

Non-Linear Relationship Between Remittance Inflow and Inflation in Nepal: An NARDL Approach

Dr. Dil Nath Dangal *, Aditya Pokhrel **, Renisha Adhikari ***

Abstract

This paper examines non-linear relationship between remittance inflow and inflation in Nepal on the basis of time series data. The Zivot unit-root testing, which permits a single substantial break in the model, the NARDL cointegration analysis, which was used to check for the presence of the structural break, and the examination of the long-run asymmetry connection were the econometric techniques used in the study. Findings of the study indicate being a long-term asymmetric cointegrating link between remittance inflow and inflation. It was found to be positive shocks of inflation subsequently increasing remittance inflow in Nepal. According to the asymmetric dynamic multiplier, the positive shock contributed more to raise inflation multiplier over time than that of the negative shock. The government of Nepal needs to develop a thorough plan for the efficient use of remittances initiating efficient policies. The findings of the study might be helpful to policymakers to create an effective plan for reducing inflation created by remittance inflows.

Keywords: dynamic multiplier, inflation, inflow, policymakers, remittance

JEL Classification: F24, E31

Introduction

Since a few decades ago, remittance inflow is found to be a significant source of development financing for middle- and low-income nations (World Bank, 2019). According to Chettri, KC, and Dhakal (2020), Tonga is the top-ranking country in the world for remittances as a percentage of GDP, with Nepal coming in at number four. Nepal is ranked 19th among the top countries in the world that receive remittances

* Lecturer, Department of Economics, Ratna Rajyalaxmi Campus, Tribhuvan University, Nepal.

E-mail: dangaldilnath@gmail.com

** Assistant Director, Nepal Rastra Bank, Nepal, E-mail: adityaraj.pokhrel@gmail.com

*** Assistant Director, Nepal Rastra Bank, Nepal, E-mail: renisha03@gmail.com

(Chettri et. al, 2020). Numerous remittance studies have empirically tried to relate macroeconomic and microeconomic variables such as interest rates, exchange rates, currency depreciation, labor force, GDP, poverty rate, economic growth, and inflation using these justifications. It is challenging to draw the conclusion that there is an unbalanced relationship between remittance inflow and inflation in the long and short periods, however, because the data have been equivocal (Hasan, 2008; Pant, 2017; Chamlagain, 2015; Gaudel, 2007; Chhetri et al., 2020; Maskay et al., 2020). Remittances were shown to have a favorable impact on the central bank's balance sheets and to be consistent with the "impossible trinity" theory, although there were insufficient evaluations of shocks that affected inflation (Maskay et al., 2020). In general, it was thought that the research based on co-integration (Engel Granger, Johansson, and ARDL) did not address the analysis of the asymmetric relationship (Pokhrel, 2022). The relevance of shock effects under the asymmetric behavior appears significant for that entity.

Understanding the unequal relationship between remittance inflow and inflation in Nepal is the focus of this paper. With the aid of remittance inflow, the economy of Nepal is praised for its socioeconomic benefits (Shrestha, 2022). According to World Bank (2016), Nepal receives remittances at a rate that is among the highest in the world, that is, a 28 percent when compared to the country's GDP. The country's foreign reserve is significantly increased by the remittance inflow. After exports, foreign direct investments, and official development aid, the remittance inflow is cited as an important source of foreign exchange earnings in the Quarterly Economic Bulletin [QEB] (2022) released by Nepal Rastra Bank (2022). From 1995 to 2000, the remittance was relatively stable, and from 2001 until 2020, it is expected to expand quickly. However, Covid 19 had no negative effects on the amount of remittances coming in (Nepal Rastra Bank, 2022). The remittance grew during the course of the time, while the rate of inflation appears to have reduced until 2000 before rapidly increasing after that. The remittance income has helped to raise the standard of living for the populace however according to Central Bureau of Statistics [CBS] (2011) report on the Nepal Living Standards Survey 2010/11, 79 percent of the total remittances received by households are used for daily expenses and 70 percent of the remittance incomes are used to pay off loans. Similar to how it is utilized in property for 5 percent, education for 4 percent, capital formation for 2 percent, and other uses for 3 percent of the total (CBS, 2011; Sah, 2019).

The increase of remittances is said to be linked to a number of political and socioeconomic factors. Since 1985, Nepal has pursued state-led, protectionism-based

economic policies, which were followed by the implementation of structural adjustment programs (Khanal et al., 2005; Shrestha, 2022). After the Structural Adjustment Programs were approved in the 1980s, democracy was restored and liberalization began. This led to considerable changes in Nepal's policy stances, and at that point, due to the Gulf countries' increased demand for laborers, labor migration picked up speed (Shrestha, 2008; Shrestha, 2022). After a decade-long political insurgency and subsequent political instability, a healthy income was required. After 2001, however, international labor migration and remittance inflows were important factors that affected the country's economic indicators, including GDP and inflation (Shrestha, 2022).

Between 1995 to 2020, Nepal experienced a volatile inflation. The economic blockade in 2015 drove up inflation, and the peak years for inflation were 1998, 2009, and 2016 (World Bank, 2022). After looking into the sources of inflation, Nepal Rastra Bank (2007) concluded that the inflation in India was primarily to blame for the inflation in Nepal. In the short run, a 1 percent rise in the restricted money supply resulted in an inflation increase of 0.18 percent in the same year, whereas a 1 percent increase in Indian inflation caused an inflation increase of 1.13 percent in Nepal (NRB, 2007). However, in this analysis, the impact of the remittance influx was not considered. Despite concluding that remittances increased inflation, Maskay et al. (2020) made no mention of any kind of asymmetric behavior, either in the long run or the short term.

Hence examining the asymmetric link between remittance inflow and inflation in Nepal from 1995 to 2020 is the main objective of this paper. The Nonlinear Auto Regressive Distributed Lag Model (NARDL) approach of long run/short run serves as the foundation for the analysis. The study claims that there has never been any non-linear asymmetric analysis of the variables, filling a gap in the prior theoretical foundations of the earlier scholars. In order to confirm the existence of non-linearity, it additionally applies the Zivot structural unit root test. Gregory Hansen and Kao cointegration, a type of structural break cointegration, has not, however, been applied. Future researchers will be able to evaluate a greater variety of data, apply cointegration at one or several structural breakdowns, and compare metadata on various cointegration utilizing the Bayer-Hanck cointegration technique.

Review of Literature

Hasan (2008) conducted a research on the macroeconomic determinants of remittances in Bangladesh with the objective of investigating whether the macroeconomic factors of the home and host countries could affect the remittance

inflow in Bangladesh, using time series data and log-linear form of regression. The findings suggested that macroeconomic factors of home and host countries have significant impact on remittances. Inflation rates of Bangladesh have negative relationship with remittance inflow. Interest rates and exchange rate have positive relationship with remittance. If the domestic interest rate goes up by 1 percent, on average, then the remittance will increase by 1.94 percent. The host countries GDP also showed a positive relationship with remittance.

Narayan, Narayan, and Mishra (2011) conducted a research on whether remittances induced inflation using fresh evidence from developing countries with the objective of examining the determinants of inflation in both the short run and the long run using a panel data of 54 developing countries for the period 1995-2004 and Arellano and Bond (AB, 1991) GMM estimator and the Arellano and Bover (1995) and the Blundell and Bond (1998) system GMM estimator. It was reported that remittances had a statistically significant positive effect on the inflation rate in developing countries. This indicated that remittances exerted inflationary pressures in developing countries in the long run.

Maskay, Steinkamp, and Westermann (2015) undertook a study on the impact of remittances on central bank balance sheets and inflation in Nepal with the objective of estimating the impact of remittances on inflation using Vector auto regression (VAR) framework and a quarterly data set from Nepal. The study asserted that there was positive impact of remittances on inflation.

Akhtar and Masih (2018) undertook a study on whether asymmetry mattered in the relationship between exchange rate and remittance using the evidence from a remittance recipient country based on ARDL and NARDL. The study had objective of finding out the sensitivity of remittance to exchange rate using 42 years of annual data from 1976 to 2017 of Bangladesh and time series technique of Autoregressive Distributed Lags (ARDL) and then test the linear and symmetric assumption in their relationship based on Nonlinear Auto Regressive Distributed Lag (NARDL). The findings suggested that Exchange rate significantly impacts remittance in the long run. The relationship between the exchange rate and remittance was nonlinear and asymmetric in both long and short run.

Mehta, Qamruzzaman, Serfraz, and Ali (2021) conducted a study on the nexus between uncertainty, remittances, and household's consumption using evidence from dynamic SUR application. The study had objective to examine whether remittances

asymmetrically influenced financial development in Bangladesh. The study used nonlinear unit root test, autoregressive distributed lagged (ARDL), NARDL, and asymmetric causality tests in its research methodology. The findings of the study suggested that there was the positive effect running from remittances inflow to financial development both in the long-run and short-run. The long-run association was confirmed by both linear and nonlinear ARDL estimation as well.

Al-Nassar (2021) conducted a study on whether gold could hedge against inflation in the UAE using a nonlinear ARDL analysis in the presence of structural breaks. The study aimed at exploring the role of gold as a hedge against inflation in the case of the United Arab Emirates. The study used monthly data of spot gold contract and consumer price index series over the period December 2015 to January 2021. It encompassed a unit root testing procedure for the study. It also used the tool of the cointegration analysis to run a nonlinear autoregressive distributed lag (NARDL) model. The results of the study revealed that the consumer and gold prices are cointegrated, which implied that investing in gold can hedge against inflation in the long run. The finding also suggested that the long-run asymmetry of the response of gold prices to changes in consumer prices therefore existed.

Pokhrel (2022) undertook a study on macroeconomic determinants of remittance inflow in Nepal. The study used objectives to analyze the trend of the Remittance inflow, inflation Rate, domestic rate of interest, and exchange rate and to examine the long/short causal relationship of the inflation rate, domestic rate of interest and exchange rate on the remittance inflow in Nepal. The study used technique of Vector auto regression (VAR) mechanism and Johansson co-integration technique followed by Unit root tests of the variables. The findings of the study suggested that the trend of the remittance showed that it was growing quite steep and had a positive slope of growth. The findings further suggested that the results showed positive association of remittance with exchange rate and inflation rate. It was found that the remittance, when increased or decreased by 1 percent the domestic rate of interest would decrease or increase by 1.27 percent, the exchange rate, and the inflation rate would increase or decrease by 3.36 and 1.07 percent respectively.

Theoretical Underpin, Empirical Model, and the Data

Theoretical Underpin

The Salter-Swan Corden-Dornbusch paradigm, which provides a means of understanding the theoretical relationship among capital inflows (in our case,

remittances), the price level, and the real exchange rate in developing economies, could be used to explain the relationship between remittances and inflation. According to the model, a rise in remittances could result in an appreciation of the real exchange rate through an increase in local prices. Ailed conversation about this (Choudhri & Hakura, 2006).

Similarly, Keynes (1929) was the first to discuss the so-called "Transfer Problem," which is the idea that transfers might have large consequences on receiving economies. The ongoing discussion implies that the potential effects of capital inflows on welfare are unclear and highly dependent on the characteristics of both the sending and receiving countries (Djajic, 1998).

When expatriates send substantial amounts of foreign currency home, the money is converted into local currency, which increases the amount of money in circulation. If this is not invested in capital projects or productive sectors, it goes into consumer spending, which increases inflation. Remittances increase real wealth as well, which increases spending on goods and services. Short-term excess demand is produced as a result, raising the price level. The balance of payments and the building of foreign reserves can both be used to examine the relationship between remittances and inflation. Remittances can also contribute to balance-of-payments surpluses and the building of foreign reserves. A rise in the monetary base results from central banks' failure to adequately sterilize the increase in foreign reserves. The currency rate continues to appreciate as a result of this. Prices therefore are under pressure to rise as a result. Similarly, Bugamelli and Paterno (2009) made a proposal (Narayan, Narayan, & Mishra, 2011).

Empirical Model

Remittance was utilized as the dependent variable in Hasan's (2008) analysis, and the exchange rate, interest rate, inflation rate, and GDP of the host nations were used as the independent factors. The key study factors in this research are remittance inflow and inflation, which are then replicated in a similar fashion. Remittance was the dependent variable while inflation was one of the independent factors in Jijin, Mishra, and Nithin (2021). Hasan (2008) did not discuss the asymmetric effects of inflation on remittance inflows; in contrast, Jijin et al. (2021) employed the ARDL method but did not address the asymmetric link between the variables. This study, which replicates the model used by Nassar (2021) in the UAE, attempts to examine the asymmetric relationship between inflation and gold prices. In the same study,

inflation was considered the independent variable under the study of its asymmetries, and gold prices were the dependent variable. To substantiate this, Sujit and Kumar (2011) discovered an empirically supported positive correlation between the price of gold and foreign exchange in the United Arab Emirates. Remittances from abroad have been a significant source of foreign currency in Nepal (Pant & Budha, 2016). With this in mind, the replication of Nassar (2021)'s study using remittance inflow as the dependent variable, which implies the asymmetric effect of inflation, is justified. Remittance inflow is a major source of foreign exchange in Nepal when compared to gold prices, which are a major source of foreign exchange in the UAE. The following is the proposed empirical model:

$$REM = f(INF_{POS}, INF_{NEG}) \quad (1)$$

Remittance inflow to the nation is referred to as REM, positive inflation shocks are referred to as INF_{POS} , and negative inflation shocks are referred to as INF_{NEG} . The Non-Linear Auto Regressive Distributed Lag Model (NARDL), on which the empirical framework is based, calls for the variables to be integrated either of order one, order zero, or mixed (Shin et al., 2014). Due to these, this research has additionally considered the Zivot and Andrews (1992) unit root test that allows for a single break.

The choice of the ARDL technique was driven by the ambiguity in the order of integration of the series under consideration (Pesaran et al., 2001; Nassar, 2021). The ARDL model's unconstrained error correction for this test specifies that:

$$\Delta REM_t = v + \rho_1 REM_{t-1} + \rho_2 INF_{t-1} + \sum_{i=0}^p \delta_i \Delta INF_{t-i} + \sum_{i=0}^q \phi_i \Delta REM_{t-i} + \mu_t \quad (2)$$

v is the component of drift; ρ_1 and ρ_2 are the long run multipliers, p and q are the lag lengths for ΔINF_{t-i} and ΔREM_{t-i} respectively (Nassar, 2021; Shin et al., 2014). The model is selected on the basis of Akaike Information criterion (AIC) and μ_t represents the error term. The cointegration NARDL model developed by Shin et al. (2014) encompasses the short short and long run nonlinearities with the positive and negative partial sum decompositions of the independent variable represented as $INF_{t+} = \sum_{j=1}^t \Delta INF_{j+} = \sum_{j=1}^t \max_{\{f_0\}}(\Delta INF_j, 0)$ and $INF_{t-} = \sum_{j=1}^t \Delta INF_{j-} = \sum_{j=1}^t \min_{\{f_0\}}(\Delta INF_j, 0)$ which includes the resulting decompositions into the ARDL model to produce the NARDL model in Equation 3.

$$\Delta REM_t = v + \rho_1 REM_{t-1} + \rho_2 + INF_{t-1} + \sum_{i=1}^3 - INF_{t-1} + \sum_{i=1}^p \phi_i \Delta REM_{t-i} + \sum_{i=0}^q (\delta_i + \Delta INF_{t-i} + \delta_i - \Delta INF_{t-i} + \mu_t) \quad (3)$$

The (+) and (-) represent the positive and negative partial sums of the decompositions, the coefficients ρ_{2+} and ρ_{3-} capture the long run symmetry whereas the δ_{i+} and δ_{i-} are the short run measurement of asymmetries. The long run symmetry is tested with the help of the Wald test formulating the null hypothesis as, $\rho_{2+} = \rho_{3-}$. Likewise, the short run asymmetry is tested stating the null hypothesis as, $\delta_{i+} = \delta_{i-}$, where “i” is any natural number. Upon the rejection of the long run hypothesis is rejected, the NARDL is used. The bounds test is carried by testing the null hypothesis of no cointegration where the null hypothesis is formulated as, $H_0: \rho_1 = \rho_{2+} = \rho_{3-} = 0$, against the alternative of cointegration $H_1: \rho_1 \neq \rho_{2+} \neq \rho_{3-} \neq 0$. The obtained *F* statistic is compared to the pair of critical values (upper and lower bound) which are tabulated in Pesaran et al. (2001) (Shin et al., 2014; Nassar, 2021).

The Asymmetric Dynamic Multiplier (ADM) was run following the analysis of the long-term asymmetry. The dynamic multipliers show how the *REMt* adjusts to its new long run equilibrium following the negative (*NEG*) or positive (*POS*) shock in *INFt*. The cumulative dynamic multiplier effects of *INFt+* and *INFt-* on *LE* are calculated (Pesaran et al., 2001).

$$mh_+ = \sum_{j=0}^h \Gamma REM_{t+j} \Gamma INF_{t+}, \quad mh_- = \sum_{j=0}^h \Gamma REM_{t+j} \Gamma INF_{t-}, \quad \text{for any } h = 0, 1, 2, \dots$$

In case $h \rightarrow \infty$, then $mh_+ \rightarrow -\rho_{2+}/\rho_1$ and $mh_- \rightarrow -\rho_{3-}/\rho_1$.

After developing the asymmetric long run model, the diagnostic and stability tests are performed on the final model. The Jarque-Bera Test for normal distribution, the Auto Regressive Heteroscedasticity Test, the BG LM Serial Correlation Test, the CUSUM and CUSUM sum of squares Test, and the RAMSEY Reset Test for functional stability were all performed (Gujrati, 2003).

Data

The data collection includes annual Nepalese time series data for the years 1995 to 2020 under the category of Inflation and Remittance Inflow. The information was taken from the Nepal Rastra Bank's Quarterly Economic Bulletin, 2022 (Nepal Rastra Bank, 2022). The data frame spans Nepal's transition to economic liberalization and the early effects of Covid 19.

Empirical Results

It was important to test the unit roots of the variables before the NARDL. According to Shin et al. (2014), the variables for the nonlinear analysis cannot be

integrated of the order $I(2)$. The dependent variable and the asymmetric variable used in the nonlinear analysis were both subjected to the Zivot and Andrews (1992) test.

Table 1

Results of ADF, PP, and ZA Test

| | | ADF | PP | ZA | |
|-------------|---------------------|----------|-----------|-----------|------------|
| | | t-stat | t-stat | t-stat | Break Date |
| <i>REM</i> | Constant | -2.2436 | -2.0663 | -5.1913** | 2007 |
| | Constant Plus Trend | -1.8842 | -4.1880** | -5.9740 | 2016 |
| <i>AREM</i> | Constant | -9.9761* | -9.5223* | | |
| | Constant Plus Trend | -2.3377 | -9.0530* | | |
| <i>INF</i> | Constant | -2.3285 | -2.3030 | -3.4691* | 2005 |
| | Constant Plus Trend | -2.2622 | -2.2670 | -3.2426 | 2005 |
| <i>AINF</i> | Constant | -5.4703* | -5.6331* | | |
| | Constant Plus Trend | -4.2069* | -5.4876* | | |

*Note: ADF = Augmented Dicky Fuller Test; PP = Phillip Perron Test; ZA = Zivot Andrews Unit Root Test (one break); lag length on the basis of Schwarz Information Criterion (SIC). *, **, *** denotes significance level at 1 percent, 5 percent, and 10 percent respectively*

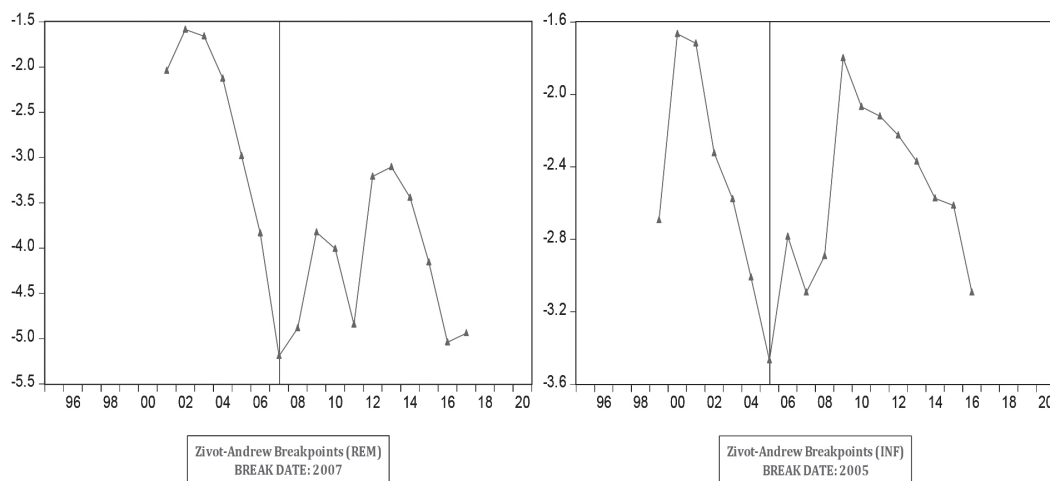
According to the results of the ADF tests, INF is integrated of order $I(1)$ at constant or at constant plus trend, but REM is stationary and integrated of order $I(1)$ at constant. The PP tests also revealed that INF was stationary at the integration of order $I(1)$ at constant or constant plus trend while REM is stationary at the order of integration at $I(1)$ on constant and at $I(0)$ on constant plus trend. Because both ADF and PP tests yield significant findings at $I(1)$ for constant only, not for constant and trend, the model with constant is only considered in this study. Tests for the ZA Breakpoint unit roots are only conducted on constants.

The REM experienced a big interruption in 2007. Figure 1 indicates that after 2007, Nepal's remittance inflow sharply increased. This may be the result of the fact that the mass people's movement came to an end in April 2006 and that the Maoist insurgency, which had lasted ten years, was put an end with the signature of the comprehensive peace treaty in September 2006 (Reuters, 2008). The year following that, the interim constitution was also drafted, restoring a number of rights and granting even more rights to residents to earn a living and live in peace (Interim Constitution of

Nepal, 2007). In addition, many young people applied for jobs abroad after the peace agreement, which caused the remittance to sharply increase. Between 2008 and 2014, the number of labor permits awarded to Nepalese seeking job abroad surged by 137 percent (Sah, 2017). In 2005, there was a break in inflation as well. Additionally, the increase in the price of petroleum products, the lag effect of the VAT rate modification in 2005, the inadequate supply due to both harsh weather conditions and the worsening law and order situation all contributed to inflationary pressure in 2006 reaching a level of 8 percent (Nepal Rastra Bank, 2007). Similar to this, since 2005, pressure on the general level of prices has been exerted by the rise in Nepali prices brought on by the global rise in the price of petroleum products, an increase in gas prices following HMG's approval of the sale and distribution of liquefied petroleum gas to the private sector, and an increase in VAT from 10 percent to 13 percent (Nepal Rastra Bank, 2005).

Figure 1

The ZA Break Graph for REM and INF



According to Pesaran et al. (2001) the model's lag selection order was based on the Akaike Information Criterion (AIC). For the investigation, the model with the lowest AIC was selected. The model selection based on the lowest AIC value (Table 2). Here, the top 3 models are considered.

Table 2

Model Selection Under AIC and BIC Criteria

| S.N | Model | logL | AIC* | BIC* | HQ | Specification |
|-----|-------|-----------|-----------|-----------|-----------|----------------|
| 1. | 10 | 47.006119 | -3.391836 | -2.996882 | -3.292507 | ARDL (1, 2 ,2) |
| 2. | 1 | 47.225961 | -3.323997 | -2.879673 | -3.212250 | ARDL (2, 2,2) |
| 3. | 8 | 42.879910 | -3.206949 | -2.910733 | -3.132451 | ARDL (2, 0, 1) |

Note: * Represents the Criteria for the Model Selection

Based on AIC and BIC, the optimal lag length was chosen. The model chosen did depend on the constant. The ideal lag choice for the model under consideration was determined by considering the lowest AIC value. Here, the best lags were determined to be 1 lag for the REM, 2 lags for INF_POS, and 2 lags for INF_NEG. The study was then advanced to the analysis of long-run co-integration and the investigation of asymmetric behavior. The presence of no serial correlation and ARCH effects in the model supported the optimality of the lags' selection, which led to the discovery that they were optimal. The functional stability Ramsey RESET test, CUSUM and CUSUM sum of squares tests, and residuals tests all supported the model with the above optimal lags. Table 4 provides a detailed presentation of these tests. And the stability of the chosen best model was ensured by the significant F test result (Table 3) and implemented with the bounds tests based on Fisher's statistics on the nonlinear category.

Table 3

Bound Test (long run)

| Test Statistic | Value | K |
|-----------------------|------------|----------|
| F- statistic | 6.263676** | 2 |
| Critical bound values | | |
| Significance | I0 bound | I1 bound |
| 10 % | 3.17 | 4.14 |
| 5 % | 3.79 | 4.85 |
| 1 % | 5.15 | 6.36 |

Note: ** Significant at 5 % Level of Significance

With the 5 % level of significance, the bound tests appeared significant. This accepted long run co integration and rejected the null hypothesis (H_0 : There is no long

run co integration relationship). The upper and lower bounds were both lower than the F-statistic values corresponding to the long-term asymmetric connection. The short run and long run coefficients were then evaluated (Table 4).

Table 4

Long Run/Short Run Coefficients

| Variables | Coefficients | Standard Error | t-stat | p-value |
|-----------------------|--------------|----------------|----------|---------|
| Long Run | | | | |
| <i>LREM</i> (-1)* | -0.27448 | 0.07092 | 2.22018 | 0.0015 |
| <i>INF_POS</i> (-1) | -0.36314 | 0.08595 | 4.22479 | 0.0007 |
| <i>INF_NEG</i> (-1) | 0.07279 | 0.05627 | 1.29353 | 0.2154 |
| Short Run | | | | |
| <i>D(INF_POS)</i> | 0.29399 | 0.13242 | 2.22018 | 0.0422 |
| <i>D(INF_POS(-1))</i> | -0.46263 | 0.14249 | -3.24661 | 0.0054 |
| <i>D(INF_NEG)</i> | -0.09333 | 0.09587 | -0.97352 | 0.3457 |
| <i>D(INF_NEG(-1))</i> | 0.21984 | 0.88355 | 2.48816 | 0.0251 |

Note: *Denotes the long run co integration (coefficient is negative and statistically significant at 1 percent and 5 percent level of significance).

The model's long run and short run coefficients are already shown (Table 4). The long-term co-integrating relationship was found to be significant at the 1 percent level of significance, indicating that the system was moving away from its short-term disequilibrium and toward equilibrium. The long-run, 1 percent level of significance revealed that the positive shocks to *INF* were statistically significant. It was discovered that while positive shocks appear to have a long-term negative impact on the dependent variable. In terms of the short run, it was observed that the dependent variable was affected by both positive and negative shocks in a negative and positive pattern, respectively. For the long-run asymmetric coefficients (Table 5).

Table 5

Long Run Asymmetric Coefficients

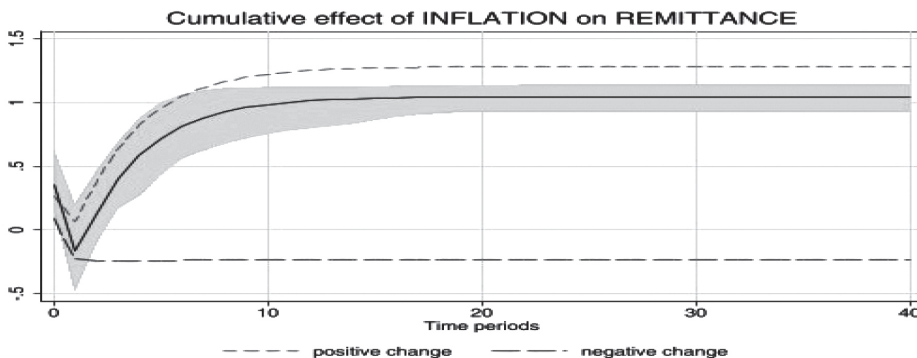
| Variable | Coefficient | Std. Error | t-statistic | p-value |
|----------------|-------------|------------|-------------|---------|
| <i>INF_POS</i> | 1.32299 | 0.21928 | 6.03308 | 0.0000* |
| <i>INF_NEG</i> | 0.26520 | 0.22238 | 1.19255 | 0.2516 |

Note: * Denotes significant at 1 percent level of significance

Hence one percent increase in inflation raised the remittance inflow by 1.32 percent, *ceteris paribus*, owing to the positive variations in inflation. This implies that the rise in inflation is always accompanied by an increase in remittance inflow whenever the government undertakes programs to boost production and lower unemployment in the economy. This happens because a good government policy increases economic activity and production, which raises prices and affects the general populace's ability to make ends meet. Since people relocate to other countries in pursuit of work to make more money as a result of the economy's rising prices, the amount of remittances they send home increases in tandem. Additionally, whenever there is a negative variation in inflation, *ceteris paribus*, a 1 percent increase in inflation reduces remittance by 0.26 percent, suggesting that the negative shocks to inflation had no effect on remittance inflow since they were statistically insignificant. When inflation climbed by 1 percent, remittance inflows tended to decline because government tends to limit economic production. Both of these occurrences take place throughout the long run.

With the aid of the stepwise least squares in a unidirectional form, the long-run asymmetries of the coefficients were tested (Shin et al., 2014). The linear limitations on the inflation coefficients were applied using the Wald test technique. The Wald test result was significant, indicating that the *INF_POS(-1)* and *INF_NEG(-1)* coefficients exhibited asymmetric behavior. At the 1 percent level of significance, the F-statistic (14.78) and Chi-Square statistic (14.78) were both deemed significant. As a result, the alternative hypothesis of long-term asymmetry was supported and the null hypothesis of long-term symmetry was rejected. The pattern of the dependent variable's adjustment to its new long-run equilibrium following a positive or negative unitary shock in the regressors was demonstrated by the asymmetric dynamic multipliers (Shin et al., 2014). For the examination of dynamic multipliers (Figure 2).

Figure 2
The Asymmetric Dynamic Multiplier

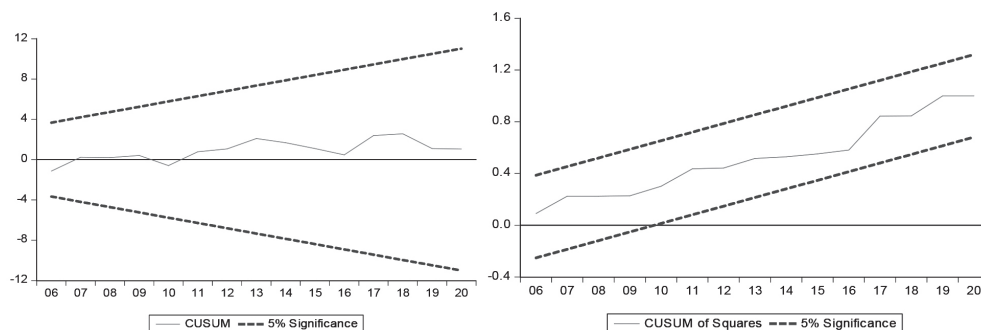


Positive shock responses were observed to be more pronounced than negative shock responses. When compared to the magnitude of the negative shock, the

magnitude of the rise in the positive shocks would have a constant effect over time. The asymmetric conduct appears to be continuously impacted by the positive shock. The long run asymmetry is significant than the threshold of 5 percent asymmetry. The stability diagnostic tests were then used to evaluate the model. First, the CUSUM and CUSUM sum of squares tests were run, which ultimately led to the results listed below:

Figure 3

CUSUM and CUSUM Sum of Squares Test



The cumulative sums and cumulative sum of squares tests showed that the nonlinear ARDL model was stable over the long run since the recursive residuals' cumulative sums and cumulative sums of squares are within the 5 percent limit that indicates the model's stability. Additionally, the RAMSEY Reset (regression equation specification test) was carried out to determine whether the functional form of the model in this situation was accurate, that is, if the model had linearity. Additionally, the RAMSEY model was a subtly used to determine whether the regressors were significant or not (Shin et al., 2014). The F-test statistic and t-test statistic were used to evaluate the null hypothesis (*Ho: The model is linear*). The F statistic was 3.3357, the t statistic was 1.8263, and both were significant at the 5 percent level of significance. It was established that the model's non-linearity and functional form were both accurate. To check whether the lag chosen for the model was the best fit, residuals tests were run. In order to test for normal distribution, the Breusch Godfrey Lagrange multiplier serial correlation test, the ARCH (auto regressive heteroscedasticity test), and the Jarque-Bera test were used. (Table 6).

Table 6

Residuals Test

| Type | | Chi-Square | <i>p</i> -value* | <i>F</i> -stat | <i>p</i> -value* | Jarque Bera | <i>p</i> -value* |
|-----------------------------------|--|------------|------------------|----------------|------------------|-------------|------------------|
| <i>BG</i> serial correlation test | | 3.6682 | 0.1598 | 1.2333 | 0.3232 | - | - |
| <i>ARCH</i> test | | 1.1910 | 0.2751 | 1.1447 | 0.2974 | - | - |
| Jarque Bera test | | - | - | - | - | 0.14617 | 0.9295 |

Note. * denotes that the *p* values were insignificant above 10 percent level

The residuals from the model did not exhibit serial correlation, and the variance of the residuals was constant along with the residuals having a normally distributed distribution, according to the *p*-values of the *BG* serial correlation test, *ARCH* test, and Jarque Bera test for normality.

Conclusion

The non-linear relationship between inflation and remittance inflows appears to have a long-run impact. With the use of the nonlinear auto regressive distributed lag model (*NARDL*), this work has sought to explore the asymmetric behavior between inflation and remittance inflow while concurrently examining the long run and short asymmetric relationship between the variables. The findings of the *NARDL* research showed an asymmetric long-run relationship between remittance inflow and inflation. According to an analysis of the data, every time the government implemented a new initiative to increase output and employment in the nation, inflation would rise, which would then result in an increase in remittance inflow. On the other hand, any supply-side restrictions or government decisions to reduce output would not have an impact on the inflation brought on by the influx of remittances. The nonlinear model's error-correction term proved to be negative and statistically significant at the 1 percent level, suggesting the likelihood of the captured adjustment parameter's convergence towards equilibrium over time. The asymmetric dynamic multipliers would probably indicate that, over time, the positive shock's contribution to the multiplier growth was greater than its contribution to the negative shock.

The study's findings somewhat agree with those of Maskay et al. (2002), and Pokhrel (2022). Partially because no researcher explained the asymmetric changes. Future studies could evaluate multiple data breakdowns and determine the association between the factors using a bigger sample size. With these findings, the research

appears to encourage the government of Nepal to create a comprehensive plan for the effective use of remittances and to introduce policies and programs that entice youth to contribute their values within the nation to increase production and employment in the country.

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