Remittance and Inflation Nexus in Nepal: An ARDL Approach

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Abstract

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Purpose: This research aims to analyze the nexus between the inflow of remittances as a share of GDP and the inflation rate along with some control variables in the context of Nepal.

Methods: The study used descriptive and causal research design. The collected data over the periods from 1990 to 2022 A.D. was analyzed by applying the ARDL model. The confirmation of model was conducted through ADF test, VAR lag length criteria. Similarly, post diagnostic check was conducted via LM test, Breusch-Pagan-Godfrey, Jarque-Bera, Ramsey RESET Test and KUSOM test.

Results: This research work reveals that there is a significant long-run positive effect of remittance on inflation as well as a negative effect of the foreign exchange rate on the inflation rate in Nepal. The result of the error correction mechanism shows that any short-run disequilibrium among the variables tends to return to their long-run equilibrium with a speed of 1.05 percent in a year.

Conclusion: The remittance inflow as a share of the GDP of Nepal has a positive relation and effect with the inflation rate of Nepal. In this regard, it is necessary to implement policies effectively to utilize the remittance earnings in productive sectors to control inflation rather than consumption by offering attractive schemes.

Keywords: ARDL, economic growth, inflation, remittance.

I. Introduction

Remittance is the income sent or transferred by migrant workers to their home country to support their families. It has been growing rapidly in the past few years and has become a vital source of foreign exchange for developing countries like Nepal. The remittance covers a large portion of financial flows to labor-exporting countries to maintain foreign exchange reserves and correct the payment balance. It implies household income from foreign inflow mainly from monetary or permanent migration (Chettri, et. al, 2020).

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Remittances are the backbone of Nepal's economy and have been a key driver of poverty reduction in the country. In the absence of easily exportable competitive goods in the international markets, remittance has become a primary source of foreign exchange. Furthermore, in comparison to other external sources such as foreign direct investment (FDI), official development assistance (ODA), private debt and portfolio equity, it is a source that is both substantial and more reliable. Since 2005, Nepal has earned more foreign exchange from remittance inflows than exports and FDI (World Bank, 2022).

Income transfer by migrant workers has been increasing in absolute terms in developing countries in relation to export revenue. On the one side, it can improve the well-being of family members, reduce poverty, increase household savings resulting from higher disposable income, attract investment, and boost the economic growth of recipient countries. On the other side, it creates dependency, lower labor participation in the recipient country, promotes conspicuous consumption, inflates prices, and accelerates environmental degradation (Calalina & Pozo, 2023).

The migration of Nepali labor to several destinations has become a common phenomenon. At the household level, the financial support of migrant family members has a significant impact on contributing to the social and economic development of the household. In between 2019/22, Nepali citizens migrated to 150 countries and Malaysia remained the preferred destination dominated by men with women migrant workers accounting for less than 10 percent of the total labor approvals issued (MoLESS, 2022).

The average remittance inflow for the last 5 years has been more than 20 percent of GDP. In the Fiscal Year 2021/22 remittance inflows accounted for 22.47 percent of GDP declined by 1.7 percent as it contributed to 22.50 percent in the previous fiscal year. Higher balance of payment deficit recorded due to rising prices of petroleum products with shrinking tourism revenue and remittance inflows (MOF, 2022).

Nepal is a low-income nation, with one-fourth of its population residing below the poverty threshold. Nepal, a disadvantaged landlocked economy, has endured significant hardships due to a decade-long Maoist insurgency (1996–2006) that exacerbated political instability, resulting in ineffective bureaucratic governance, sluggish economic growth, rampant corruption, elevated unemployment, and insufficient exposure of youth to talent development. The catastrophic earthquake of 2015 has exacerbated pollution, health insecurity, and underdevelopment in the country. Currently, it is among the least developed countries globally, with a population of approximately 27 million and a per capita GDP of US$707 (World Bank, 2017). The Nepalese people is constrained to regard foreign migration as a livelihood strategy, notably for remittances (Kunwar, 2015). The nation, with a population of 27 million, has dispatched over 10 percent of its workforce, specifically individuals aged 20 to 40, to seek employment overseas. According to official statistics, 4.8 million Nepali individuals departed from the country during the fiscal year 2017-2018 (Department of Foreign Employment, 2018). The number of Nepalese emigrants exceeds the official figures documented by the Government of Nepal (Kunwar, 2015). Nepali migrant worker departures decreased by 39.2 percent in the initial seven months of the fiscal year, in contrast to a 4.9 percent decline during the corresponding time last year (NRB, 2017). Over 3 out of every household member is employed overseas (Taguchi & Lama, 2011). Nepal ranks as the sixteenth greatest recipient of remittances. (World Bank, 2018). Remittance income in Nepal has emerged as a crucial factor for economic development. Currently, remittances as a source of foreign income have been increasing significantly each year, reaching $8.1 billion in 2022 (NRB, 2022).

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One of the causes of inflations due to an increase in money income resulting rise in demand is the money sent by migrant labor as it increases purchasing power. Macroeconomic policy aims to maintain price stability in the nation. Besides poverty reduction, increase in financial access, reducing unemployment, social and economic development, and boost the purchasing power, demand for goods. Remittance also causes inflation and disturbs economic stability which is the pre-determined objective of monetary and fiscal policy. There are very few literatures regarding the nexuses between remittance and inflation. However, some studies are conducted by using panel data of south Asian and Pacific regions. In this regard, the association between remittances and inflation was found to be positive by Upadhyay and Upadhyaya (2011) and Thung et al. (2015). But yet there is conducted a study using the ARDL model as well as incorporating control variables such as net inflow of foreign direct investment as a share of GDP, exchange rate, and growth rate of GDP. The estimation of long- and short-term impacts is possible with the ARDL model, by incorporating lagged values and their differences, it captures the dynamic interaction between variables and allows for the examination of both long-term equilibrium and short-term adjustment (Pesaran et al., 2001). Thus). Thus, the goal of the study is to examine how remittances and inflation are related to each other as well as the foreign exchange rate and net inflow of foreign direct investment

II. Reviews

There are different approaches and theories of inflation mentioned as follows. Classical economists point out price inflation as excessive growth in the quantity of money in circulation. They explain inflation is determined by money supply and money demand without referring to any other variables. The supply of a quantity of money is the factor that determines the trend of inflation, and there is a direct proportional relationship between the quantity of money and inflation (Shapiro, 2004).

On the other hand, according to the Keynesian theory of inflation, inflation is brought about when the value of aggregate demand is higher than the value of aggregate supply while the economy is operating at full employment. According to Sargent (1982), the rate of inflation increases in proportion to the size of the gap that exists between aggregate demand and aggregate supply.

However, monetarists have a different point of view concerning remittances and inflation. According to monetarists, inflation is a monetary phenomenon that takes place when there is a quicker growth in the amount of money than the real production. According to Froyen (2005), the main contributors to inflation are the expansion of the money supply and the rate of increase of the national income.

Over the years, several scholars have assessed and offered their views and opinion from empirical perspectives. Suman and Sridharan (2018) investigated the empirical relationship between remittances and the economic growth of the Indian economy using the ARDL model and time series data from 1977-2016. The findings revealed a significant positive relationship and linkage between remittance and economic growth. According to the research that has been conducted in the field of macroeconomics, remittances are inflationary due to the fact that they lead to higher levels of consumer expenditure as a result of increased income. On the other hand, when seen from the point of view of household decision-making, remittances have the potential to reduce fluctuations in spending and to alleviate inflationary pressures.

Pakistan is classified as a low-income country with substantial remittance inflows. Iqbal et al. (2013) analysed the effect of foreign remittances on inflation in Pakistan utilising time series data from 1980 to 2012. The findings of the VECM model indicated that foreign remittances exert a significant positive influence on inflation, highlighting the necessity to direct foreign remittances towards productive investments to mitigate their inflationary effects in the country. After six years,, Sagir, et.al (2019) conducted research to determine the effect of workers' remittance on long term inflation in the case of Pakistan using CPI and WPI as indicators of inflation and the market-determined exchange rate regime. The result concluded that there is the presence of one-way causality from workers' remittance to CPI and WPI causing inflation. In 2021, Syed and Rahman investigated the nexus between remittance and inflation by considering the ARDL model with linear trend and concluded that remittance and exchange rate has a significant positive impact to raise inflation whereas the real exchange rate has no impact to raise inflation.

Dahal (2022) analysed the short-term macroeconomic effects of remittances and other macroeconomic variable shocks using the SVAR model within a year. The findings indicated that the effect of remittance shock on output (GDP) is negligible, whereas remittances substantially enhance money supply and prices. In the same year, Basnet et al. (2022) investigated the impact of remittances on inflation in South Asian nations utilising panel co-integration and the Pooled Mean Technique, spanning from 1975 to 2017. The findings indicated that the inflationary effect of remittances in South Asia is reliant upon the extent of time.

Upadhyay and Upadhyaya (2011) examined the impact of remittance inflow on inflation and the real exchange rate. The research utilised panel data from five distinct South Asian nations, including Nepal. The increase in remittances exhibits a positive correlation but is statistically negligible across all nations, while real GDP growth similarly lacks a substantial impact on inflation.

Joshi (2022) analysed the impact of remittances on inflation in Nepal from 1975 to 2020 A.D. The least squares method is employed for estimate purposes. The study revealed a positive correlation between remittances and overall inflation. Additionally, remittances, money supply, import trade, and budget deficit positively influence food and beverage inflation, whereas real GDP exerts a negative impact on food and beverage inflation. Empirical research indicates that to derive benefits from remittances, it is essential to invest in productive industries by providing appealing investment options from the Government's perspective.

Byanjankar (2020) examined the macroeconomic factors influencing inflation in Nepal. The research indicated that the exchange rate positively influences prices in both the long term and short term. The devaluation of the exchange rate results in increased costs for imported items, exerting upward pressure on domestic pricing. There exists a long-run relationship between real GDP and the inflation rate at a 5 percent significance level. It also positively affects on inflation. However, there is inadequate evidence concerning the short-run relationship between real GDP and the inflation rate..

Narayan et al. (2011) analysed the factors of inflation in developing nations with a panel dataset comprising 54 countries from 1995 to 2004. The research employed the Arellano and Bond panel dynamic estimator alongside the Blundell and Bond system generalized technique of moments estimator. In underdeveloped countries, remittances induce inflation, with their impact on inflation being more significant in the long term. Additionally, openness, debt, current account deficits, the agriculture sector, and short-term U.S. interest rates positively influence inflation. The findings indicate that enhancements in democracy reduce

inflation. The economic growth rate reduces the inflation rate, whereas the lagged inflation rate positively influences current inflation.

Thung et al. (2015) investigated the relationship between remittances and inflation utilising a sample of 32 developing nations in Asia and the Pacific from 1985 to 2013 A.D. The findings from three estimate methods; Ordinary Least Squares, Two-Stage Least Squares, and Panel Generalised Method of Moments; indicate a positive correlation between remittances and inflation. The rise in remittance inflow may increase both domestic consumption and aggregate demand in an economy through a multiplier effect. This results in an increase in the inflation rate due to demand-pull inflation.On the other hand, remittance inflows increase the supply of foreign currency and then employ pressure on the decrease of the exchange rate. The fall in exchange rate causes the trade balance negative. Therefore, the central bank needs to increase the domestic money supply to buy foreign currency for raising the exchange rate. As per the Quantity theory of money, the growth of the domestic money supply leads to a rise in inflation. The study also found the positive and significant effect of the growth rate of GDP on inflation.

Mustafa (2019) examined the relationship between foreign direct investment inflow and the inflation rate in Sri Lanka. The Johansen Co-integration test revealed a long-term relationship among the variables examined in the study. The findings indicate a negative relationship between the inflow of foreign direct investment and the inflation rate.

Hossain and Masih (2018) concluded that the impact of inflow of foreign direct investment reduced the inflation rate and develop the internal economy in the case of Bangaladesh. It was caused due to the large dependency on external investment and structural ideas to develop the new and innovative project for utilizing the foreign direct investment.

Sayek (2009) contended that the multinational enterprise (MNE) is permitted to invest in both home and host economies and to finance its foreign direct investment through either domestic or foreign sources. The study findings of the study indicate that foreign direct investment serves as a hedging instrument, alleviating the impact of inflation taxes despite the absence of formal hedging strategies. The potential for investment smoothing mitigates the actual adverse impacts of inflation.

The review of the several studies reveals that there is a lack of studies examining non- linear relationship and indirect effect of consumption pattern and housing prices on inflation using ARDL and VECM models. Similarly, most of the studies have not used the variables like foreign direct investment (FDI), exchange rate and GDP growth which could provide a more comprehensive understanding of effect on inflation. Moreover, it may be an opportunity for future research to address the gap and provide more significant insight by incorporating these variables.

III. Methodology

The research employs annual time series data of inflation (INFR), serving as a proxy for the consumer price index, as the dependent variable, while remittance inflow as a percentage of gross domestic product (REM_GDP), the growth rate of gross domestic product (GDPGR), net inflow of foreign direct investment as a percentage of gross domestic product (FDI_GDP), and exchange rate (EXR) are utilised as independent variables. The data was obtained from the World Development Report from 1990 to 2022 A.D. The reason behind the span of the dataset chosen is the change in the political and economic system.

Definition and Measurement of Variables

The primary aim of this study is to assess the relationship between remittance inflow and the inflation rate in Nepal. The inflation rate serves as the dependent variable, while personal remittance inflow as a percentage of GDP, the growth rate of gross domestic product, net inflow of foreign direct investment as a percentage of GDP, and the foreign exchange rate in Nepalese currency are the independent variables. The study also aims to analyse the long-term and short-term impacts of specific independent variables on the dependent variable.

Remittances can increase aggregate demand and lead to higher consumer spending, potentially driving up prices. However, the impact of remittances on inflation depends on various factors, such as the size of remittance inflows relative to the overall economy, the absorption capacity of the economy, and the effectiveness of the monetary policy. There is a complex relationship between GDP growth rate and inflation. In general, higher GDP growth rates can lead to increase aggregate demand, may put upward pressure on prices, and contribute to inflation. Nonetheless, additional factors including productivity development, supply-side constraints, and monetary policy interventions can also affect the correlation between GDP growth rate and inflation. The inflow of foreign direct investment has both direct and indirect effects on inflation. Direct effects may arise from increased demand for goods and services, which can push up prices. Indirect effects can occur through increased investment, technology transfer, and productivity improvements, which may have a dampening effect on inflation. Exchange rate movements can impact inflation through various channels. A depreciation of the home currency might result in elevated import prices, thus exacerbating inflation and vice versa. The correlation between currency rates and inflation is affected by factors like import reliance, pass-through effects, and monetary policy reactions.

Empirical Model and Diagnostic Checking

This study employs the auto-regressive distributed lag model, deemed the superior economic strategy for scenarios involving a combination of I(0) and I(1) variables (Frimpong & Oteng, 2006). It assesses the long-term equilibrium relationship among the variables and the short-term impact via the Error Correction Term (ECT). The generalized ARDL(p, q) model of Pesaran et al. (2001) is a;

$$Y_t = \gamma_{0i} + \sum_{i=1}^{p} \delta_i Y'_{t-i} + \sum_{i=1}^{q} \beta_i X'_{t-i} + \varepsilon_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where Y'_t is a vector and the variables in $(X'_t)'$ are allowed to be purely $I(0)$ or $I(1)$ or co-integrated; β and δ are coefficients; γ is constant; i = 1, 2, 3, …, k, p, q are optimal lag orders. ε_{it} is a vector of error terms.

The generalized form of the ARDL model is as below

$\Delta INFR_t = \beta_0 + \beta_1 REM\_GDP + \beta_2 GDPGR + \beta_3 FDI\_GDP + \beta_4 EXR + \beta_5 \Delta(REM\_GDP)_{t-1} + \beta_6 \Delta(GDPGR)_{t-1} + \beta_7 \Delta(FDI\_GDP)_{t-1} + \beta_8 \Delta(EXR)_{t-1} + ECT_{t-1} \dots (2)$

To determine the optimal number of lags for each variable, a lag length test is performed by estimating a single equation of Vector Autoregressive (VAR) and applying lag length criteria. This is followed by the estimation of a single equation unrestricted Error Correction (EC) model, with the number of estimated delays specified below. This contrasts with the unrestricted error correction model referenced in equation (2), which incorporates simply lags of all variables, including the dependent variable, without differentiation.

$$\Delta INFR_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta(REM\_GDP)_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta(GDPGR)_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta(FDI\_GDP)_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta(EXR)_{t-i} + \beta_5 (REM\_GDP)_{t-1} + \beta_6 (GDPGR)_{t-1} + \beta_7 (FDI\_GDP)_{t-1} + \beta_8 (EXR)_{t-1} + v_t \dots (3)$$

In the aforementioned equation, Δ denotes the first difference operator, while p represents the optimal lag length. A Wald test is conducted on the coefficients of unconstrained ECT variables to derive F-statistics, which are utilised to assess the presence of long-run associations. The F-statistic is compared to Pesaran's crucial value at the 5% significance level. The examination entails asymptotic critical value limits contingent upon whether the variable is I(0), I(1), or a hybrid of both. Critical values for the upper and lower bounds are obtained from the I(1) and I(0) series, respectively. If the F-statistic exceeds the upper bound value, we reject the null hypothesis of no cointegration among the variables, indicating evidence of a long-run relationship among them, regardless of their sequence of integration. If it falls below the lower bound, we do not reject the null hypothesis of no cointegration; if it resides between the bounds, the outcome is inconclusive.

Upon discovering that the variables are cointegrated (indicating a long-term link), short-term disequilibrium may occur. Subsequently, the Error Correction method is employed to rectify the imbalance. The short-run dynamics are assessed using the Error Correction Term (ECT) with the designated lags outlined below;

$$\Delta INFR_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta(INFR)_{t-i} + \sum_{i=0}^{p} \beta_2 \Delta(REM\_GDP)_{t-i} + \sum_{i=0}^{p} \beta_3 \Delta(GDPGR)_{t-i} + \sum_{i=0}^{p} \beta_4 \Delta(FDI\_GDP)_{t-i} + \sum_{i=0}^{p} \beta_5 \Delta(EXR)_{t-i} + \beta_6 ECT_{t-1} \dots (4)$$

Where, ECT_{t-1} error correction term defines as given below;

$$ECT_{t-1} = \Delta INFR_t - \beta_0 - \sum_{i=1}^{p} \beta_1 \Delta(\Delta INFR)_{t-i} - \sum_{i=0}^{p} \beta_2 \Delta(REM\_GDP)_{t-i} - \sum_{i=0}^{p} \beta_3 \Delta(GDPGR)_{t-i} - \sum_{i=0}^{p} \beta_4 \Delta(FDI\_GDP)_{t-i} - \sum_{i=0}^{p} \beta_5 \Delta(EXR)_{t-i} \dots (5)$$

All coefficients in the short-run equation pertain to the model's short-run dynamics of convergence to equilibrium, while βs in equation (4) denote the pace of adjustment.

Prior to selecting this model, an Ex-Ante diagnostic assessment is performed utilising descriptive statistics and the Unit Root Test-Augmented Dickey-Fuller (ADF) test. Ultimately, an ex-post diagnostic assessment is performed, including the Jarque-Bera test for normality, the Breusch-Godfrey test for serial correlation, the Breusch-Pagan and White tests for heteroscedasticity, and the KUSUM test for stability. The Ramsey RESET test is employed to validate the accuracy of model definition.

IV. Results and Discussion

Descriptive Statistics

Table 1 depicts the descriptive statistics analysis by using descriptive statistics of selected variables between the period of 1990 to 2022 A.D. As per table 1, the average inflation during the study period is 6.68 percent and standard deviation is 2.76 percent. The average remittance inflow in the percentage of GDP between the study period is 14.81 percent and the standard deviation is 10.06 percent.

Table 1

Descriptive Statistics, 1990 – 2022 periods

Variable Statistics	INFR	REM_GDP	GDPGR	FDI_GDP	EXR
Mean	6.677931	14.81707	4.345448	0.236897	80.26731
Median	7.450000	16.79200	4.413000	0.233000	74.02000
Maximum	11.24000	27.62600	8.977000	0.677000	120.0000
Minimum	2.270000	0.977000	-2.088000	-0.098000	48.60700
Std.Dev.	2.761905	10.06813	2.280516	0.221791	20.76192
Skewness	-0.161876	-0.334881	-0.569273	0.158709	0.439053
Kurtosis	1.753574	1.474695	4.283505	1.787252	2.161447
Jarque-Bera	2.003890	3.353290	3.556938	1.898911	1.781373
Probability	0.367165	0.187000	0.168896	0.386952	0.410374
Sum					
SumSq.Dev.	193.6600	429.6950	126.0180	6.870000	2327.752
Observations	30	30	30	30	30

Note. Author's calculation using the data derived from sources described in section 3.

The average growth rate of GDP recorded 4.35 percent, the foreign direct investment inflow percentage of GDP recorded 0.24 percentage and average foreign exchange rate is recorded at 80.26. Table 1 also reveals that Jarque-Bera (JB) test with corresponding p-values, where p-value of each time series are greater than 5 percent. It indicates all the time series variables are normally distributed.

Unit Root Test

For the unit root test, the Augmented Dickey-Fuller test, which was devised by Dickey and Fuller (1979), is the one that is utilised the most commonly. Before carrying out the ARDL bound test, this test is carried out in order to verify the sequence in which each of the time series variables are integrated. If the p-value is greater than 0.05, the test will be considered to have a null hypothesis, which states that the time series data of each variable will include a unit root.

According to the findings presented in Table 2, REM_GDP and EXR are stationary at first difference, but INFR, GDPGR, and FDI_GDP are observed to be stationary at level. That the variables are of mixed order, that is, I (0) and I (1), is what it signifies. Based on the recommendations made by Pesaran and Shin (1995), the ARDL modelling is the most suitable approach to this model.

Table 2

The Results of ADF test

Variables	ADF(Constant)		ADF(Constant &Trend)		Integrated or Nonintegrated
	At level	At First-Difference	At level	At First difference	
INFR	0**	0***	0*	0***	I(0)
REM_GDP	0.70	0***	0.92	0***	I(1)
GDPGR	0***	0***	0***	0***	I(0)
FDI_GDP	0**	0**	0***	0***	I(0)
EXR	0.47	0***	0.14	0***	I(1)

Note. Author's calculation using the data derived from the sources described in section 3..
*Significant at 10%; ** Significant at 5%;*** Significant at 1% and (no) Not Significant

VAR Lag Length Selection Criteria

In order to carry out the ARDL model, it is required to determine the suitable lag length of the variables that have been chosen. Choosing appropriate lag is done with the intention of reducing residual correlation. Through the utilisation of VAR, the optimal lag is the one that possesses the lowest value as indicated by each of the criteria, which may include AIC, SIC, HQ, or FPE..

Table 3

VAR Optimal Lag Length Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-318.5239	NA	17597.58	23.96473	24.20470	24.03609
1	-220.4770	152.5174*	81.62790	18.55385	19.99367*	18.98199*
2	-191.2207	34.67416	73.70700*	18.23857*	20.87824	19.02348

Note. Author's calculation using the data derived from the sources described in section 3..

Results from Table 3, as per criteria the maximum lag length of variables are two.

Results of the ARDL Bound Test

The ARDL bound test confirms the possibility of cointegration among the time series variables i.e. INFR, REM_GDP, GDPGR, FDI_GDP, and EXR, in the framework of multivariate ARDL. Using AIC automatic lag selection criterion, the maximum lag for both dependent and independent variables is 2. The criterion proposes ARDL (1, 1, 2, 0, 1) model that has no serial correlation. Table 4 depicts the results of the ARDL bound F-test.

Table 4

ARDL Bound Test

Test Statistic	Value	K
F-statistic	11.63	4
Critical Bound Value		
Significance	I(0) Bound	I(1) Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

Note. Author's calculation by using the data derived from the sources described in section 3.

The value of the F-statistic is 11.63, as seen in Table 4. Even at the one percent level, it is higher than the upper bound critical value (that is, 3.74, 5.06). There is sufficient evidence to conclude that the null hypothesis should be rejected. The fact that this is the case indicates that there is a potential for a long-run relationship to exist between the dependent variable INFR and the independent variables REM_GDP, GDPGR, FDI_GDP, and EXR within the time frame of 1990 to 2022. This finding merely illustrates the likely relationship that exists between the variables over the long run. The results of this study are in agreement with the Suman and Sridharan (2018). Therefore, it is necessary to analyze ahead with the ARDL (1, 1, 2, 0, 1) model in order to estimate the long-run and short-run dynamics of the relationship between the INFR and selected independent variables.

Results of Long-run Estimates and Error Correction Model

This section examines the estimation of the long-run outcomes and the error correction model of the ARDL (1, 1, 2, 0, 1) model that was chosen. According to the data presented in the table, the coefficient of REM_GDP is 0.3086, which holds statistical significance at a level of one percent. The fact that there is a relationship between the REM_GDP and INFR over the long run is indicated by this. In a similar vein, it also suggests that an increase of one percent in the percentage of GDP that is comprised of remittances that are received corresponds to an increase of 0.3086 percent in the inflation rate. Syed and Rahman (2021), Sagir et al. (2019), and Iqbal et al. (2013) all agree with this result, which is consistent with their findings. This provides more evidence that a rise in the amount of remittances received in Nepal is associated with an increase in the rate of inflation even in Nepal. By virtue of the fact that the coefficient of EXR is -0.1758 and statistically significant at the one percent level, it may be concluded that there is a negative link between the exchange rate and the inflation rate over the long term.

According to the findings, a one-unit increase in the exchange rate results in a 0.1758 percent decrease in the country's overall inflation rate. These findings are in agreement with the findings of Frenkel and Johnson (1978). According to the findings of academics, in the context of the monetary approach to the balance of payment, a depreciation of the exchange rate can result in a contractionary effect on the money supply through a variety of channels. These channels include increasing the cost of imported products, reducing real income, and having an influence on the monetary base. The contractionary impact can lead to a reduction in

domestic demand, which in turn can lead to a decrease in inflation rates. On the other hand, this result does not agree with the findings of Monfared and Akin (2017).

Table 5

Long-run Results of ARDL (1, 1, 2, 0, 1) Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.06985	3.224454	4.673613	0.0002
REM_GDP	0.308674	0.056135	5.498784	0.0000
GDPGR	0.300244	0.360480	0.832899	0.4158
FDI_GDP	-1.559064	2.247033	-0.693832	0.4966
EXR	-0.175891	0.028363	-6.201453	0.0000

Note. Author's calculation using the data derived from the sources described in section 3.

Further, the results also show that the coefficient of GDPGR is 0.30 and statistically insignificant. It depicts, there is a positive relationship between the growth rate of gross domestic product and the inflation rate in Nepal but there is not sufficient evidence for confirmation. This result is consistent with Byanjankar (2020) but inconsistent with Narayan et al. (2011). Similarly, the coefficient of FDI_GDP is -1.559 but statistically insignificant. It reveals that there is a negative relationship between the net inflow of foreign direct investment as a percentage of GDP and the inflation rate but not sufficient evidence for confirmation. This result is consistent with Mustafa (2019), Hossain and Masih (2018), and Sayek (2009). As per the results, there is a significant impact of REM_GDP and exchange rate on the inflation rate of Nepal but GDPGR and FDI_GDP do not significantly affect the inflation of Nepal.

Table 6

Error Correction Representation of the ARDL (1, 1, 2, 0, 1) Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.06985	1.945555	7.745783	0.0000
D(REM_GDP)	-0.186126	0.150967	-1.232888	0.2335
D(GDPGR)	-0.002459	0.099490	-0.024713	0.9806
D(GDPGR(-1))	-0.457303	0.105984	-4.314841	0.0004
D(EXR)	0.353540	0.078694	4.492569	0.0003
Coint Eq(-1)*	-1.054178	0.125055	-8.429750	0.0000

Note. Author's calculation using the data derived from the sources described in section 3.

The table 6 further confirms the existence of a stable long-run relationship among the variables under the study by the significant error correction term (Benerjee & Mestre, 1998). The coefficient of ECT_{t-1} indicates the speed of adjustment towards long-run equilibrium. Or, to put it another way, it indicates the rate at which the deviation in the unrestricted model rebounds back to long-run values. The coefficient of ECT is -1.05, which indicates that the error correction process varies about the long-run value in a damping manner rather than monotonically converging to the equilibrium path straight. The coefficient of ECT is -1.05, implying that instead of monotonically converging to the equilibrium path directly, the error correction process fluctuates around the long-run value in a dampening manner. Such speed

of adjustment is 1.05 percent each year. The value of the coefficient, which lies between -1 to -2, produces the dampened fluctuation (Narayan & Smyth, 2006).

In addition, the short-run results demonstrate that REM_GDP and GDPGR do not have any short-run influence on the rate of inflation. This is since the coefficients of REM_GDP and GDPGR are not significant. The lagged value of GDPGR, on the other hand, has a considerable impact that is negative on the inflation rate, but the impact that EXR has on the inflation rate is significant and positive (positive).

Results of Residuals Diagnostic and Stability Check of the Model

In the following part, the results of the residual diagnostic and stability test of the estimated ARDL (1, 1, 2, 0, 1) model are shown. As can be seen in Table 7, the Breusch-Godfrey serial correlation LM test demonstrates that the residuals are not affected by the issue of serial correlation. This is due to the fact that the results of the F-version and Chi-square tests are not statistically significant. The results of the Breusch-Pagan-Godfrey heteroscedasticity test do not show any statistical significance. The presence of homoskedasticity in the model is indicated by this. Similar to the previous example, the Jarque-Bera test does not yield statistically significant results, which suggests that the residuals derived from the model follow a normal distribution.

Table 7

*Residual Diagnostic and Stability Test for the ARDL (1, 1, 2, 0, 1) Model*

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.085096	p-value F(2,16)	0.1568
Obs*R-squared	5.789007	p-value Chi-Square(2)	0.0553
Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.264820	p-value F(9,18)	0.9766
Obs*R-squared	3.273971	p-value Chi-Square(9)	0.9524
Jarque-Bera	0.072	p-value	0.9642
Functional Form: Ramsey RESET Test			
t-statistic	1.884653	p-value (17)	0.0767
F-statistic	3.551918	p-value (1, 17)	0.0767

Note. Author's calculation using the data derived from the sources described in section 3.

Furthermore, the p-value of the Ramsey RESET Test is more than the 5 percent level of significance. It depicts that the model is linear

Figure 1

Plot of CUSUM Test
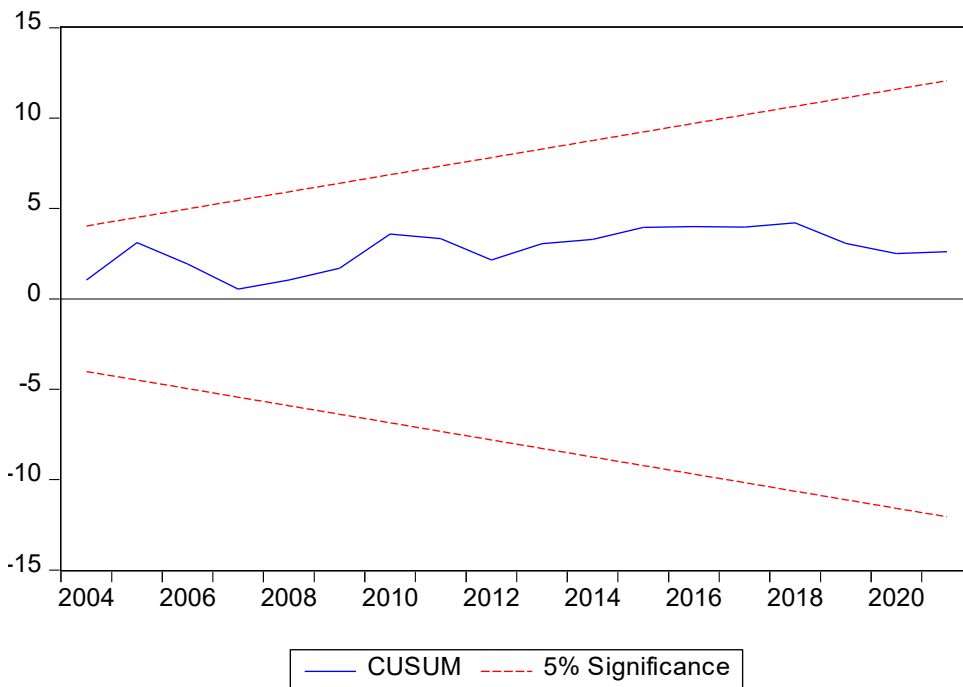
The stability of the ARDL parameters are also tested by applying the CUSUM tests developed by Brown, Durbin, and Evans (1975). Figure 1 result shows that there is stability of the ARDL model because estimated CUSUM lines are within the 5 percent critical bounds.

V. Conclusion and Implication

The study concludes that there is long-run as well as short-run relationship between remittances inflow and inflation in Nepal. Furthermore, remittances inflow in Nepal has a positive and significant effect on inflation, while changes in the exchange rate influence inflation in the opposite direction in long-run. Inflow of larger remittances is associated with the increased inflationary pressures, leading towards the rise in cost of living. In contrary, there is not found significant long-run effect of GDPGR and a net inflow of foreign direct investment on the inflation rate. The short-run results also show that REM_GDP and GDPGR have no short-run effect on the inflation rate because the coefficients of REM_GDP and GDPGR are not significant. However, the lagged value of GDPGR has a negative significant effect on the inflation rate and EXR has a positive significant effect on the inflation rate.

The positive and significant long-run effect of the inflow of remittance on inflation infers that the inflow of remittance leads to an increase in the inflation rate through the increase in consumption demand as well as the supply of money. Therefore, the government and policymakers need to focus on the policy of the use of remittance earnings in different productive sectors by offering attractive schemes. Nepal is an import-based economy. There

is a negative effect of the exchange rate on inflation, it means the increase in the foreign exchange rate (i.e. depreciation of domestic currency) leads to decrease in the inflation rate. It is because the depreciation of domestic currency increases the import price causing an increase in the rate of inflation. Therefore, the government may take the policy of import reduction through the monetary policy and trade restriction policy as well as generate the concept of a self-reliant economy. Eventhogh there is not a significant effect but a positive effect of GDPGR on inflation. As per the increase in the growth rate of gross domestic product, a rise in the inflation rate is expectable. However, the government may formulate and implement policies to control inflation at a manageable rate. Similarly, the insignificant and negative long-run effect of the inflow of foreign direct investment implies that the inflation rate in Nepal is not sensitive to the change in the inflow of foreign direct investment. The policy may be developed by the government in such a way by which inflation rate should be sensitive to the inflow of foreign direct investment. The government may implement the policy to attract large amounts of foreign direct investment by identifying the products that are most demanding in the domestic nation as well as, which can substitute the import.

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