

An Analysis of Relationship between Remittances and Inflation in Pakistan

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Abstract: *Remittances play a significant role in the economic development of recipient economy through different micro and macroeconomic channels. However, the adverse impact of remittances in the form of Dutch disease and inflation cannot be overlooked. This study aims to examine the impact of remittance on inflation and its different categories, namely, food inflation, footwear and textile inflation, housing and construction inflation. Accordingly, four vectors have been formulized to capture the determinants of overall inflation and its different categories with particular focus on remittances. The study employed Johansen (1990) and Johansen & Juselius (1990) cointegration technique to check the existence of long run relationship between remittances and inflation. Vector Error Correction technique is further applied to examine the extent and direction of relationship between variables and to check the stability of models. The results indicated the existence of one cointegrated vector for all equations. Moreover, remittances, money supply and real per capita income are found to have positive impact on inflation and its different categories. The results revealed that among different inflation categories food inflation is most effected and housing & construction inflation is least effected by remittances. Budget deficit is significant in reducing foot wear and textile inflation only. On the other hand trade openness is effective in reducing all types of inflation by same magnitude and strength. Given the inflationary nature of remittances it becomes necessary for government to channelize the remitted funds into productive investment to avoid surge in demand pull inflation.*

Keywords: remittances, Inflation, cointegration, VECM

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Introduction

Remittances play a significant role in the economic development of the recipient country. The growth enhancing effects of remittances may materialize through various macro and microeconomic channels (Balderas & Hiriyana (2005)). For instance, availability of foreign exchange reserves owing to remittances not only reduces current account deficit and external borrowing but also helps countries recover from the effects of adverse international shocks such as oil price shock and financial crises (Iqbal & Abdus (2005)). Moreover, either remitted funds are oriented toward consumption or investment, they happen to have direct bearing for economic growth. At the microeconomic level remittances helps household combat poverty and improves the income distribution in favor of the poor. By easing the credit and liquidity constraints may lead to higher level of household consumption and investment. Remittances provide self-insurance to the recipient households in times of uncertainties, economic crisis and natural disasters (Khan (2009)).

However, the adverse impact of remittance for economy cannot be overlooked. The negative effect of remittances on the receiving economy may occur in the form of Dutch disease¹, reduced incentive for recipients to work² and moral hazard problem. Remittances by increasing the supply of foreign exchange can cause the domestic currency to appreciate. This decreases the competitiveness of the traded goods sector leading to stagnation in the economy (Javaid (2009)).

More importantly remittances can cause inflation in the economy through the channel of aggregate demand. The increased money supply through the inflow of remittances stimulates the demand for goods and services, and increases consumption expenditure on goods and services. The increase in demand puts upward pressure on prices and results in demand pull inflation (Iqbal & Abdus (2005) and Nishat & Nighat (1991)). Inflation, on the other hand, has always been one of the major macroeconomic goals of stabilization policies due to its adverse consequences for the economy. It increases the cost of business and thus discourages savings and investment. It also adversely affects the consumption and harms the low and fixed income groups by reducing their purchasing power.

Given this effect of remittances on inflation which is in contradiction with the policy objective of price stability, it has become increasingly important to explore the nature of relationship between these two variables. The issue becomes even more pertinent for countries like Pakistan where inflation has become serious concern on one hand, while on the other; importance of remittances cannot be ignored.

Literature about the determinants of inflation is very vast. Numerous researches have been conducted for Pakistan revealing a variety of factors responsible for the phenomenon. However, incorporating remittances in inflation equation is relatively a new approach. The contribution of this study to literature does not remain confined

to exploring the impact of remittances on overall inflation. Rather given the diverse effect of remittances on the different expenditures categories, this research also examines the impact of remittances on food, footwear and textile and housing and construction inflation separately. Objectives of the study are given as follows:

- To examine the impact of remittances on overall inflation and its different categories namely, food inflation, footwear and textile inflation, and, housing and construction inflation.
- To specify other determinants of inflation for all categories of inflation.

To achieve these objectives time series data from 1970 to 2010 is collected. Time series econometrics techniques namely cointegration and vector error correction model are used to assess the long run relationship between inflation and its determinants.

Related Literature

Remittances can have inflationary impact on the economy if the demand generated by remittances is greater than the economic capacity to meet the demand. This proposition is empirically examined directly by few studies as the idea is relatively novel. However, numerous studies have been undertaken on the varying macroeconomic effects of remittances which have theoretically strong but indirect linkages with inflation. For instance, Irfan (1983) investigated the link between remittances and consumption and postulated the resultant effect for inflation. His study showed that remittances increase the level of consumption followed by the increase in aggregate demand through monetary expansion and result in demand pull inflation. Similarly, Zarate and Hoyos (2004) in their study revealed that with the increment in household income in the form of remittances, consumer expenditures (on housing, furniture, medical care) or investment in productive activities (like education, manufacturing, farming) increases. Resultantly, the demand for such items increases relatively more than for other items. These shifts in demand combined with price elasticity of supply may result in disproportionate changes in relative prices and overall inflation.

On the other hand, Balderas and Hiranya (2005) examined the direct effect of remittances on the distribution of relative price changes and inflation in Mexico for the time period from 1988-2005. The results were obtained through generalized impulse responses derived from the estimation of vector autoregressive model. The results indicated that remittances have a significant and positive impact on inflation and relative price variability since 1995. The evidence suggested that most of the remitted funds are spent on consumption, which through the channel of aggregate demand puts upward pressure on the prices of consumer goods and services. This fact is also

supported for Pakistan as Amjad (1986) showed that in Pakistan a major portion of remittances is spent on consumption which is 63.3% of total remitted fund.

Ball *et al.*, (2008) corroborated that the strength of relationship between remittances and inflation depends on the choice of exchange rate regime of the economy. They conducted a study to analyze the role played by exchange rate regime in determining the effects of remittances on the inflation. The analysis considered yearly and quarterly data for seven Latin American countries over the period 1980:81 to 2006:4. The study employed a panel vector autoregressive approach that controls for regime differences. The study stated that remittances can cause inflation under fixed exchange rate regime due to an increase in money supply followed by the increase in money demand. However under flexible exchange rate regime inflow of remittances have deflationary effects on the economy.

Acosta *et al.*, (2009) highlighted the fact that remittances results in decrease in labor supply which leads to an increase in production costs of the non-tradable sector, which is relatively labor intensive. This results in an increase in price of the non tradable goods and services. Iqbal and Qudus (2005) examined the effect of remittances on labor force participation also and found it to be negative. They further alleged that this may also exert upward pressure on prices attributed to supply shortages.

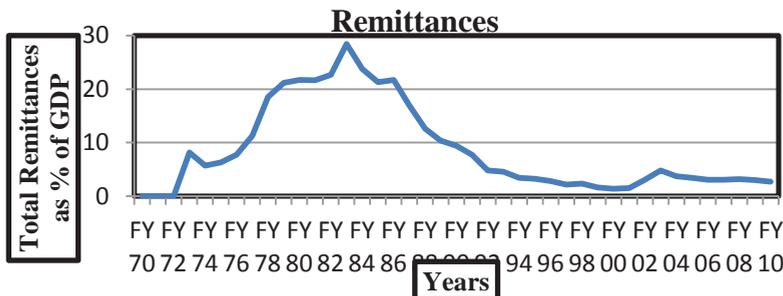
The review of the literature indicates that the inflationary nature of remittances is not yet explored for Pakistan. The present study aims to establish a direct link between inflation and remittances for Pakistan.

Descriptive Analysis

Trend of Remittances

The trend of remittances as a percentage of Gross Domestic Product is shown in Figure 1.

Figure 1: Trend of Remittances



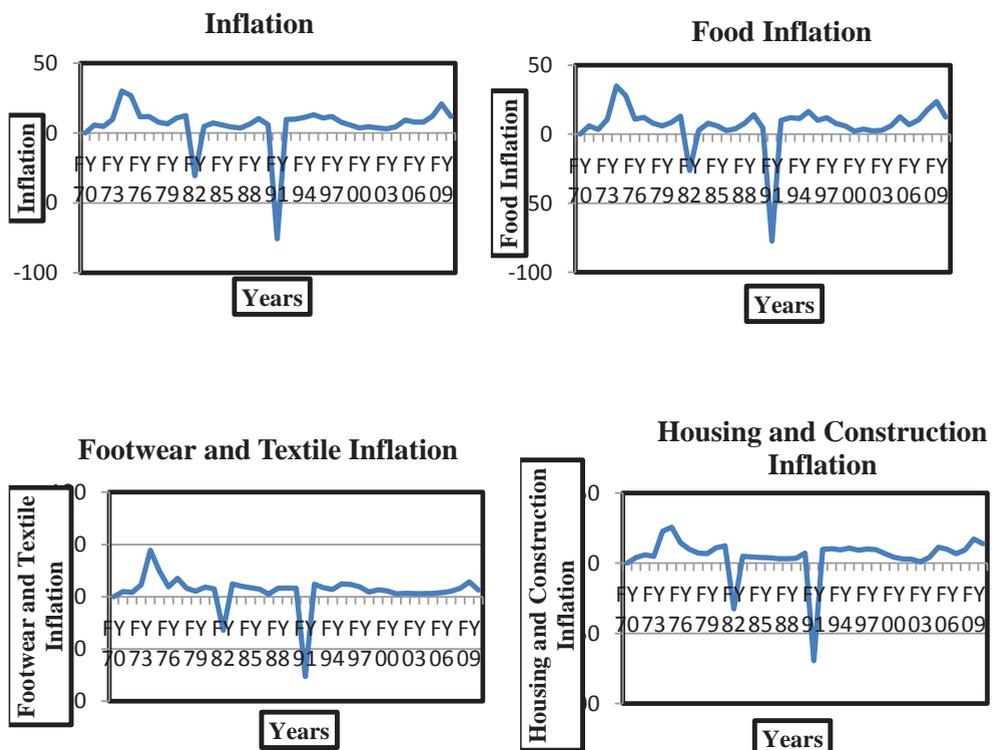
During 1970's and early 1980's remittances as a percentage of GDP followed increasing trend being highest in 1983. Afterwards it showed a declining trend while showing momentary increase in some years till 2000. In 2003 it experienced the peak value after the sluggish increase from 2000 which is followed by moderate decline from 2004-2010. Before the mid 1970s the flow of remittances to Pakistan was limited because of small number of migrants and nature of emigration. Many migrants to UK and USA were accompanied by their families so they lack the motivation to transfer money. As the number of migrants to the countries in the Middle East increased in the 1970s the amount of remittances to Pakistan also increased as Pakistani workers needed to send money back home to support their families that are left behind in the home country and to repay the debt if the cost of migration has been financed by borrowing. As the migration reduces in 1980s remittance flows also started shrinking after having reached a peak in 1983. In 1983 the amount of remittances exceeded Pakistan's export volume. The declining trend continued till 2001. The changes in the amount of remittance inflows is partially explained by the fluctuations in the number of Pakistani migrant workers and is partially explained by the excessive use of informal channels of money transfer. This activity results in a decline in the flow of remittances through official channels. The declining trend in the official remittance flows to Pakistan was reversed in September 2001 due to tough controls on the informal routes of money transfers. This led the Pakistani workers to channel money through formal transfer mechanisms. This resulted in a significant increase in the inflow of remittances recorded officially. During the last decade (2001-2010) workers' remittances to Pakistan increased (Khalid *et al.*, (2011).

A number of factors are held responsible for this increasing flow of remittances. Falling property prices, rising interest rate differential and sharp depreciation of the rupee against the dollar is attracting large amount of remittances. The increased immigration and the increasing supply of labor from Pakistan to diversified migration destinations are also contributing in the increasing inflow of remittances. Additionally the skill composition of the migrants has changed i.e. more skilled workers are migrating relative to the unskilled. The skilled workers are paid well and hence they remit more funds, resulting in an increase in the flow of remittances. With the reduction in the cost of remitting funds and the betterment of the payment systems and delivery channels the flow of remittances has increased. The increased efficiency of the financial system also attracts remittances due to the provision of better opportunities for the migrants to invest in profitable economic activities. Altruism is another important driving factor behind the inflow of remittances. The efforts taken by the government also contributed in the increasing flow of remittances. In 2009 the State Bank of Pakistan along with the Ministry of Finance and Ministry of Overseas Pakistanis launched Pakistan Remittance Initiative (PRI) for raising the flow of remittances through banking channels. This discouraged the illegal channels of money transfer and increased the services business of the commercial banks (Oda (2009)).

Inflation

In this section the trend of inflation is explained along with the causes of inflation over the time period 1970-2010. Inflation is decomposed into two broad categories namely food inflation (it represents changes in the prices of essential food items; it is the volatile component of inflation) and core inflation (it represents non food and non energy inflation; it is calculated by taking out the effect of volatile components from inflation). Core inflation is further decomposed into two sub categories namely footwear and textile inflation and housing and construction Inflation. Inflation is measured by calculating the growth rate of CPI and inflation rate for other categories is calculated by taking the growth rate of the respective price indexes. The trend of each category over the time period 1970-2010 is separately studied. The line graphs showing the trend are presented in Figure 2.

Figure 2: Trend of Inflation and its different categories



During 1970s inflation rate followed an increasing trend till 1974, being highest in the year 1974, after that it followed a declining trend till the end of the decade with a negligible increase in 1976 and 1979. During 1970s the main factor behind high

inflation rate was the inflation expectation effect. The structural changes of the government and the external oil price shocks of 1973 and 1979 also resulted in inflation.

During the 1980s inflation rate followed a declining trend with a momentary increase in some years. The 1980s was a decade of low average inflation (7.2 percent). Private sector borrowing, exchange rate depreciation and adaptive expectations were the main factors behind the growth in consumer prices. Denationalization enlarged the private sector as a result private sector borrowing increased during the period.

During the first half of 1990s the rate of inflation followed an increasing trend, however in the second half the trend was declining. In the 1990s average inflation rate increased to 9.6 percent. Liberalization policies, frequent changes in government, inconsistent policies, nuclear explosion, exchange rate depreciation and adaptive expectations and other political and economic changes were the main factors behind the surge in inflation rate.

During the first half of 2000 a declining trend was observed. In the second half of 2000 the rate of inflation followed an increasing trend. The main factors behind the increase in consumer prices are decelerating economic growth, output setbacks, loose monetary policy, inflation expectation which played a major role due to the practices like hoarding, assets price hikes and surge in house rents and depreciation of the rupee. Non government sector borrowing also contributed in causing inflation.³

Food Inflation

Food inflation is the most significant contributor of overall inflation. It adversely affects the fixed wage earners and widens the gap between the rich and the poor. During 1970s food inflation rate followed an increasing trend, being highest for the year 1974. Afterwards it followed a declining trend till 1980 with momentary increase in some years. During the 1980s the trend was mixed it increased for some years and followed a decline in others. During the 1990s the rate of inflation followed an increasing trend with the exception of the years 1996, 1998 and 1999. During the decade of 2000 it followed an increasing trend except in the year 2003 and 2006. In these years a negligible decline was observed.

Increase in food inflation rate was due to the increase in demand in comparison to the shortfall of supply. This led to an increase in the prices of a few essential items such as wheat, rice, edible oil, meat, pulses, tea, milk and fresh vegetables. The shortfall in production of some essential items was due to floods and other negative supply side shocks. Indirect taxes are also attributed to cause inflation as sales tax and excise duties increases the prices of consumer goods particularly of food products. Support price of wheat was not raised during 2001-03 which explains the low level of food inflation during this period. After 2003 the increase in food inflation rate was partially explained by the increase in wheat procurement prices, along with this

hoarding and smuggling of goods also created inflationary pressures in the economy. On the basis of the report of Finance Ministry it is concluded that the surge in food inflation was due to extraordinary increase in demand, shortage of supply, frequent adjustments in the administered prices of wheat, faulty policies of the government and market failures.⁴

Footwear and Textile Inflation

The footwear and textile inflation is the non food component of inflation. During 1970s footwear and textile inflation rate followed an increasing trend, being highest for the year 1974. Afterwards it followed a declining trend till 1980 with the exception of the year 1977. During the 1980s it followed a mixed trend; increased for some years and followed a decline in others. For majority of the years it was low. During the 1990s the rate of inflation followed a declining trend with the exception of the years 1995 and 1999. During the decade of 2000 footwear and textile inflation rate followed an increasing trend with the exception of the years 2004. In 2004 it experienced a negligible decline.

The increase in footwear and textile inflation was due to increased demand and shortfall of supply. The increase in cost of production, which is due to the energy shortages, increase in oil prices, withdrawal of petroleum and gas subsidy, rationalization of electricity tariffs and frequent adjustments in the administered prices of gas and electricity created inflationary pressures in the economy. Easy availability of credit to the private sector also played a significant role in causing inflation as it led to a significant increase in the demand of consumer goods particularly of footwear and textile items. Indirect taxes are also attributed to cause inflation as sales tax and excise duties increases the prices of consumer goods particularly of footwear and textile products. The increase in prices is attributed to the mismanagement of the fiscal policy. During the time of high world oil prices in 2009 the government excessively borrowed from the Central bank to finance the oil import bill. The excess supply of money created inflationary pressures in the economy. This sets in motion the inflation expectation effect. This effect led to a wage spiral, workers demanded high wages to compensate the decline in purchasing power due to high inflation. As a result the cost of production increased for the textile sector that compensated its losses by transferring some of the burden to the consumers. This created a vicious circle of rising prices in the economy.⁵

Housing and Construction Inflation

It is the non food component of inflation and contributes significantly in core inflation. It is less volatile in nature. During 1970s housing and construction inflation rate

followed an increasing trend, being highest for the year 1975. Afterwards it followed a declining trend till 1980. During the 1980s it followed a declining trend with the exception of the years 1981 and 1989, during these years there was a negligible increase in inflation. During the 1990s the trend was mixed; increased in one year followed by a decline in the next year. During the decade of 2000 it followed a declining trend with a momentary increase in 2004, 2005, 2008 and 2009.

The increase in housing and construction inflation is due to loose monetary policy pursued by the Central Bank. Additionally, easy availability of credit to the private sector also played a significant role in causing inflation as it led to a significant increase in the demand for housing.⁶

At present the inflow of remittances and rate of inflation both are increasing. Recently the increasing inflow of remittances is due to the reduction in the cost of remitting funds, development of the financial system and improvement in the official channels of money transfer. The surge in consumer prices is due to decelerating economic growth, output setbacks, loose monetary policy, inflation expectation, and depreciation of the rupee. The next chapter presents the review of the literature on remittances.

Methodology and Results

In this chapter the determinants of inflation are examined for Pakistan with particular focus on remittances. For the purpose of comparative analysis, along with overall inflation the determinants of food inflation, footwear and textile inflation and housing and construction inflation are also studied.

Methodology

Many researches are undertaken to encompass the determinants of inflation for Pakistan (Qayyum (2006), Kemal (2006), Khan and Abid (2010), Mohammad *et al.*, (2009) and Mukhtar, (2010)). These studies have shown mixed approach regarding the said issue. For instance the study conducted by Qayyum (2006) and Kemal (2006) have shown that inflation is a monetary phenomenon in Pakistan while Khan and Abid (2010) in their study have proved inflation to be structural in nature. The major determinants of inflation incorporated by these studies include money supply, trade openness, budget deficit, exchange rate, GDP, and support prices. To the researcher's limited knowledge none of these studies have included remittances as a potential determinant of inflation in Pakistan. The present study adds to the literature by incorporating remittances as a potential determinant of inflation in Pakistan. Moreover, in this research the determinants of different indicators of inflation, representing differ-

ent commodity groups are also studied with particular focus on remittances. For the purpose of comparative analysis the study has incorporated a series of models having four dependent variables, namely, overall inflation, food inflation, footwear and textile inflation and housing and construction inflation. The explanatory variables are remittances, money supply, real per capita income, and budget deficit and trade openness. The model is partially adopted from Qayyum (2006) and Mukhtar (2010); these studies have included money supply measured as broad money (M2), budget deficit and trade openness as major determinants of inflation respectively. The explanatory variables are kept same for all the models. The purpose of this specification was to know that price level of which commodity group is most affected by remittances. The models are presented as follows:

$$\begin{aligned}
 \text{Model 1: } inf_t &= \alpha_1 + \alpha_2 rem_t + \alpha_3 ms_t + \alpha_4 pci_t + \alpha_5 bd_t + \alpha_6 to_t + \mu_t \dots\dots\dots i \\
 \text{Model 2: } finf_t &= \beta_1 + \beta_2 rem_t + \beta_3 ms_t + \beta_4 pci_t + \beta_5 bd_t + \beta_6 to_t + \varepsilon_t \dots\dots\dots ii \\
 \text{Model 3: } tinf_t &= \gamma_1 + \gamma_2 rem_t + \gamma_3 ms_t + \gamma_4 pci_t + \gamma_5 bd_t + \gamma_6 to_t + \omega_t \dots\dots\dots iii \\
 \text{Model 4: } hinf_t &= \delta_1 + \delta_2 rem_t + \delta_3 ms_t + \delta_4 pci_t + \delta_5 bd_t + \delta_6 to_t + \epsilon_t \dots\dots\dots iv
 \end{aligned}$$

Where,

- inf_t = inflation
- $finf_t$ = food inflation
- $tinf_t$ = footwear and textile inflation
- $hinf_t$ = housing and construction inflation
- $\alpha_1, \beta_1, \gamma_1$ and δ_1 = intercept terms
- rem_t = remittances
- ms_t = money supply
- pci_t = per capita income
- bd_t = budget deficit
- to_t = trade openness
- $\mu_t, \varepsilon_t, \omega_t, \epsilon_t$ = error terms
- $t = 1, 2, 3, 4 \dots 30$

Theoretical Justification of Variables

A brief discussion on the expected relationship between the dependent and explanatory variables mentioned in the above models is presented as follows:

Remittance is an important demand side variable and is expected to affect inflation positively. At the micro level remittances serve as a direct increment in income and increase the domestic demand for goods and services which if exceeds the domestic production creates positive output gap and inflation (Khan *et al.*, (2007)). The variable is pertinent to be included in the inflation regression due to its effect both

at micro and macro level. Moreover the effect of remittances may not be uniform across all commodity groups as empirical evidences have shown that the pattern of expenditure varies by consumption categories and this affects the relative prices of different goods and services (Balderas & Hiriyana (2005)). For this reason the present study has incorporated remittances as a major determinant of overall inflation and its different categories.

Money supply is a monetary policy variable and considered to be an important determinant of inflation. There are two transmission mechanisms through which growth in supply of money affects the price level. The indirect mechanism involves the changes in interest rate and the direct mechanism works through the channel of aggregate demand. However, the effect of money supply may differ across different categories of consumption and thus have diverse effect on different categories of inflation (Qayyum (2006) & Kemal (2006)).

Real per capita income is also an important demand side variable that may determine inflation. It is expected that there exist a positive association between real per capita income and inflation again through the channel of aggregate demand.

Budget deficit is a fiscal policy variable that may determine inflation. It is expected that fiscal policy has the tendency to stimulate economic growth through expenditure expansions at the cost of higher inflation and public deficits. The government finances its budget deficit either by borrowing from domestic or international sources or by directing the Central bank to increase the money supply by printing new money. Thus, deficit financing by the government as a result of increased expenditures leads to liquidity effects and causes the aggregate demand to increase resulting in inflationary pressure in the economy (Mohammad *et al.*, (2009)).

Trade openness is an important determinant of inflation. According to Romer (1993) hypothesis inflation is low in small and open economies. Trade openness leads to increase in efficiency by reducing costs through changes in the composition of inputs employed domestically and internationally and results in efficient allocation of resources and enhances the utilization capacity. Trade openness results in rise in foreign investment which expands the production and leads to an increase in output, thus releases the pressure on prices. The cheaper imports of finished goods and intermediate goods through direct and indirect price effects lead to an overall decline in prices. In addition to this, high level of openness reduces the incentive for policy makers to pursue expansionary policies. Increased foreign competition enhances domestic productivity growth and reduces the producers' ability to push prices up resulting in a negative relation between trade openness and inflation (Mukhtar (2011), Bowdler & Luca (2006) and Lin (2010)).

There also exist evidence in support of the positive relationship between trade openness and inflation depending on the proportion of import and export in total volume of trade. Depreciation of domestic currency will occur in case where growth

rate of imports is greater than that of exports leading to higher domestic price level as explained by Pass-through phenomena (Zakaria (2010)).

The above discussion shows that all variables included in inflation regression have strong theoretical relationship with inflation and its different categories.

Data Sources and Variable Transformation

The study employs annual data for consumer price index, food price index, footwear and textile index, housing and construction index, remittances, money supply, real per capita income, budget deficit and trade openness. All the dependent and explanatory variables are taken in natural logarithm form except budget deficit and trade openness which are expressed as percentage of GDP. Logarithm of Consumer price index is used as a proxy of overall inflation rate. Remittances, money supply and per capita income are taken in real form; this is done by dividing the variable with the GDP deflator with base 2000-2001. The study covers the time period from 1970-2010. The data on all the variables is collected from the Handbook of Statistics on Pakistan Economy (2010).

Estimation and Results

The long run relationship between remittances and inflation for the time period 1970-2010 is assessed through Johansen (1998) and Johansen and Juselius (1990) cointegration technique. Cointegration is used to determine long run relationship between two or more variables that are individually non stationary but their linear combination turns out to be stationary. Johansen (1998) and Johansen and Juselius (1990) proposed two pre requisites of applying cointegration in order to get reliable results. The first step is to check the stationary properties of data. Cointegration requires all the variables to be integrated of same order. The second step is to find out the appropriate lag length.

Unit Root Test

Time series data is usually non stationary and thus is subject to spurious regression.⁷ For cointegration analysis the first step is to check the stationary properties of data. Augmented Dickey Fuller (1979) unit root test is performed to check the order of integration of each variable. The ADF test includes the estimation of the following regression: (Gujrati and Dawn (2009))

$$\Delta X_t = \alpha + \beta_t + \gamma_i X_{t-1} + \sum_{i=1}^n \phi_i \Delta X_{t-1} + \epsilon_t$$

Where X_t is the variable under consideration, Δ is the first difference operator, t captures the time trend, ε_t is the random error term and n is the maximum lag length. The optimal lag length is determined to ensure that the error term is white noise error term, while α , β , γ and δ are the parameters to be estimated. If the null hypothesis of the test $\gamma=0$ is not rejected it shows that the series under consideration has a unit root and is therefore non stationary. The results of ADF test are presented in Table 1.

Table 1: Augmented Dickey Fuller (ADF) Tests

Variables	Level t-Statistic	1 st Difference t-Statistic	Order of Integration
inf_t	0.80	-6.01*	I(1)
finf_t	0.85	-5.87*	I(1)
tinf_t	0.61	-6.23*	I(1)
hinf_t	0.89	-6.09*	I(1)
rem_t	0.39	-3.80*	I(1)
ms_t	2.16	-3.26*	I(1)
pci_t	-0.02	-6.22*	I(1)
bd_t	-0.96	-7.23*	I(1)
to_t	-0.03	-4.22*	I(1)

Note: *denotes significance at 1% level of significance.

From the results of ADF test it is evident that all the time series used in the study are stationary at first difference, this implies that they are integrated of order one.

Lag Length Criteria

The second step of cointegration analysis is to determine the optimal lag length using proper information criterions. There are two criterions namely Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC). The present study has used SC criterion, the results are quoted in Table 2

Table 2: VAR Lag Order selection Criteria

	Model 1	Model 2	Model 3	Model 4
Lag	SC	SC	SC	SC
0	14.29	14.45	14.18	14.02
1	9.08*	9.16*	9.19*	8.75*
2	10.76	10.88	10.79	10.47

Note: *denotes minimum value according to Schwartz Information Criterion.

Co Integrating Vector

The multivariate co integration test can be expressed as:

$$Z_t = K_1 Z_{t-1} + K_2 Z_{t-2} + \dots + K_{k-1} Z_{t-k} + u + v_t$$

Where Z_t ($inf_t, rem_t, ms_t, pci_t, bd_t, to_t$) i.e. a 6 x 1 vector of variables that are integrated of order one (i.e. I (1)), μ is a vector of constant and v_t is a vector of normally and independently distributed error term.

Johansen cointegration technique proposed two tests namely trace test (λ trace) and maximum eigen test (λ max) that are used to determine the existence and number of cointegrating vectors. In case of trace test the null hypothesis is number of cointegrating vectors is less than or equal to r where r=0, 1, 2, 3..., etc. In each case the null hypothesis is tested against general hypothesis. That is full rank r=n. In case of maximum eigen value test the null hypothesis of the existence of r cointegrating vectors is tested against the alternative of r+1 co integrating vectors For all of the four models under analysis these two tests indicate that there is one cointegrating vector among the six time series. The results are presented in Table 3 for all four models.

Table 3: Co integration Test Based on Johansen’s Maximum Likelihood Method

Model 1: Dependent Variable:					
Null Hypothesis	Alternate Hypothesis	Critical Values			
		0.05%	p-values*		
λ trace rank tests		Eigen values	λ trace rank value		
$H_0: r = 0$	$H_1: r = 1$	0.81	110.67 **	103.84	0.016
$H_0: r = 1$	$H_1: r = 2$	0.56	59.78	79.97	0.48
$H_0: r = 2$	$H_1: r = 3$	0.39	35.09	54.07	0.71
λ max rank tests		λ max rank value			
$H_0: r = 0$	$H_1: r > 0$	0.81	50.88**	40.95	0.002
$H_0: r \leq 1$	$H_1: r > 1$	0.56	24.69	34.80	0.46
$H_0: r \leq 2$	$H_1: r > 2$	0.39	14.88	28.58	0.82
Model 2: Dependent Variable:					
Null Hypothesis	Alternate Hypothesis	Critical Values			
		0.05%	p-values*		
λ trace rank tests		Eigen values	λ trace rank value		
$H_0: r = 0$	$H_1: r = 1$	0.82	110.06 **	103.84	0.015
$H_0: r = 1$	$H_1: r = 2$	0.55	59.35	79.97	0.50
$H_0: r = 2$	$H_1: r = 3$	0.38	35.18	54.07	0.71
λ max rank tests		λ max rank value			
$H_0: r = 0$	$H_1: r > 0$	0.82	51.61**	40.95	0.002
$H_0: r \leq 1$	$H_1: r > 1$	0.55	24.17	34.80	0.50

Model 3: Dependent Variable:					
Null Hypothesis	Alternate Hypothesis	Eigen values	λ trace rank value	Critical Values	
				0.05%	p-values*
λ trace rank tests					
$H_0: r = 0$	$H_1: r = 1$	0.80	110.63**	103.84	0.016
$H_0: r = 1$	$H_1: r = 2$	0.56	61.18	67.97	0.42
$H_0: r = 2$	$H_1: r = 3$	0.40	35.97	54.07	0.67
λ max rank tests			λ max rank value		
$H_0: r = 0$	$H_1: r > 0$	0.80	49.55**	40.95	0.004
$H_0: r \leq 1$	$H_1: r > 1$	0.56	25.20	34.80	0.43
$H_0: r \leq 2$	$H_1: r > 2$	0.40	15.65	25.58	0.76
Model 4: Dependent Variable:					
Null Hypothesis	Alternate Hypothesis	Eigen values	λ trace rank value	Critical Values	
				0.05%	p-values*
λ trace rank tests					
$H_0: r = 0$	$H_1: r = 1$	0.80	109.42**	103.84	0.02
$H_0: r = 1$	$H_1: r = 2$	0.56	59.94	79.97	0.47
$H_0: r = 2$	$H_1: r = 3$	0.38	34.72	54.07	0.73
λ max rank tests			λ max rank value		
$H_0: r = 0$	$H_1: r > 0$	0.80	49.47**	40.95	0.004
$H_0: r \leq 1$	$H_1: r > 1$	0.56	25.21	34.80	0.43

Note: ** denotes the rejection of hypothesis at the 0.05 level.

* Denotes the MacKinnon- Haug- Michelis (1991) p values.

Trace and Max- Eigen value test indicate 1 cointegrating equation at the 0.05 level.

Results of Vector Error Correction Model

The results of cointegration are interpreted through Vector Error Correction Model (VECM). It is restricted vector autoregressive model (VAR) designed to use with non stationary times series that are cointegrated of order one. It is used to capture the linear relationship among multiple time series. It adds error correction features to a multi-factor model. The error correction tells how much the error is being corrected each year in the variables. The above equation can be generated by a vector error correction model (VECM) in following form:

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \dots + \Gamma_{k-1} \Delta Z_{t-k-1} + \Pi Z_{t-1} + u + v_t$$

Where $\Gamma_i = (I - A_1 - A_2 - \dots - A_i)$, $i = 1, 2, 3, \dots, k - 1$ and $\Pi = -(I - A_1 - A_2 - A_3 - \dots - A_k)$. The coefficient matrix Π provides information about the long-run relationships among the variables in the data. Π can be factored into $\alpha\beta$ 'where α will include the speed of adjustment to the equilibrium coefficients while the β will be the long-run matrix of coefficients. The presence of r co integrating vectors between the elements

of Z implies that II is of the rank r , ($0 < r < 6$) (Mukhtar (2010)). The results of VECM are presented in Table 4.

Table 4: Vector Error Correction Model

Variable	Model 1		Model 2		Model 3		Model 4	
	Coefficients	t-Stat	Coefficients	t-Stat	Coefficients	t-Stat	Coefficients	t-Stat
rem_t	0.78*	-9.97	0.84*	9.96	0.75*	9.78	0.64*	9.14
ms_t	0.40*	-3.25	0.43*	3.32	0.40*	3.38	0.30*	2.75
pci_t	0.54*	-5.31	0.56*	5.21	0.53*	5.42	0.48*	5.36
bd_t	0.02	1.15	-0.02	-1.18	-0.04*	-2.66	-0.002	-0.15
to_t	-0.06**	2.63	-0.05**	-2.30	-0.05**	-2.58	-0.05*	-2.83
C	5.78*	3.11	-6.78*	-3.45	-5.89*	-3.31	-3.49**	-2.13
ECT	-0.49**	-2.03	-0.46*	-2.82	-0.56*	-3.21	-0.48*	-2.84
Autocorrelation LM test	LM-STAT	p-value	LM-STAT	p-value	LM-STAT	p-value	LM-STAT	p-value
	30.86	0.71	30.08	0.75	30.61	0.72	31.00	0.71
White Heterosce- dasticity test	Chi-Square	p-value	Chi-Square	p-value	Chi-Square	p-value	Chi-Square	p-value
	318.30	0.16	319.24	0.15	317.28	0.17	31.01	0.19

Note: * denotes significance at 10 percent

** denotes significance at 5 percent

*** denotes significance at 1 percent

The results suggest that 1 percent increase in remittance will cause 0.78 percent increase in overall inflation. The magnitude of this effect of remittances is highest for food inflation (0.84) and lowest for housing and construction inflation (0.64). This is because most of the migrant households belong to low or lower middle income brackets. This class in majority of the cases is the victim of malnutrition. With the increase in family income through the inflow of remittances these households immediately increase their expenditures on food. Once the basic needs are satisfied people strive to improve their standard of living. After the attainment of a reasonable standard of living people are interested in investing in real estate. Thus the demand for housing increases and consequently the price level increases (Balderas & Hiriyana (2005)). The coefficient is significant at 1 percent level of significance in all models. The results indicate that overall inflation, food inflation and footwear & textile inflation have shown approximately same magnitude of change in response to 1 percent increase in money supply .i.e. 0.40 percent. However, housing and construction inflation is relatively less responsive to changes in money supply as 1 percent increase in money supply causes housing inflation to increase by 0.30 percent. All coefficients are significant at 1 percent level of significance showing the strength of relationship between money supply and different categories of inflation. This result is in accord-

ance with the findings of Qayyum (2006), Kemal (2006) and Grauwe & Magdalena (2005). Qayyum (2006) reported in his study that there is a positive association between money growth and inflation. Kemal (2006) reinforced the findings of Qayyum (2006) and reported that inflation is a monetary phenomenon in Pakistan. The effect of money supply is positive and is highest on food inflation and is lowest on housing and construction inflation because in this case the mechanism of transmission is indirect and involves the role of interest rate.

The results show that real per capita income affects overall inflation, food inflation and footwear & textile inflation with approximately the same magnitude (0.54). However, housing & construction inflation is the least affected by changes in real per capita income as 1 percent increase in real per capita income causes housing and construction inflation to increase by 0.48 percent. The coefficient is significant at 1 percent level of significance.

The coefficient of budget deficit is insignificant in case of overall inflation, food and housing & construction inflation. It is significant in case of textile inflation only; it implies that there is a long run significant relationship between budget deficit and footwear and textile inflation. With 1 percent increase in budget deficit, 0.05 percent decline in footwear and textile inflation is observed. This is possibly due to the provision of subsidies to the textile sector, which indirectly reduces the cost of production and thus results in decline in prices.

The coefficient of trade openness carries negative sign, which shows that 1 percent increase in trade openness will cause decline in overall inflation and its categories. The coefficient is significant at 5 percent level of significance. Trade openness increases the efficiency in the allocation of resources and also results in increase in foreign direct investment. This leads to an increase in production and consequently increases the level of output. Additionally the increased foreign competition due to greater openness enhances the domestic productivity growth and results in an overall decline in price level. This result is in accordance with the findings of Mukhtar (2010), Bowdler & Luca (2005) and Lin (2010). Mukhtar (2010) in his study supported the Romer's (1993) hypothesis and stated that inflation is negatively associated with trade liberalization in Pakistan. Bowdler & Luca (2005) reinforced the findings of Mukhtar (2010) and stated that the negative relationship between trade openness and inflation holds true for OECD countries also. Lin (2010) conducted a panel study including Pakistan and reported that the relationship between trade openness and inflation is negative. Trade openness affects all the three categories of inflation negatively and with the same magnitude (0.05). This is because the degree of openness does not vary across different sectors of the economy, for a particular time period it remains same for all the sectors and therefore affect indicator of inflation with the same magnitude.

The time path of cointegrated variables is affected by any deviation in the long run equilibrium. The error correction term represents the percentage of correlation

to any deviation in the long run equilibrium and also represent the speed of correction of the deviation in the long run. The error correction term for overall inflation and its different categories is negative showing the stability of all models. Speed of correction is highest for footwear and textile inflation and lowest for food inflation. Moreover, to detect the autocorrelation and heteroscedasticity, tests are also applied on all four models. Results revealed the non-violation of no autocorrelation and homoscedasticity assumptions for all models.

Conclusion and Recommendations

This study is an attempt to determine the role of remittances in causing inflation in Pakistan. The determinants of inflation were estimated with particular focus on remittances using cointegration for the time period 1970-2010. Moreover in this research the determinants of different indicators of inflation, representing different commodity groups (food inflation, footwear & textile inflation and housing & construction) are also studied with particular focus on remittances.

The results indicate that all the explanatory variables significantly explain the changes in inflation except budget deficit which has a significant impact on footwear & textile inflation only. The regression results suggest that remittances are positively associated with inflation and other categories of inflation each representing a particular commodity group. Apart from remittances money supply and real per capita income also effect inflation positively, while trade openness has a negative effect on inflation and its different categories. The effect of all explanatory variables is highest on food inflation and is lowest on housing & construction inflation except trade openness that affects each commodity group with the same magnitude.

The finding of study suggests that we should focus on reducing excess consumption as increased demand followed by increased consumption creates positive output gaps and results in inflation. Policies should be made to direct the use of remittances in a way that these monetary flows remain beneficial for the recipient economy. Empirical evidence suggests that to have benefits from remittances it is necessary to invest these flows. Accordingly, remittances should be directed towards productive investment projects. The government may provide attractive investment opportunities to encourage the use of remittances for investment purposes rather than for consumption. One way of doing this is to increase the saving rate. Compared to the marginal propensity to consume the saving rate in Pakistan is low (Khan *et.al*, 2007). Investment environment can also be made favorable by keeping the cost of business manageable and by ensuring political and structural stability in the economy. The government may also take measure to explore new markets for man power export and to lower the cost of remitting funds through official channels in order to get stable level of remittances.

Considering the limitations of the study the reliability of the data set is worth mentioning. The study has used officially recorded data on workers' remittances, however, large proportion of remittances are transmitted through private unrecorded channels thus the level of remittances recorded officially underestimates the actual flow of remittances. Additionally, remittances can be in the form of in kind transfers which cannot be measured accurately. It is also believed that remittances are unevenly distributed across different cities of Pakistan. Some provinces or communities receive more remittances than others. Accordingly, it is useful to employ regional data on remittances but such data are not available for longer enough sample period. Due to the constraints faced by data and incomplete information regarding the number of workers abroad and total remittances sent to the economy the formulation of an appropriate policy is very difficult. Resultantly there exists a room for further research which might be able to overcome the limitations faced by this study.

NOTES

¹ Remittances can cause Dutch disease effects in the receiving economy. This is because the massive inflow of foreign currency is associated with real exchange rate appreciation. This results in loss of international competitiveness, which in turn leads to a decline in the production of manufactures and tradable goods.

² The increase in income through the inflow of remittances reduces the need and incentive to work. The increase in income sets in motion the income and substitution effect. If the income effect is dominant over substitution effect then with the increase in income the spent in labor market decreases. Depending upon the relative strength of income and substitution effect remittances may create a disincentive to work.

³ [Economic Survey of Pakistan (2008-09) and (2009-2010)].

⁴ [Economic Survey of Pakistan (2008-09) and (2009-10)].

⁵ [Economic Survey of Pakistan (2008-09) and (2009-10)].

⁶ [Economic Survey of Pakistan (2008-09) and (2009-10)].

⁷ [Mukhtar (2010)]

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