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Workers' Remittances, Resident FCAs and Kerb Premium: A Cointegration Analysis

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Abstract
This paper employs Johansen's model selection and maximum likelihood cointegration technique to analyze the relationship among workers' remittances, kerb premium and resident FCAs for Pakistan during July 1993 to December 2001. The results suggest that these variables are cointegrated from July 1993 to April 1998. However, the relationship was jolted by the two-tier exchange rate regime, freezing of FCAs and subsequent tightening of foreign exchange regulations following the nuclear tests. In addition, the causal relationship is found to flow (i) from kerb premium to remittances from the Gulf and (ii) from remittances to resident FCAs prior to nuclear tests. After that, the causal relationships reverse for the Gulf and other region. The results also indicate that higher kerb premium has a detrimental effect on remittances. The findings of this paper have implications for the future economic reforms particularly in the area of the monetary, trade, exchange and payments reforms in Pakistan with special emphasis on enhancing remittances from expatriate Pakistanis.

Author's note: I wish to thank Mr. Tasneem Alam, Analyst Research Department for carrying out extensive editorial changes. Any errors and omissions are of course mine.

Workers' remittances and resident Foreign Currency Accounts (FCAs) represent a sizeable component of Pakistan's current account inflows, and historically a large proportion of the trade and services account deficit was covered by these inflows. However, the remittances registered a sharp decline after the first half of 1980s. Slowdown in economic activity in the Gulf region (main source of remittances) during early years of 1980s explains, to some extent, the decline in formal remittances. However, as will be shown in the following section, the real contributing factor behind this decline had been the expansion and the popularity of a highly efficient informal (Hundi) channel. In addition, the commencement of resident FCAs in early 1990s further affected the formal remittances, as remitters reallocated their amount of monies sent home between remittances and resident FCAs.

There are many factors that may affect migrant workers' choice between the formal banking and the informal channel in remitting their earnings which include: socio-economic characteristics of migrant's household members, levels and types of economic activities in the sending and host countries, differential interest and exchange rates and the relative efficiency of these channels (Straubhaar 1988). In case of Pakistan, the offerings of a higher than official exchange rate coupled with quick transfer and delivery services were the prime factors, which diverted the remittances from formal banking channel to Hundi network.

The declining flow of workers' remittances through formal banking system deserves special attention because remittances serve two primary purposes: (i) these inflows are an unrequited source of foreign exchange and, (ii) remittances potentially play a major role in financing the growth of the economy (Nishat and Bilgrami 1991).[1] This paper tries to assess to what extent kerb premium and resident FCAs affect the flow of monies sent home by expatriate Pakistanis. The remainder of the paper is organized as follows. The next section describes the size and sources of workers' remittances. Section 3 compares formal channels with informal (Hundi) channels. Section 4 discusses the data and its limitation. Section 5 describes the methodology of the study. The results of the study are presented in Section 6. The final section sums up the conclusion and discusses policy implications for future economic reforms in Pakistan.

2: Size and Source of Workers' Remittances

[1] The corresponding domestic resources, which are generated through these transfers, can be used to supplement domestic investment or domestic consumption thus increasing national income.

Following the oil shock in 1974, GDP of the Gulf countries increased manifold, endowing their economies with heaps of domestic resources to initiate numerous infrastructure projects. This suddenly raised the demand for labor in the Gulf region. The extremely friendly relations among the governments of Pakistan and Gulf countries provided a labor-abundant Pakistan the opportunity to export its labor force to these countries. Due to this huge efflux of manpower, the flow of remittances that accounted for only about 18 percent of exports in FY73 rose to 74.7 percent in FY80. Workers' remittances even surpassed the export earnings in FY83 to reach US$ 2.89 billion following the second oil price shock and adoption of managed floating exchange rate in 1982. As a result, the various indicators of remittances exhibit a strong performance in the first half of 1980s as shown in **Table 1.**

Table 1: Indicators of Workers Remittances

Percent

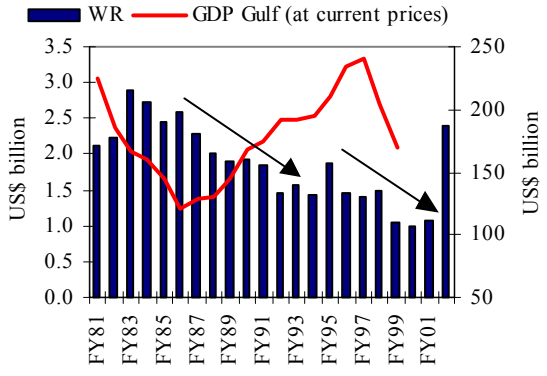
	WRB/X	WRB/M	WRB/FEE	WRB/GDP
Average				
FY81-90	76.3	37.8	35.0	7.1
FY91-00	20.0	14.9	12.5	2.6
Average				
FY81-85	96.6	42.9	42.2	8.3
FY86-90	55.9	32.8	27.7	6.0
FY91-95	24.3	17.7	14.9	3.2
FY96-00	15.7	12.1	10.1	2.1
FY96	17.6	12.2	11.4	2.3
FY97	17.4	12.5	10.9	2.3
FY98	17.7	14.5	11.1	2.4
FY99	14.1	11.0	9.4	1.8
FY00	12.0	10.2	7.7	1.6
FY01	12.1	10.6	7.6	1.8

WRB: Remittances Via banking channels; X: Exports;

M: imports; FEE: Foreign exchange earnings and nominal GDP (at factor cost).

In the second half of 1980s, all ratios of workers' remittances declined sharply amid deceleration in economic activity in the Gulf region and popularity of the Hundi channel. In order to gauge the impact of economic slowdown in Gulf on remittances, GDP of Gulf region is used as an indicator of the demand for Pakistani workers in the region. It is evident from **Figure 1** that workers' remittances have tended to decline even after the revival of Gulf economies. Furthermore, the registered number of expatriate Pakistanis into Saudi Arabia and UAE, two major contributing countries from the Gulf, also witnessed a sudden upsurge by FY87 (see **Figure 2**). This dispels the argument that falling remittances after FY83 are due mainly to the slowdown in economic activity in Gulf. What is more, the absolute inflows of remittances into many countries

Figure 1: Remittances Via Formal Channel and GDP Gulf (current prices)



increased over this period as against Pakistan, which also suggest that the remittances through formal banking channel leaked to informal Hundi channel (see **Table 2**).

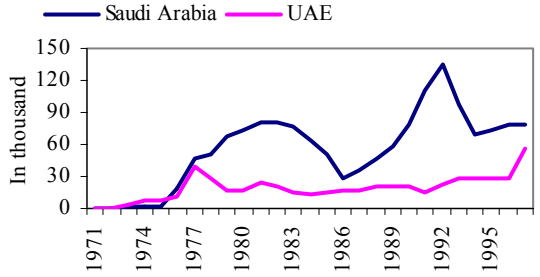
Table 2: Workers' Remittances: International Comparison
US$ million

	Pakistan	Egypt	India	Bangladesh	Jordan	Sri Lanka	Turkey	Philippines
1973	146	117	185	0	45	..	..	..
1975	220	366	490	9	167	9	1,312	..
1980	1,748	2,696	2,786	197	595	152	2,071	205
1983	2,888	3,165	2,568	576	1,110	294	1,513	180
1985	2,456	3,496	2,219	364	1,021	292	1,714	111
1990	1,942	3,743	1,668	761	500	401	3,246	262
1995	1,866	3,279	7,180	1,198	1,244	790	3,327	432
1998	1,490	3,718	9,385	1,525	1,543	999	5,356	204
1999	1,060	3,772	11,501	1,706	1,664	1,056	4,529	102

Source: Global Development Finance, Various issues.

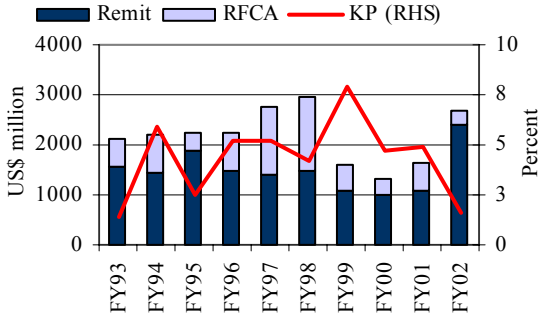
In 1990s, workers' remittances further edged down to 20.0 percent of export earnings from 76.3 percent on average in 1980s due to diversion into informal channel and resident FCAs (see **Table 1 & Figure 3**). These inflows fell to US$ 1.5 billion before the nuclear tests. Subsequent measures after the nuclear tests like the implementation of a two-tier exchange rate regime, the suspension of FCAs, coupled with the heightened uncertainty led to sharp widening of the gap between the official and the free market rates of Pak rupee. Consequently, the formal inflow of remittances declined to US$ 1 billion per annum over the period FY99-01 (see **Figure 3**). [2]

Figure 2: Number of Pakistanis Proceeded Abroad for Employment Registered by BEOE



Source: Bureau of Emmigration and Overseas Employment

Figure 3: Cummulative Inflows of Workers' Remittances and Resident FCAs



[2] SBP took various steps like the restriction on forex funding for education, travel and other services at official exchange rate, the imposition of a 30 per cent cash margin on import letters of credit, etc. which helped in reducing the uncertainty. These steps were essentially reflecting the fact that SBP would not allow free fall of the Rupee.

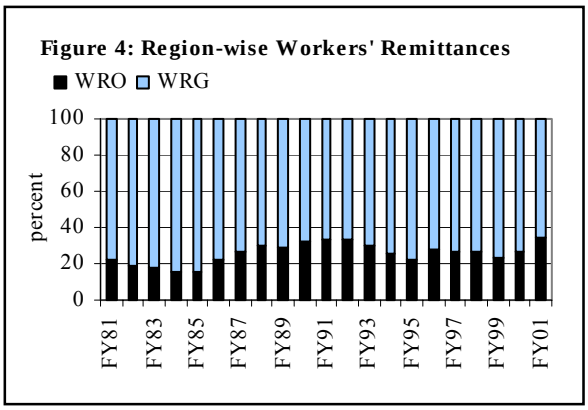
The kerb premium very much stabilized from January 1999 following the placement of an unofficial cap on the rupee/dollar parity. Despite the concerted effort of government and SBP, remittances could not, however, be recovered to pre-May 1998 level until after September 2001. Therefore, SBP had to resort to outright purchases from the kerb market in order to tap these informal flows. Though not a perfect solution to the structural imbalance, the practice was necessitated by the exigencies created in the post-nuclear period.

Recent Surge in Workers' Remittances

The tight global monitoring of financial transfers to starve terrorists of funds after the events of September 11, 2001 and the fear of associating their monies with terrorist networks forced many expatriate Pakistanis to revert back to formal banking channel. Consequently, remittances through formal channels have recently shown a tremendous increase, resulting in a collapse of the kerb premium in Pakistan. However, a breakdown analysis of the recent upsurge in remittances reveals that the increase came mainly from the USA and the UAE. Increased remittances from the USA probably reflect a reversal of capital flight for fear of possible freeze following international scrutiny. If the efforts to arrest money laundering continue then we could expect still more inflows in future. On the other hand, the increase in remittances from UAE has largely been the result of enhanced monitoring of the Hundi network by the UAE central bank. It is therefore expected that with continuing efforts to clamp down the Hundi network, these inflows would persist in coming future as well.

Region-wise analysis

A look at region-wise remittances reveals that typically bulk of these inflows come from the Gulf (see **Figure 4**). However, the share of the Gulf region in total remittances saw a sudden fall over the period 1985-91. The decline in the share of remittances from the Gulf region was associated with the maturity of Hundi network in these countries. Subsequently, the share of other region in total remittances witnessed a decline after the introduction of resident FCAs in Pakistan. The highly attractive returns on these accounts encouraged expatriate Pakistanis into diverting their earnings to these schemes.



Although the Hundi system also operates in other regions, anecdotal evidence suggests that the network in these countries is smaller and less efficient than the network in Gulf region.

This is also reflected by the fact that the premium given to remitters in these countries is not as high as offered in the Gulf region.[3]

3: Formal Vs Informal Channel

Officially transferred remittances as published in the balance of payments underestimate the actual level of remittances. Unrecorded remittances have become one of the most critical issues concerning current account in labor exporting economies. In case of Pakistan, prior to September 2001, formal channel remittances accounted for only US$ 1.5 billion per annum as against an estimate of total remittances (formal and informal) of about US$ 8.0 billion by the market participants.[4]

3.1: Forms of unrecorded remittances

The leakage of remittances takes three forms. First, migrant workers maintain some amount of their earnings in personal accounts with overseas banks for meeting children's educational expenses overseas and other expenses in the event of subsequent permanent emigration. Second, a part of unrecorded flows comprises of the hand-carried amount by the returning migrants in the form of cash and travelers cheques. Third, and the most dominant leakage into informal channel is the transfer of monies through Hundi. In a typical Hundi transaction, the migrant worker transfers a sum in foreign currency to an agent overseas under the agreement that the local moneychanger of that agent transfers the Rupee equivalent at an agreed exchange rate to the migrant's family or nominee.

3.2: Reasons for remittance leakages

Generally, informal foreign exchange markets are used when the remittance-receiving country is characterized by;

- an overvalued official exchange rate as compared to the rate offered by the informal channel.
- highly restrictive trade and exchange control system, which also generate a demand for capital flight through over-invoicing of imports and smuggling.
- lack of adequate and efficient banking facilities.

All characteristics described above are visible in case of Pakistan and influence the demand and supply condition of the informal market. A high and rising kerb premium, which enables

[3] SBP's third Quarterly Report 2001.

[4] Anecdotal evidence suggests that the total size of workers' remittances is about US$ 8 billion. The main suppliers of foreign exchange in both formal and informal markets are an estimated 3-3.5 million nonresident Pakistanis that can be classified into three categories namely workers, professionals and investors (Source: Report of Task Force on Overseas Pakistanis). On average, Pakistan received just US$ 316 per NRP in FY01 through banking channel, which is very low.

the remittances to be converted at a higher rate than formal banking channels, pushes a sizable share of remittances to flow through Hundi. In addition, the relative efficiency and additional services of the Hundi system over the commercial banks also exert a significant influence on worker's choice about the remitting channel. More specifically, Hundi dealers offer door-to-door and same day service, which is particularly welcome in remote areas.[5] Occasionally, they offer to remit the Rupee equivalent of a sum of foreign exchange to the migrant's family with the understanding that the migrant would submit the foreign exchange on an agreed date. On the demand side, high rate of return on FCAs, SBP kerb purchases and a restrictive trade and exchange payments regime created high demand for these funds in kerb market.

4: Data Description and Limitations

4.1: Data Description

This study uses monthly data on remittances (from Gulf and other region), kerb premium and resident FCAs in Pakistan from July 1993 to December 2001. Besides examining full sample characteristics, we have also performed sub-sample analyses dividing the whole data set into pre-nuclear test period (July 1993-April 1998) and post-nuclear period (May 1998-December 2001). The rationale for such an exercise is to gauge the impact of the events following nuclear tests on the relationship among remittances, kerb premium and resident FCAs. In addition, remittances were also bifurcated in terms of their origin to investigate the strength of relationship in Gulf and other than Gulf region. Since remittances from Gulf also include one-time receipts on account of Kuwait war effecties, we adjusted these numbers in order to eliminate the upward bias. We also incorporated four dummies DH, D1, D2 and D3 in our system to account for Hajj Sponsorship Scheme (HSS), and outliers in data of kerb premium, resident FCAs and recent surge in remittances from other region, particularly the USA.[6]

4.2: Data Limitations

The monthly data on kerb market exchange rate is available from July 1993.[7] Prior to 1991, only certain established firms, hotels and other organizations catering to foreign tourists were allowed to do limited money changing business. These money changers (MCs) were

[5] The licensed moneychangers work closely with a larger numbers of unlicensed dealers, who either work as middleman between the licensed dealers and the holders of foreign exchange (Pakistanis working abroad) or hunt for sellers through their direct street persuasions.

[6] Hajj Sponsorship Scheme (HSS) allows expatriates Pakistanis to sponsor a Hajj trip for a resident on payment of US$ 1,600. Since the amount generated through HSS is treated as cash remittances, it increases the official inflows in that month.

[7] Formal kerb market did not exist prior to July 1992. However, after the introduction of FEBC in 1985, the difference between the managed floating exchange rate and price of FEBC quoted at Karachi Stock Exchange Rate were used as a proxy for kerb premium. FEBCs were issued by the government, through commercial banks on

permitted to purchase foreign currency notes, coins, and travelers checks and required to surrender the same to authorized dealers on monthly basis. They were, however, not permitted to fix their exchange rates. In October 1991, SBP granted licenses to Authorized Money Changers (AMC) and subsequently allowed them to fix their own exchange rates for purchase/sale of various currency notes/coins and TCs (purchase only) from July 1992. [8]

5: Methodology

The graphical presentation of workers' remittances, kerb premium and resident FCAs suggests that their long-term movements may be related (see **Figures 5 a,b,c,d,e**). Furthermore, if we allow for short-run dynamics in long-run behavior, it would then suggest that the past changes in remittances, resident FCAs and kerb premium contain useful information for predicting their future changes. These implications can be easily examined through Johansen's multivariate cointegration and Granger-causality tests. More specifically, the modeling strategy adopted in this study involves four steps:

I. Augmented Dickey Fuller (ADF) unit root test is used to determine the order of integration of the variables;

II. Granger causality test is used to assess the direction of causation;

III. If variables are integrated of the same order, we test for cointegration by applying Johansen (1988) and Johansen and Juselius (1990) maximum likelihood estimation approach; and

IV. If the variables are cointegrated, we specify a Vector Error Correction (VEC) model and estimate it.

5.1: Testing for Unit Root

The stationarity property of each data series is investigated by testing for the presence of a unit root. The Augmented Dickey Fuller (ADF) test is used to accomplish this task. This test is based on estimating the following equation:

$$\Delta y_t = \alpha + \rho y_{t-1} + \beta T + \sum_{s=1}^{n} d_s \Delta y_{t-s} + \varepsilon_t \qquad (1)$$

payment of foreign currency; these carried an interest rate at 2 percentage points above the Eurodollar deposit rate. These carried a premium of 8 to 15 per cent on the official exchange rate in the secondary market.

[8] Initially, kerb premium witnessed a sharp decline that negatively affected AMCs business amid increasing flows in resident FCAs and the boom in Karachi Stock Exchange.

Where y_t is the relevant time series, ε_t is the residual term and T is a time trend. This test is performed on levels as well as first differences. The null hypothesis is that the variable under investigation has a unit root, against the alternative that it does not.

Figure 5a: Workers' Remittances (Adjusted) from Gulf (WRG)

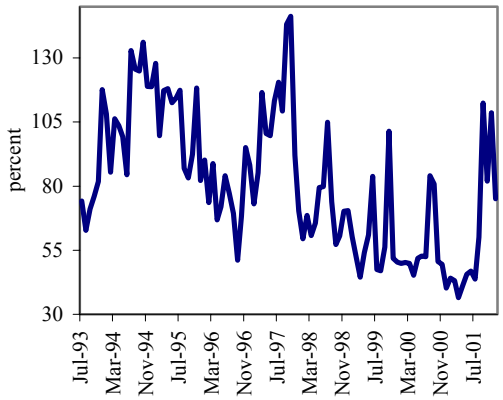


Figure 5b: Workers' Remittances from Other Region (WRO)

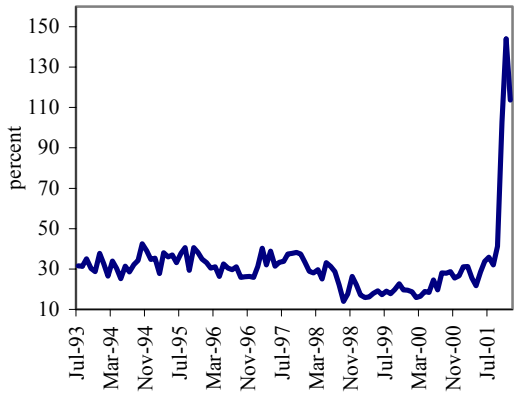


Figure 5c: Kerb Premium (KP)

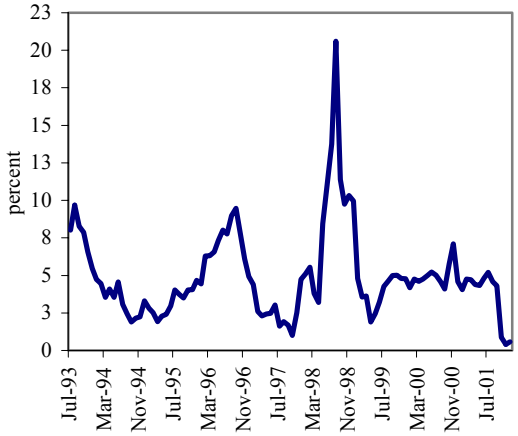


Figure 5d: Net Inflow in Resident FCAs (RFA)

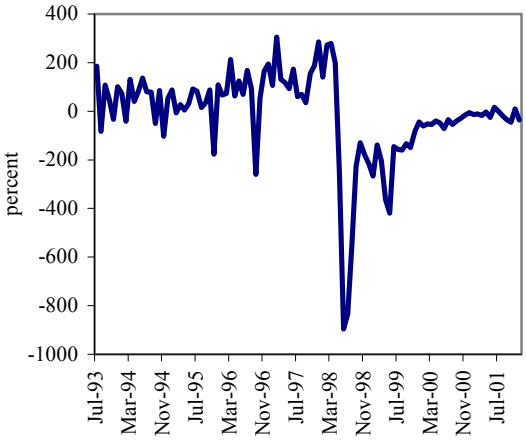
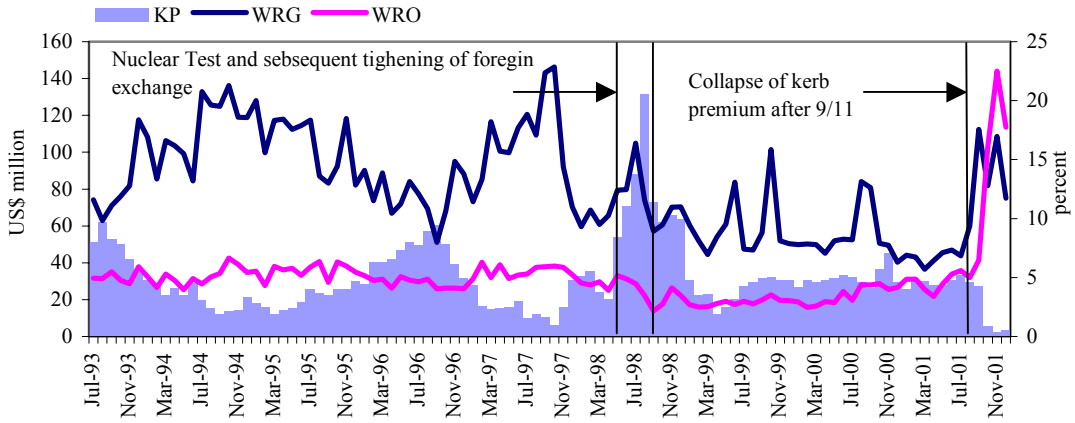


Figure 5e: Kerb Premium and Region-wise Workers' Remittances



5.2: Testing for Granger Causality

The Granger test helps to assess the direction of causation between two variables (Granger 1986,1988). The test was conducted by running bi-variate vector autoregression (VAR) on remittances, kerb premium and resident FCAs. Kerb premium is said to Granger cause remittances if lagged market premium coefficients in the remittance equation are jointly significant, and vice versa. Granger causality test is widely perceived as being sensitive to misspecification. To be precise, Granger causality test results are sensitive to the lag selection used and give no indication about the dynamics of causal relationship. Given these shortcomings of the Granger causality test, we use Johansen's cointegration technique to ascertain the nature and the strength of the relationship.

5.3: Testing for Cointegration

The cointegration technique lets the data speak for itself and suggests the type of long-run relationships of variables under consideration. Before undertaking the cointegration test, we first specify the optimal lag length (k) of the unrestricted Vector Autoregressive (VAR). The VAR approach treats every variable as endogenous in the system, which are regressed on their lagged values.[9] Consider the Vector Autoregressive (VAR) model:

$$X_t = \phi_1 X_{t-1} + \phi_2 X_{t-2} + \cdots + \phi_k X_{t-k} + \mu + \eta_t, \qquad t = 1,2,\cdots T \tag{2}$$

Where X_t is a 3×1 vector containing Resident FCAs (RFA), kerb premium (KP), and remittances. If these variables are integrated of same order, there may exist co-movements of these variables and possibilities that they will trend together towards a long-run equilibrium state. Using Granger representation theorem, we may posit the following testing relationships that constitute our Vector Error Correction (VEC) model.[10]

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \cdots + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + \mu + \eta_t, \quad t = 1,2,\cdots,T \tag{3}$$

Where ΔX_t is the vector of RFA, KP and remittances, Γs are estimable parameters, η_t is a vector of impulses which represent the unanticipated movements in X_t, with $\eta_t \sim$ niid $(0, \Sigma)$ and Π is the long-run parameter matrix.[11] With r cointegrating vectors ($1 \leq r \leq 3$), Π has rank r and can be decomposed as $\Pi = \alpha \beta'$, with α and β both $3 \times r$ matrices. The β matrix is the matrix of cointegrating parameters while α is the matrix of weights with which each

[9] In structural modeling, the empirical model is restricted to a particular functional relationship concerning the variables' behaviour.
[10] A Vector Error Correction (VEC) model is a restricted VAR that has cointegration restrictions built into the specification, so that it is designed for use with nonstationary series that are known to be cointegrated.
[11] Where niid stands for normally independently identically distributed.

cointegrating vector enters the VAR equation. In a sense, α can be viewed as the matrix of the speed of the adjustment parameters, which represent the proportion by which the long-run disequilibrium in the independent variables is corrected in each short-term period. Due to the cross-equation restrictions, it is not possible to estimate α and β using OLS. However, the maximum likelihood technique of multivariate cointegration, suggested by Johansen (1988, 1992) and Johansen and Juselius (1990), allows us to estimate the long-run or cointegrating relationship between the non-stationary variables. With this estimation technique, it is possible to: (1) estimate equation 3 as an error correction model; (2) determine the rank of Π; (3) use the rank and the most significant cointegrating vectors to form β matrix; and (4) select α such that $\Pi = \alpha \beta'$. As proved by Johansen (1991, 1992), the intercept terms in the VEC model should be associated with the existence of a deterministic linear time trend in the data. If, however, the equation does not contain a time trend, the VEC model should include a restricted term associated with the cointegrating vectors.

5.4: Vector Error Correction Mechanism

We use the following VEC model in our study:

$$\Delta LWRG_t = \theta_0 + \sum_{s=1}^{k} \theta_{1,s} \Delta LWRG_{t-s} + \sum_{s=1}^{k} \theta_{2,s} \Delta LRF_{t-s} + \sum_{s=1}^{k} \theta_{3,s} \Delta KP_{t-s} + \alpha_1 v_{t-1} + \varepsilon_{1,t}$$

$$\Delta LRF_t = \phi_0 + \sum_{s=1}^{k} \phi_{1,s} \Delta LWRG_{t-s} + \sum_{s=1}^{k} \phi_{2,s} \Delta LRF_{t-s} + \sum_{s=1}^{k} \phi_{3,s} \Delta KP_{t-s} + \alpha_2 v_{t-1} + \varepsilon_{2,t} \qquad (4)$$

$$\Delta KP_t = \delta_0 + \sum_{s=1}^{k} \delta_{1,s} \Delta LWRG_{t-s} + \sum_{s=1}^{k} \delta_{2,s} \Delta LRF_{t-s} + \sum_{s=1}^{k} \delta_{3,s} \Delta KP_{t-s} + \alpha_3 v_{t-1} + \varepsilon_{3,t}$$

Where LWRG is natural log of workers' remittances (adjusted) from Gulf, LRF is resident FCAs, KP is kerb premium while v_t is the cointegrating vector and α_1, α_2 and α_3 are the adjusting coefficients. Following Hendry's (1995) general-to-specific modeling approach, we first include all the optimal lags of the variables determined in unrestricted VAR and of the error correction term, and then gradually eliminate the insignificant variables.

6: Empirical Results

The results of time series properties of data are reported in **Table 3**. The ADF unit root test indicates that each variable has one unit root by failing to reject the null hypotheses of a unit root in the level and by rejecting the null hypotheses for the first difference of each variable at 1 percent.

Results of the Granger causality test are described in **Table 4**, which suggest that kerb premium Granger-causes workers' remittances from the Gulf over the sample period July

1993 to April 1998.[12] However, in case of remittances from other region, the causality flows in the opposite direction. Interestingly, the direction of causation reverses in the case of remittances from Gulf and kerb premium over the period May 1998 to December 2001. Notwithstanding these results, we find the evidence of a strong uni-directional causal relationship between remittances from other region and kerb premium over the full sample period. The causality is found to flow from KP to LWRO due possibly to the surge in remittances from these countries after September 2001. It is also apparent from **Table 4** that over the full sample period there exists a two-way causality between kerb premium and remittances from the Gulf.

Table 3: Unit Root Test

Variable	Augmented Dickey Fuller Test		Order of integration
	Level	First Diff.	
Sub sample I: July 1993 to April 1998			
KP	-2.85(1)	-6.37**	I(1)
LWRG	-2.84	-8.77**	I(1)
LWRO	-3.01(1)	-7.93(1)**	I(1)
LRF	-1.46(3)	-10.40(1)**	I(1)
Sub sample II: May 1998 to December 2001			
KP	-2.16(1)	-5.19(1)**	I(1)
LWRG	-2.82(2)	-5.75(2)**	I(1)
LWRO	-2.06(2)	-5.43(2)**	I(1)
LRF	-3.48(2)*	-5.25(2)**	I(1)
Full sample: July 1993 to December 2001			
KP	-1.80(1)	-7.23(1)**	I(1)
LWRG	-0.11(1)	-9.14(1)**	I(1)
LWRO	-2.48(2)	-7.98(2)**	I(1)
LRF	-2.72	-13.07(0)**	I(1)

**, * indicate significance at 1 % and 5 % respectively.

Table 4: Pair-wise Granger Causality Tests

Null Hypothesis:	n	F-value	P-value	n	F-value	P-value	n	F-value	P-value
	July 1993-April 1998			May 1998-Dec. 2001			July 1993 to Dec. 2001		
KP does not Granger Cause LWRG	48	1.85	0.10	44	1.39	0.25	90	1.95	0.04
LWRG does not Granger Cause KP		1.00	0.47		1.80	0.12		1.89	0.05
KP does not Granger Cause LWRO	48	1.31	0.28	44	1.95	0.09	90	2.54	0.01
LWRO does not Granger Cause KP		2.37	0.04		1.49	0.21		0.59	0.84
LRF does not Granger Cause LWRG	47	1.07	0.42						
LWRG does not Granger Cause LRF		1.45	0.21						
LRF does not Granger Cause LWRO	47	0.50	0.88						
LWRO does not Granger Cause LRF		1.00	0.47						
LRF does not Granger Cause KP	47	0.95	0.50						
KP does not Granger Cause LRF		1.00	0.47						

Before applying the Johansen's procedure to α and β, it is necessary to determine the lag length, k, of the VAR equation (2), which should be high enough to ensure that the errors are approximately white noise, but small enough to allow estimation. Since the Johansen's procedure is sensitive to the choice of the lag length, selection of the appropriate lag length is crucial for estimation of cointegration equation. Based on the Akiake's Final Prediction Error

[12] Granger causality test is performed on pair-wise basis, in which we test whether one independent variable with their optimal lags jointly granger cause dependent variables, and vice versa, using F test. Granger causality test results are sensitive to the lag selection used and give no indication about the dynamics of causal relationship.

(FPE) criterion we select k=10 for all system of equations i.e. (i) LWRG, KP, and LRF, and (ii) LWRO, KP, LRF in case of sub-sample I. While in case of full sample and sub-sample II, the optimal lag length is found to be 12. The diagnostic test for normality and serial correlation in residuals for each of these equations in the VAR system is reported in Appendix **Table A1**.[13] The results indicate that the residuals are approximately normally independently identically distributed (niid) for all equations at selected lag length. [14]

After determining the lag length of VAR and diagnostic check of respective residuals, the next step is to determine the rank of the cointegrating vectors. On the basis of Johansen's cointegration technique, which uses maximum eigenvalue (λ max) and the trace statistics, we determine the rank of the cointegrating vectors (see **Table 5)**. As can be noticed, both the λ max and the trace statistics suggest the existence of a unique vector in case of three-variable system; LWRG, KP and LRF and LWO, KP and LRF over the period July 1993 to April 1998.[15] Before examining sub-sample II (May 1998-December 2001) and the full sample period (July 1993-December 2001), we delete LFR from the system to account for suspension of FCAs following the nuclear tests in May 1998.[16] In this two-variable system (kerb premium and remittances), Johansen's cointegration test suggests the existence of a single cointegrating vector over sub-sample II as well as the full sample period.

Table 5: Cointegration Results Based on Johansen Test

	λ max rank tests			**λ Trace tests**		
	Ho: r = 0	**Ho: r = 1**	**Ho: r = 2**	**Ho: r = 0**	**Ho: r = 1**	**Ho: r = 2**
Sub sample I: July 1993 to April 1998						
Constant and no linear deterministic trend in data						
LWRG, KP, LRF	85.82**	14.62	2.29	102.73**	16.91	2.29
LWRO, KP, LRF	50.98**	18.90	2.90	69.88**	21.80	2.90
Sub sample I: May 1998 to Dec. 2001						
Constant and no linear deterministic trend in data						
LWRG, KP	89.36**	8.40		97.75**	8.40	
LWRO, KP	44.72**	0.55		45.28**	0.55	
Sub sample I: July 1993 to Dec. 2001						
Constant and no linear deterministic trend in data						
LWRG, KP	24.99**	1.62		26.61**	1.62	
LWRO, KP	16.56**	3.16		19.72**	3.16	

** Denotes rejection of Ho at the 1 % significance level
* Denotes rejection of Ho at the 5 % significance level

[13] Jarque and Bera (1980) test is used to check for normality of residuals; which is asymptotically distributed as $\chi^2(2)$.
[14] Ljung-Box statistics is used to test the serial correlation in residuals up-to tenth-order; $TSE=T\Sigma(r^2_i)$ where, i = 1, 2, …., 10 and it is normally distributed as $\chi^2(10)$.
[15] The critical values of λ trace are 40.198, 35.068 and 32.093 at 1%, 5% and 10% respectively for three-variables system. For two-variables system, the critical values are 24.988, 20.168 and 17.957 at 1%, 5% and 10% respectively (See Enders, W. 1995).
[16] Subsequently, SBP allowed conversion of these accounts either into Special US Dollar Bonds or in Pak Rupees as evident from **figure 4.d**.

From the long-run relationships given by the cointegrating equations for sub sample I, we can see that kerb premium and resident FCAs have a negative impact on remittances from both Gulf and other than Gulf region. The significance level of kerb premium is higher than that of resident FCAs as suggested by the actual cointegrating vector presented in **Table 6.** However, the long-run relationship between kerb premium and remittances was jolted by the surge in kerb premium and heightened uncertainty following the nuclear test, as reflected by the change in sign of coefficients of kerb premium with respect to remittances. Nonetheless, we notice that the relationship seems to have retained the expected (inverse) direction of causality over the full sample period (see **Table 6**).

Once the cointegrating relationship is established, the next step is to estimate a VEC model in order to determine the short-run dynamics of the system. Following Hendry's (1995) general-to-specific modeling approach, we first include ten optimal lags of the explanatory variables and the error correction term, and then gradually eliminate the insignificant variables.

Table 6: Long-run Relationship: Cointegrating Vectors

System	No. of Cointegrating Vectors	Cointegrating Vector
Sub sample I: July 1993 to April 1998		
LWRG, KP, LRF	1	1.00 + 0.120 + 2.729
		'(19.36) (2.35)
LWRO, KP, LRF	1	1.00 + 0.029 + 2.322
		'(4.72) (2.964)
Sub sample II: May 1998 to Dec. 2001		
LWRG, KP	1	1.00 - 0.307
		(-4.67)
LWRO, KP	1	1.00 - 0.4.33
		(-3.08)
Full sample: July 1993 to Dec. 2001		
LWRG, KP	1	1.00 + 0.68
		(1.53)
LWRO, KP	1	1.00 + 0.293
		(2.86)

Figures in parentheses are t values

After experimenting, a VEC model is found to best fit the data corresponding to Gulf and other than Gulf region for sub-sample I (see Appendix **Table A2 & A3**). The diagnostic test statistics show no evidence of serial correlation and non-normality in residuals. From these estimated models, specifically from the α vectors (EC terms), we can see that the speed of adjustment of kerb premium is greater than the other variables in case of both Gulf and other region. It may also be noted that there is a direct relationship between kerb premium and resident FCAs whereas the kerb premium and remittances are inversely related to each other. The estimated VEC model exhibits that kerb premium affects resident FCAs with the lag of 1, 2, 6, and 9 months (see **Table A2**).

Intuitively, the higher kerb premium fuels the private sector expectation of devaluation of inter-bank exchange rate. Prior to May 1998, if the workers expected devaluation of Rupee in inter-bank market then they tended to reduce remittances through formal banking channel and

diverted their forex earning for maintaining resident FCAs. This allowed them to book capital gains in the case of realization of the expected devaluation.[17] Higher returns on resident FCAs and the potential to book capital gains through devaluation of Rupee also tended to increase the cumulative inflows of remittances and resident FCAs. After freeze of FCAs in May 1998, the cumulative flows went well below US$ 1.6 billion (see **Figure 3**). Therefore, we can conclude that resident FCAs acted as a substitute for remittances.

In case of workers' remittances from other region, we notice that kerb premium has a positive sign contrary to what we observed in case of Gulf region. This unexpected result appears to validate our earlier assertion that the Hundi network in other than Gulf countries is not as mature and efficient as in case of Gulf region. The resident FCAs have a significant positive effect on remittances with the lag of three months. In addition, the own effect of remittances is positive. The diagnostic test statistics show no evidence of serial correlation and no problem of non-normality in residuals.

We then drop the resident FCAs from our system, because these accounts experienced a structural change following their freeze in May 1998. As is evident from Appendix **Table A4,** the sign of the coefficient of kerb premium turns positive in both LWRG and LWRO equations over the sample May 1998 to December 2001. [18] In terms of the overall sample (July 1993 to December 2001), the results show that kerb premium has an inverse relationship with formal remittances from Gulf, which suggests that the relationship prior to nuclear test was too strong and thus dominated the sub sample after May 1998 (see Appendix **Table A5**). The diagnostic tests show no evidence of serial correlation and non-normality in residuals.

7: Conclusion and Policy Implications

One of the major conclusions of our study pertains to the effective role played by the kerb premium in influencing the decision of expatriate Pakistanis of sending money through formal channel. Kerb premium enters in all the cointegrating vectors with the expected (negative) sign over the sample period July 1993 to April 1998. Although the sign of kerb premium was distorted after the nuclear test, it has the expected sign over the full sample. Consequently, the kerb premium emerges as an important relative price influencing the behavior of workers. In addition, the kerb premium acquires importance not only from this direct relationship but also as an important indicator of the deficiencies in exchange rate,

[17] The expatriate Pakistanis also switched from formal banking channel to Hundi due to higher premium on their monies.
[18] After the suspension of hard currency withdrawal from these accounts, bulk of these accounts were either converted into Pak. Rupee at prevailing exchange rate or into Special US Dollar Bonds (see **Figure 4.d**).

payments and trade policies. A high and persistent kerb premium can substantially undermine the allocative role of the exchange rate and signifies market segmentation. Until and unless these polices remain distorted, any "migrant-specific" incentive scheme would fail to divert back remittances into formal banking system. Keeping in view these points, the SBP and the government have started to implement a wide range of reforms such as adoption of a realistic exchange rate regime since July 2000, liberalization of foreign trade, allowing portfolio investment abroad, increase in travel and business quota of foreign exchange, proclamation of protection of foreign currency account ordinance, etc. The formalization of moneychangers businesses into foreign exchange companies would also help in removing the market segmentation of the forex market.

Finally, the popularity of Hundi channel cannot be attributed solely to the better exchange rates offered. Migrant workers also turn to them because of their efficient and speedy service. The banking companies would need to improve their efficiency and significantly reduce the time required in the transfer of remittance so as to compete with the informal sector. Additionally, the delivery system of remittances also requires to be improved. This, however, calls for substantial investment in information technology and human capital by the banking system. The delivery network can also be improved through better coordination between the banks and post offices. The designation of post offices in remote areas as bank's agent can effectively link overseas workers with the remittance receiving families. As an additional service, banks should also consider the facility of overdraft to remittance beneficiaries in Pakistan with an agreement with expatriate Pakistanis. In brief, banks need to provide efficient and quick services in order to persuade Pakistani workers abroad to channel their remittances through banking system. Needless to say, these efforts would fail to bear any positive results in the presence of a high and rising kerb premium. Therefore, only with the right mix of policies can Pakistan look forward to substantial foreign exchange inflows to finance its economic growth.

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Appendix Tables

Table A1: Diagnostic Test of Residuals for the VAR Equations

	TSC	N	TSC	N	TSC	N	TSC	N	TSC	N	TSC	N
	k=10		k=10		k=12		k=12		k=12		k=12	
	July 1993 to April 1998				May 1998 to Dec. 2001				July 1993 to Dec. 2001			
LWRG	7.33	2.49			7.50	3.37			8.83	0.18		
LWRO			6.70	1.01			9.60	0.01			5.90	4.12
KP	10.07	5.35	8.51	0.20	8.07	3.30	9.36	1.76	11.65	0.38	7.76	2.26
LRFA	12.97	0.11	22.58	0.53								

Where k: Optimal lag length; TSC: Serial Correlation Test; N: Normality

Table A2: Estimates of the Vector Error Correction Models

	D(LWRG)		D(KP)		D(LRF)	
Sub sample I: July 1993 to April 1998						
	Coefficient	t-Stat	Coefficient	t-Stat	Coefficient	t-Stat
EC	-0.38	-2.91	-4.96	-3.88	-0.04	-1.94
D(LWRG(-1))			3.76	2.87	0.03	1.32
D(LWRG(-2))			5.86	4.50		
D(LWRG(-3))	-0.20	-1.65	7.92	5.98	0.02	1.66
D(LWRG(-4))			6.32	4.72		
D(LWRG(-5))	-0.31	-2.08	5.86	5.57		
D(LWRG(-6))	-0.28	-2.41				
D(KP(-1))			0.34	1.81	0.00	1.12
D(KP(-2))			0.65	3.70	0.01	1.79
D(KP(-3))			1.25	5.34		
D(KP(-4))			0.60	3.11		
D(KP(-5))	-0.06	-2.00	0.27	1.65		
D(KP(-6))					0.01	2.87
D(KP(-7))			0.57	4.04		
D(KP(-9))					0.01	2.08
D(RFA(-1))	-1.34	-1.56	6.61	1.52	-0.74	-6.92
D(RFA(-2))	-2.68	-3.37	11.68	3.04	-0.41	-3.30
D(RFA(-3))					-0.40	-3.03
D(RFA(-4))					-0.35	-3.31
D(RFA(-6))			11.71	3.41		
D(RFA(-8))			-25.64	-4.57	-0.16	-2.18
D(RFA(-9))			-34.26	-4.95		
D(RFA(-10))			-16.21	-3.70		
C	-0.05	-2.14	0.16	1.65	0.00	1.45
DH	0.15	2.12				
D1	0.16	2.85			0.02	2.57
D2					0.09	6.85
R^2	0.56		0.73		0.80	
Adjusted R^2	0.47		0.56		0.72	
DW stat	1.89		2.13		2.09	
Jarque-Bera	0.95		1.05		0.04	
Probability	0.62		0.59		0.98	
Q-Stat	9.37		6.36		12.32	

Table A3: Estimates of the Vector Error Correction Models

	D(LWRO)		D(KP)		D(LRF)	
Sub sample I: July 1993 to April 1998						
	Coefficient	t-Stat	Coefficient	t-Stat	Coefficient	t-Stat
EC	-0.73	-6.37	5.99	5.64	-0.08	-2.67
D(LWRO(-1))			-6.31	-5.30		
D(LWRO(-2))			-4.68	-4.22		
D(LWRO(-3))	0.13	1.30	-4.17	-4.48		
D(LWRO(-7))	0.18	1.89				
D(KP(-2))	-0.04	-2.14	-0.32	-2.72		
D(KP(-3))			-0.31	-2.80		
D(KP(-4))			-0.36	-3.02		
D(KP(-6))			0.50	4.49		
D(KP(-8))					0.01	1.61
D(KP(-9))			-0.38	-3.94		
D(RFA(-1))					-0.69	-4.45
D(RFA(-2))					-0.69	-3.73
D(RFA(-3))	0.71	1.57			-0.52	-2.55
D(RFA(-4))			-6.82	-2.51	-0.44	-2.13
D(RFA(-5))					-0.46	-2.21
D(RFA(-6))			9.48	3.75	-0.51	-2.48
D(RFA(-7))					-0.35	-1.65
D(RFA(-8))					-0.34	-1.82
D(RFA(-9))					-0.19	-1.40
D1			-1.30	-5.85		
R^2	0.62		0.74		0.74	
Adjusted R^2	0.59		0.66		0.66	
DW stat	2.18		1.89		1.89	
Jarque-Bera	0.69		0.19		3.58	
Probability	0.71		0.91		0.17	
Q-Stat	8.81		3.38		6.22	

Table A4: Estimates of the Vector Error Correction Models

	D(LWRG)		D(KP)		D(LWRO)		D(KP)	
Sub sample II: May 1998 to December 2001								
	Coefficient	t-Stat	Coefficient	t-Stat	Coefficient	t-Stat	Coefficient	t-Stat
EC	0.17	7.56	0.97	3.16	0.04	1.99	1.75	5.32
D(LWRG(-1))	-0.64	-6.26	-2.68	-1.80				
D(LWRG(-2))			-4.22	-2.74				
D(LWRG(-3))	-0.36	-3.78	-3.83	-2.44				
D(LWRG(-4))	-0.38	-3.72	-5.70	-3.36				
D(LWRG(-5))	-0.27	-2.81	-4.21	-2.70				
D(LWRG(-6))	-0.41	-4.71	-4.59	-3.08				
D(LWRG(-7))	-0.31	-3.77	-4.27	-3.06				
D(LWRG(-8))	-0.25	-2.93	-2.71	-1.82				
D(LWRG(-9))			-3.60	-2.49				
D(LWRG(-11))	-0.19	-2.20	-2.48	-1.73				
D(LWRO(-1))					-0.25	-2.14	-3.05	-1.79
D(LWRO(-2))					-0.51	-4.64		
D(LWRO(-3))							-7.88	-4.04
D(LWRO(-4))					-0.28	-2.07	-6.35	-3.28
D(LWRO(-6))							-4.49	-2.34
D(LWRO(-7))							-3.15	-1.72
D(KP(-1))	0.03	2.77	0.23	1.45			0.35	2.58
D(KP(-2))	0.05	5.40					0.25	1.72
D(KP(-3))	0.03	3.66	0.26	1.80			0.69	4.58
D(KP(-4))							0.28	1.89
D(KP(-5))	0.02	2.42						
D(KP(-6))	0.02	2.65			0.02	1.59	0.26	1.86
D(KP(-7))							0.22	1.48
D(KP(-10))	0.06	6.86						
D(KP(-11))	0.03	2.79						
D(KP(-12))	-0.02	-2.65						
C					0.03	1.19	0.23	0.89
DH	0.58	10.33						
D1	0.03	1.43	1.10	2.81			1.38	3.40
D2					0.18	5.79	-2.06	-4.76
R^2	0.89		0.52		0.65		0.68	
Adjusted R^2	0.81		0.31		0.60		0.52	
DW stat	1.67		1.77		1.59		1.61	
Jarque-Bera	1.32		0.14		0.05		0.34	
Probability	0.52		0.93		0.97		0.84	
Q-Stat	11.67		4.58		8.23		8.40	

Table A5: Estimates of the Vector Error Correction Models

	D(LWRG)		D(KP)		D(LWRO)		D(KP)	
Full sample: July 1993 to December 2001								
	Coefficient	t-Stat	Coefficient	t-Stat	Coefficient	t-Stat	Coefficient	t-Stat
EC	-0.02	-1.60	-0.33	-5.49	-0.07	-3.15	-0.75	-5.22
D(LWRG(-1))	-0.33	-3.47						
D(LWRG(-2))	-0.19	-2.01	-1.11	-2.40				
D(LWRG(-3))	-0.14	-1.52	0.92	1.81				
D(LWRG(-6))	-0.15	-1.64			-0.63	-7.62		
D(LWRO(-1))					-0.37	-4.71		
D(LWRO(-2))							1.49	2.77
D(LWRO(-4))					-0.33	-2.64		
D(LWRO(-6))					-0.36	-2.76		
D(LWRO(-7))					0.31	2.44		
D(LWRO(-9))					0.30	2.20		
D(LWRO(-10))								
D(KP(-1))	-0.31	-2.08	0.21	3.34			0.22	3.32
D(KP(-5))					0.02	2.13		
D(KP(-6))	-0.28	-2.41	0.20	3.17	0.03	2.35	0.26	4.03
D(KP(-7))	-3.05	-4.60	0.15	2.51			0.12	1.90
D(KP(-8))	-0.02	-1.53			-0.04	-3.47		
D(KP(-9))					-0.03	-2.57		
D(KP(-10))	0.04	3.18	-0.10	-1.58				
D(KP(-11))	0.02	1.74			0.05	3.91		
D(KP(-12))					0.02	1.92		
C					0.00	-0.13	0.09	0.86
DH	0.27	4.73						
D1			2.12	13.29			2.19	13.23
D3					0.28	6.22		
R^2	0.41		0.72		0.65		0.70	
Adjusted R^2	0.36		0.70		0.58		0.68	
DW stat	1.75		2.04		1.60		2.06	
Jarque-Bera	0.72		0.26		0.32		4.23	
Probability	0.70		0.88		0.85		0.12	
Q-Stat	9.53		9.88		7.67		10.75	