabić and Lee (2017) Fourier Coentegration Test Result

As a result of the Banerjee, Arčabić, and Lee [96] Fourier Cointegration Test, one of the cointegration tests based on Fourier functions, long-run cointegration was found between the foreign exchange rate and *femicide* (Table 7).

4. Conclusion

The current living conditions of individuals and their economic status affect their psychology and behavior. Therefore, it is very imperative to investigate the widespread and systematic violence and murders of women from an economic perspective, as well as the feminist, sociologic, criminologic, civil rights, and decolonial frameworks. It is also necessary to investigate the effects of macro-economic phenomena on the vigorous deaths of women and shape the monetary and fiscal policies based on the findings to prevent future murders.

Violence and murder of women and girls have an economic cost that cannot be measured and ignored. This cost is the loss of production, labor force, and income on a macro basis. Unemployed/prevented (and even killed) female labor potential causes a loss in the growth rates of countries. Each individual has a consumption process that starts before birth and continues as long as he/she lives. The transformation of consumption into production is important for all economies. The fact that women, who make up half of the world population, cannot find a place in employment and other fields is against all individuals and all societies and is not understandable. Political authorities and policy-makers need to shape the society with this perspective, away from individual power struggles.

This *matter*, which has turned into a serious public health problem, requires global multidisciplinary studies. Globally harmonized – based on gender equality – policies should be developed by identifying causes, costs, and potential risk factors. Rather than imposing certain groups' norms in the healthy reproduction and shaping of societies, the use of harmonized human rights, law, and scientific-based global norms is necessary on behalf of all humanity and behalf of countries. Women and girls who are subjected to violence and victims of sexual violence are not responsible for violence and *femicide/gendercide*, contrary to what some people think, perpetrators and policy-makers are responsible for the violence against women and girls and *femicide/gendercide*. All experiences are the results of the choices. For instance, as Ertürk [97], pointed out, the allocation of available resources to defense and military expenditures leads to the neglect of social development and human rights while

bringing about an increase in poverty and violence. Disintegrations and fragmentation experienced, destroyed livelihoods lead to an increase in male unemployment in some areas. Losing socio-economic status and the balance of power are tried to be compensated in the form of violence against women and girls.

As mentioned by Engelen et al. [98], based on the findings of their study, the significant and strong deterrent effect of the increase in the probability of being caught and punished should be benefitted from. Nonetheless, it is also possible to identify the factors that trigger these criminal elements and prevent them with appropriate policy practices. For this reason, it is necessary to investigate the phenomenon of violence and murder against women and girls in terms of the economy. The purpose of this study carried out from this point was to examine the existence of a relationship between the foreign exchange rate and *femicide.* The reason for choosing the foreign exchange rate among various variables to carry out the study was that exchange rates were one of the triggers of many crises. Crises lead to unemployment and poverty. The increase in the foreign exchange rate in Turkey, which has a chronic current account deficit and is dependent on foreign capital, affects various socio-economical factors in addition to growth and employment. The data on *femicide* required for conducting this study was not available; eventually, support was requested from a non-governmental organization. The daily data on *femicide* and US Dollar buying rates belonging to the period between 1 January 2019 and 29 September 2020 were obtained from the We Will Stop Femicide Platform and the Central Bank of Turkey. Various econometric analyses were performed on these data. Based on the findings of the analyses,

- A long-run cointegrating relationship was found between foreign exchange rate and *femicide.*
- It was determined that the deviation caused by a 1 percent shock in the exchange rate could reach the balance after 22.6 days.

Based on these results, maintaining the fluctuations in exchange rates under control and ensuring that they remain within a specific range is important regarding the value of the national currency, foreign trade, growth, and employment, and also in terms of preventing deaths of women and girls. This research is a contribution to the literature as it is *the first study* to reveal this subject matter empirically using current and advanced analyzes. The independence of the Central Banks, whose main task is to protect the national currency's value, and the implementation of correct policies in this direction is of *vital* importance. Policymakers have important responsibilities in preventing violence and murder of women and girls, which have become widespread and legitimized by discourses and policies. It is essential to carry out future studies investigating widespread and systematic violence against women and girls and *femicide* from an economic perspective.

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