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EXCHANGE RATE VOLATILITY AND TRADE NEXUS: IMPLICATIONS FOR COMMODITY TRADE FLOWS BETWEEN THE PAKISTAN AND THE UNITED KINGDOM

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ABSTRACT

Previous studies used aggregate level trade data to investigate the impact of exchange rate volatility (EV) on trade flows. However, the empirical results of these studies were criticized for the aggregation bias that embedded in aggregated level trade data. To overcome the aggregation bias, the present study utilizes the disaggregate level export and import trade data for 100 commodities between Pakistan and the United Kingdom in order to explore the implication of Rupee-Pound EV for trade flows at commodity level. We utilize time series data from 1980 to 2019. Employing bound testing approach to cointegration and error correction modelling, the results indicate that out of 100 commodity level exports and import industries, a total of 24 industries were significantly affected by exchange rate volatility in the short run and a total of 21 industries were affected in the long run.

Keywords: Pakistan, UK, volatility, Trade flows.

JEL Classification: F31

1. Introduction

Since the collapse of fixed exchange rate (ER), many counties have witnessed fluctuations in the bilateral exchange rates. Increasing fluctuations cause uncertainty in the exchange rate that tend to affect international trade flows. The association between ER fluctuations and trade flows becomes more important when the economy is relatively open (Hau, 2002). EV directly affects the trade balance via the cost paid for uncertainty and adjustment of business cycle (Barkoulas et al, 2002) while indirectly it affects the trade balance through change in output structure, investment and government policy (Agolli, 2004).

In recent years, a number of studies have examined the implications of EV for trade flows. Kroner and Lastrapes (1993), McKenzie and Brooks (1997) and Langley et al. (2000), Grauwe and Skudelny (2000) as well as Doyle (2001) have reported positive effect of EV on trade flows. Whereas, many studies have reported negative effect of EV on trade flows (such as Chowdhurry, 1993; Kim and Lee, 1996; Bahmani-Oskee, 2002 and Bahmani-

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Oskooee & Kovyryalova, 2008). While there are some studies such as Aristotelous, (2001); Susilo, (2001) and Tenreyro, (2007) and Baum & Caglayan, (2010) which indicate an insignificant effect of EV on trade flows. Studies related to Pakistan have mostly relied on aggregate level trade data. Aggregate-level studies include the study of Kumar and Dhawan (1991) who examined the impact of exchange rate volatility on Pakistan's exports to the developed countries; Similarly, Bahmani-Oskooee and Payesteh (1993) examined the impact of exchange rate volatility on trade flows that included Pakistan; Similarly, other studies that used the aggregate-level trade data while exploring the nexus between the exchange rate volatility and the trade flows included Javed and Farooq (2009); Alam (2010); Mahmood et al. (2011); Khan et al. (2014); and Humayon et al. (2014).

One of the major limitations of the mentioned studies is that most of these studies were based on aggregate level trade data which is supposed to result in aggregation bias. We wonder what happens to trade flows in response of EV, if we disaggregate the trade flows at commodity level. As different sectors of the economy like agriculture sector, manufacturing sector and services sector are quite different towards price setting mechanism. Hence, these sectors therefore cannot be examined collectively (Schuh, 1974 & Maskus, 1986). The current study therefore, instead of aggregate level trade data, focuses on the disintegrated commodity level trade data in order to analyse the relationship between EV and trade flows of the Pakistan and the UK.

Pakistan and UK are the two major trading partners of each other. UK is one of the major export destinations for Pakistan. The trade between these two countries comprised of a variety of industrial commodities. Like other determinants, EV is supposed to have a significant influence on the volume of Pakistan-UK trade. Thus, the present study aims to analyse the influence of EV on the Pak-UK trade volume.

The current study is organized as follows: section II deals with nature of data which is followed by empirical model and estimation methodology. Section III explains the empirical results while section IV comes up with conclusion.

2. Data and Methodology

To empirically examine the impact of EV on the volume of commodity trade between Pakistan and UK, the current study follows the model used by Bahmani-Oskooee and Hegerty (2009), Bahmani-Oskooee, et al (2012) and Bahmani-Oskooee and Satawtananon (2013. Our model suggests that the volume of trade between Pakistan and UK is determined by the size of economy which is measured by real Gross Domestic Product of each country. Similarly, we use two other variables such as real bilateral ER and volatility of real bilateral ER as independent variables. Our model contains exports and imports functions for each industry. Since Pakistan is a reporting country while the UK is Pakistan's trading partner, hence for the sake of convenience the model is formulated here from Pakistan perspective i.e.,

$$Ln\, VX_{it} = a_0 + a_1\, Ln\, Y_{UK} + a_2 LnRER_t + a_3 LnEV_t + \varepsilon_t \qquad (1)$$

$$Ln\, VM_{it} = b_0 + b_1\, Ln\, Y_{PAk} + b_2 LnRER_t + b_3 LnEV_t + \varepsilon_t \qquad (2)$$

VX in equation (1) represents the volume of exports from Pakistani industry to the UK. The volume of exports VXi in Pakistan is determined by the size of the trading partner's economy that is the UK. For the size of the UK economy, we use annual real GDP of the UK as a proxy, and is denoted by Y_{UK}. The other two determinants are real bilateral ER between Pakistan and the UK denoted by RER and the EV. Similarly, VM in equation (2) represents the volume of Pakistan industrial commodity imports from the UK. Pakistan commodity imports from the UK are supposed to be determined by annual real GDP of Pakistan denoted by Y and the other factors RER and EV as mentioned earlier.

As far the signs of coefficients are concerned, the existing literature suggests that in equation (1) UK's GDP is supposed to have positive effect on the volume of UK's industrial commodity imports. As the UK's GDP increases, they would increase demand for Pakistan industrial commodities. Similarly, the effect of real bilateral ER between Pakistan and the UK is supposed to be negative. A depreciation of Pakistan ER with the UK indicates that UK would increase demand for Pakistan's industrial commodities. Similarly, in equation (2) sign for the coefficient of Pakistan annual Real GDP is supposed to be positive, as Pakistan GDP increases it would increase demand for the UK industrial commodities. Sign for the real bilateral ER is supposed to be positive, as Pakistan currency depreciates it would decrease demand for the UK industrial commodities. Finally, the coefficient sign of EV is supposed to be either positive or negative as EV caneither increase or decrease Pakistan's industrial commodity imports from the UK.

To estimate the models, the current study follows the bound testing approach to co integration and error correction modelling, as used by Bahmani-Oskooee, *et al.* (2012) and Bahmani-Oskooee and Satawtananon (2013). This approach is best suited for time series data to analyse both SR and LR estimates. Moreover, it works with reduced form of the model. Equation (1) and equation (2) may contain the variables integrated of different order. Following Pesaran et al. (2001), we present them both in the form of error correction model that analyse the effect of EV on the volume of exports and imports in both SR and in LR. The two equations can be presented in error correction form as below:

$$\Delta LnVX_{it} = c_0 + \sum_{k=1}^{n1} c_{1k}\Delta LnVX_{it-k} + \sum_{k=0}^{n2} c_{2k}\Delta LnY_{UK,t-k} + \sum_{k=0}^{n3} c_{3k}\Delta LnRER_{t-k} + \sum_{k=0}^{n4} c_{4k}\Delta LnEV_{t-k}$$

$$+ \lambda_0 LnVX_{it-1} + \lambda_1 LnY_{uk\ t-1} + \lambda_2 LnRER_{t-1} + \lambda_3 LnEV_{t-1} + \xi_t \qquad (3)$$

$$\Delta LnVM_{it} = d_0 + \sum_{k=1}^{n1} d_{1k}\Delta LnVM_{it-k} + \sum_{k=0}^{n2} d_{2k}\Delta LnY_{pak\,t-k} + \sum_{k=0}^{n3} d_{3k}\Delta LnRER_{t-k} + \sum_{k=0}^{n4} d_{4k}\Delta LnEV_{t-k}$$

$$+ \delta_0 LnVM_{it-1} + \delta_1 LnY_{pak\,t-1} + \delta_2 LnRER_{t-1} + \delta_3 LnEV_{t-1} + \mu_t \qquad (4)$$

Both equation (3) and (4) are estimated through ARDL method. The coefficients attached with Δ represent the SR estimates where Δ is first difference operator. λ_1, λ_2 and λ_3 normalized on λ_0 and δ_1, δ_2 and δ_3 normalized by δ_0 represents the LR effect of EV on the volume of exports and imports in equation(3) and equation (4) respectively. Furthermore, co integration is checked in order to ensure that the LR estimates are not spurious. For the purpose, F- test tabulated new critical values provided by Pesaran et al. (2001) have been used.

3. Empirical Results

In order to analyse the effect of EV on the volume of exports and imports both in the SR as well as in the LR, the current study has used time series data over the period 1980-2019. The sample includes 50 Pakistani commodity exports industries and 50 Pakistan's commodity imports industries. For lag selection of each first difference variable, the Akaike's Information Criterion (AIC) is followed. Table 1 and table 2 indicate the empirical results obtained for Pakistan commodity exports. Table 1 shows the results for SR as well as LR coefficients' estimates while table 2 shows the diagnostic tests of the same model. Similarly, table 3 shows the SR as well as the LR coefficients estimates of Pakistan's commodity imports while table 4 shows the diagnostics for the same model. Both table 1 and table 3 report SR coefficients estimates only for EV which is our variable of interest, while for all other variables only the LR coefficients are reported.

Table 1 shows that out of 50 commodity level exports industries that traded between Pakistan and the UK, EV has significantly affected a total of 12 industries. Out of these 12 industries, the exports of 4 industries were affected positively in response of EV which are coded as 532, 633, 684 and 691. While, the remaining 8 industries which were affected negatively with increasing EV are coded as 431, 561, 642, 652, 665, 696 and 723. While moving to the LR, interestingly, here too in total of 12 exporting industries, a significant effect of EV was observed. Out of these 12 industries, only one export oriented industry coded as (633) is affected positively and significantly, while the remaining 11 industries that have been affected significantly and negatively as a result of Rupee-Pound EV are coded as 71, 73, 561,629, 652, 657, 665, 684, 691, 723 and 821. As far as the results of other variables are concerned, out of 50 industries, in ten (10) export industries, the results was found significantly negative. These industries are coded as 51, 73, 263, 292, 561, 657,684, 722, 723 and 851. The effect of real bilateral ER is found significant only in 6 industrie coded as 51, 73, 532, 561,684 and 723. Whereas the effect of real bilateral ER is significantly positive in industries coded as 51, 73, 561, 684 and 723 while this impact is significantly negative in one industry coded as 532.

Table 2 indicates diagnostic tests. To examine co integration, the F-test calculated value is compared with the upper bound critical value of 4.11 provided by Pesaran et al. (2001), more particularly the same critical values for small samples are provided by Narayen (2005). Co integration is found in 12 industries only. To examine co integration in the remaining industries the alternative technique suggested by Bahmani-Oskooee and Satawtananon, (2013) is applied, where a significantly negative coefficient for lagged error correction model is considered as an existence of co integration. Following this technique, co integration is found in 45 industries. LM test follows Chi^2 distribution with one degree of freedom; it has a critical value of 3.84 for 5% level of significance. The value of LM test

is less than 3.84 which suggests a serial correlation free model. In our case, only two models show LM statistic which is greater than 3.84 while all the remaining models are correlation free. Ramsey Reset test also follows chi^2 distribution with one degree of freedom. It is used to check the functional form of the model. Only in five models the Ramsey Reset statistic is greater than 3.84 that indicates misspecification of the functional form of these models while the remaining all models are suggested to have correctly specified functional forms. The Jarque-Bera test follows chi^2 distribution with two degrees of freedom with critical value of 5.99 which is used to check the normality assumption for the residuals. Only in 9 models, the value of Jarque-Bera test is greater than 5.99 which suggests that the normality assumption for residuals is violated in these models, however this assumption holds for all other models. CUSUM and CUSUMS tests are employed to the residuals of each optimum model, the stable model is denoted by S while the unstable models are denoted by the UK. Finally, the goodness of fit for each model is shown through the value of adjusted R2.

Table 3 shows the results obtained from estimation of Pakistan imports model. Parallel to the results of Pakistan's exports model, here too the SR coefficients' estimates are reported only for the variable of our interest that is EV while for other variables only the LR results are presented. The SR effect of EV on the volume of Pakistan industrial commodity imports is evident only from 12 industries; these industries are coded as 71, 81, 211, 231, 292, 431, 521, 532, 629, 652, 684 and 725. The effect varies at different lags for the same industry. For example, the SR effect of EV was found on the import volume of industry coded as 629. The result is negative at no lag but positive at first and second lags. However, in the LR, 9 industries coded as 211, 231, 292, 599, 629, 684, 722, 725 and 893 show significant effect of EV on the volume of Pakistan commodity imports. Among the significant coefficients, only one coefficient is positive while the remaining 8 coefficients are negative. The other LR determinants of Pakistan industrial commodity imports are also worth to discuss here. The effect of Pakistan annual real GDP on the volume of Pakistan commodity imports is found significantly negative in case of 16 industries that is 71, 73, 599, 629, 642, 652, 664, 665, 691, 722, 723, 725, 726, 821, 863 and 893. Finally, the effect of real bilateral ER on the volume of Pakistan industrial commodity imports is found in 13 industries coded as 71, 99, 629, 664, 665, 682, 684, 691, 722, 723, 725, 726 and 893 where most of them appeared with positive sign.

For the validity of the LR coefficient estimates, it is necessary that there must exist a co integration among the variables. If the co integration exists, only then the LR coefficients estimates would be considered valid. For this purpose, we compare the calculated F-test value with the upper bound critical value of 4.11 provided by Pesaran, et al. (2001). Various diagnostic tests for the models of Pakistan industrial commodity imports are reported in table 4. The F-test calculated value is greater than 4.11 in 11 models which suggest the existence of co integration. The alternative method of co integration is also used where the lagged value of error correction model is significantly negative in 38 models which confirm co integration in these models. The reported value of LM test is greater than 3.84 only in case of 7 models which suffers from serial correlation, however the remaining all models where LM test value is less than 3.84 are considered serial correlation free. The Ramey Reset test is used to examine the functional form of each model. The results confirms that the functional form is miss specified only in 7 models

where the value of Ramsey Reset test is greater than the critical value 3.84 while the remaining models have functional forms correctly specified. The Jarque-Bera test used to test whether the normality assumption for residuals prevails or not. The results suggest that only in 11 models the normality assumption for residuals has violated where the value of Jarque-Bera statistic is greater than the critical value of 5.99. However, for most of the models the normality assumption for residuals holds. Furthermore, the CUSUM and CUSUMS tests are applied to the residuals of optimum models and the stable and unstable models are denoted by S and the UK respectively. Finally, adjusted R^2 is reported for each models the value of R2 close to 1 indicates best fit model.

4. Conclusion

Then nexus between the EV and the trade flows is an important issue from policy point of view. EV may affect the risk behaviour of the traders and may result in uncertainty in future prices. Previous studies either focused on Pakistan trade flows between one country and the rest of the world either it focused on bilateral trade flows of a country. However, all these studies were criticized for the aggregation bias as these studies relied on aggregated level trade data. To account for the aggregation bias, this study uses a more disaggregated trade data to investigate the impact of EV on commodity trade between the Pakistan and the United Kingdom. The empirical results show that out of 50 commodity level exports industries that traded between Pakistan and the United Kingdom, EV has significantly affected a total of 12 industries both in the short as well as in the LR. Similarly, in total of 50 import industries of the Pakistan that traded with the United Kingdom, a total of 12 industries were affected in the SR while 9 industries were significantly affected in the LR.

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"Appendix: Data and Variables"

Data Source

"The data on all variables used in the current study is obtained from three main sources. These are (a) World Bank Development Indicators Data Base 2015, (b) The World Bank's WITS system that obtains data from COMTRADE, (c) International Financial Statistics of IMF Data Base 2015."

Variable Description

"VX for each industry i represents the volume of Pakistan commodity exports to the UK. To construct this variable, the data on exports value in thousands US dollars for each industry has taken from source (b). As the annual price level for each industrial commodity is not available thus following Bahmani-Oskooee and Satawtananon (2012) the trade value for each industry is deflated by U.K. exports unit value which is obtained from source (c)."

"VM for each industry i represents the volume of Pak commodity imports from U.K. To construct this variable, the data on imports value in thousands US dollars for each industry has taken from source (b). As the annual price level for each industrial commodity is not available thus following Bahmani-Oskooee and Satawtananon (2012), the trade value for each industry is deflated by U.K. imports unit value which is obtained from source (c)."

To represent size of economic activities, the annual real GDP in both countries is denoted by Y_{Pak} and Y_{UK} for Pakistan and UK respectively. The data for these two variables come from source (a).

The real bilateral ER between Pak Rupee and UK Pound is denoted by RER. The variable is defined as number of Pak Rupees per U.K. Pound. The variable is constructed as $(P_{UK} * NE)/P_{Pak}$ where, P_{Pak} is Pakistan CPI, Puk is U.K. CPI while NE is bilateral ER between Pakistan Rupee and the UK Pound. The data for variable RER and all its constructing components have taken from source (c).

The fluctuations in real bilateral ER between Pak Rupee and U.K. Pound is captured by the EV and is denoted by EV. This variable is constructed by taking the standard deviation of 12 monthly real ER during a year. The data for monthly CPI for both countries come from source (c).

Table 1. Estimated Coefficients for Pakistan's Commodity Exports Industries.								
	SR Coefficients Estimates					LR Coefficients Estimates		
Industry	ΔlnVt	ΔlnVt-1	ΔlnVt-2	ΔlnVt-3	Constant	Y_{Pak}	RER	lnVt-1
(24) Cheese and curd	0.01(0.19)				4.40(0.63)	-0.16(0.63)	0.26(0.56)	-0.02(0.18)
(31) Fish, fresh & simply preserved	-0.09(0.88)				1.34(0.15)	-0.05(0.19)	0.30(0.53)	-0.14(1.01)
(32) Fish, in airtight containers, n.e.s	-0.24(1.32)				11.74(0.78)	-0.400.79)	0.84(0.91)	-0.07(0.31)
(51) Chemical elements and comRupees	-0.05(0.68)	0.12(1.03)	0.03(0.3)	0.08(1.04)	23.05(2.18)*	-0.78(2.17)*	1.09(1.90)*	-0.10(0.76)
(53) Fruit, preserved and fruit preparat	0.04(0.78)	0.07(1.11)			4.53(0.74)	-0.15(0.72)	0.16(0.44)	0.02(0.28)
(71) Coffee	-0.02(0.16)	0.40(1.48)	0.31(1.3)	-0.30(1.66))	-11.16(0.43)	0.31(0.35)	-0.27(0.20)	-0.65(2.36)*
(73) Chocolate & other food preptns. con	-0.11(1.44)				17.94(2.86)*	-0.63(2.92)*	0.83(2.14)*	-0.23(2.42)*
(81) Feed. Stuff for animals excl. unmil	-0.01(0.11)	0.34(1.57)	0.14(0.7)	-0.01(0.10)	28.49(1.47)	0.98(1.48)	0.41(0.43)	-0.39(1.56)
(99) Food preparations, n.e.s.	-0.06(0.68)	-0.02(0.20)			5.90(0.61)	-0.20(0.62)	-0.05(0.09)	-0.11(0.78)
(112) Alcoholic beverages	-0.02(0.99)				-1.31(0.65)	0.04(0.62)	-0.001(0.01)	-0.02(0.67)
(211) Hides & skins, exc.fur skins undres	0.01(0.06)				4.68(0.29)	-0.14(0.25)	-0.32(0.32)	0.13(0.52)
(212) Fur skins, undressed	0.04(0.11)				-8.38(0.25)	0.30(0.26)	0.42(0.20)	0.37(0.70)
(231) Crude rubber incl. synthetic & recl	-0.24(1.43)	-0.16(1.01)			11.96(0.73)	-0.40(0.73)	0.91(0.93)	0.01(0.06)
(263) Cotton	-0.17(0.74)				37.45(2.01)*	-1.28(2.00)*	0.86(0.75)	-0.24(0.83)
(291) Crude animal materials, n.e.s.	-0.15(1.60)	0.00(0.00)			2.77(0.29)	-0.09(0.30)	0.08(0.15)	-0.04(0.33)
(292) Crude vegetable materials, n.e.s.	-0.03(0.72)	0.03(0.83)			10.89(2.55)*	-0.37(2.53)*	0.40(1.57)	-0.05(0.79)
(341) Gas, natural and manufactured	0.05(0.10)				27.95(0.60)	-1.00(0.63)	1.76(0.61)	-0.58(0.79)
(411) Animal oils and fats	-0.11(0.90)				-0.39(0.03)	0.02(0.05)	-0.48(0.74)	0.01(0.07)
(431) Anim./veg. Oils & fats, processed,	-0.57(2.32)*				-32.30(1.60)	1.11(1.60)	-1.93(1.54)	0.13(0.42)
(521) Crude chemicals from coal, petroleu	-0.17(0.38)	-0.18(0.40)			-12.94(0.29)	0.48(0.31)	-0.48(0.18)	0.46(0.69)
(532) Dyeing & tanning extracts, synth. t	0.18(1.81)*				-6.91(0.85)	0.24(0.87)	-0.95(1.88)*	0.02(0.22)

(561) Fertilizers manufactured	-0.27(2.24)*				26.49(2.68)*	-0.92(2.73)*	1.67(2.73)*	-0.31(2.03)*
(571) Explosives and pyrotechnic products	0.07(0.55)				-2.50(0.24)	0.08(0.24)	-0.95(1.50)	-0.06(0.39)
(599) Chemical materials and products, n.	-0.02(0.45)	0.01(0.18)	0.02(0.4)		4.86(0.82)	-0.16(0.80)	-0.21(0.62)	-0.05(0.69)
(613) Fur skins, tanned or dressed, inclu	0.08(0.46)				-8.01(0.56)	0.26(0.54)	-0.67(0.75)	-0.01(0.07)
(629) Articles of rubber, n.e.s.	0.01(0.16)				6.38(1.05)	-0.23(1.10)	0.13(0.36)	-0.17(1.87)*
(633) Cork manufactures	0.30(1.72)*				-20.46(1.42)	0.72(1.49)	-1.05(1.18)	0.49(2.17)*
(642) Articles of paper, pulp, paperboard	-0.15(2.33)*				7.53(1.35)	-0.26(1.37)	0.12(0.36)	-0.11(1.36)
(652) Cotton fabrics, woven ex. narrow or	-0.10(1.80)*	-0.03(0.54)			3.79(0.68)	-0.14(0.73)	-0.53(1.59)	-0.17(2.11)*
(657) Floor coverings, tapestries, etc.	-0.05(1.43)				6.07(1.84)*	-0.22(1.94)*	0.14(0.70)	-0.16(3.11)*
(662) Clay and refractory construction ma	-0.02(0.28)	0.001(0.01)			0.31(0.03)	-0.02(0.07)	-0.53(0.88)	-0.20(1.36)
(664) Glass	0.05(0.48)				2.72(0.32)	-0.08(0.31)	-0.58(1.11)	-0.05(0.43)
(665) Glassware	-0.10(1.86)*				6.85(1.50)	0.24(1.53)	-0.20(0.72)	-0.15(2.12)*
(682) Copper	-0.05(0.85)	-0.09(1.06)	-0.09(1.35)		11.39(1.46)	-0.39(1.46)	0.65(1.45)	-0.05(0.47)
(684) Aluminium	-0.12(1.42)	0.25(1.73)*	0.15(1.59)		48.05(4.38)*	-1.66(4.40)*	2.27(3.64)*	-0.44(2.87)*
(691) Finished structural parts and struc	0.06(0.91)	0.41(3.31)*	0.25(2.26)*	0.16(2.13)	4.33(0.45)	-0.18(0.55)	-0.13(0.25)	-0.40(2.98)*
(696) Cutlery	-0.13(1.79)*				1.82(0.30)	-0.06(0.33)	-0.13(0.37)	-0.08(0.91)
(712) Agricultural machinery and implemen	-0.03(0.48)	-0.04(0.71)			2.24(0.35)	-0.07(0.36)	-0.23(0.61)	-0.07(0.76)
(722) Electric power machinery and switch	0.005(0.17)				5.33(2.14)*	-0.17(2.10)*	-0.19(1.23)	-0.05(1.37)
(723) Equipment for distributing electric	-0.08(1.03)	0.31(2.50)*	0.12(1.06)	-0.03(0.39)	23.71(2.07)*	-0.82(2.09)*	1.29(2.13)*	-0.26(1.83)*
(725) Domestic electrical equipment	0.007(0.11)	-0.08(1.24)			6.77(1.04)	-0.22(1.03)	-0.07(0.19)	-0.04(0.47)
(726) Elec. apparatus for medic.purp., ra	0.008(0.15)	-0.05(1.16)			7.44(1.57)	-0.24(1.50)	0.19(0.68)	0.04(0.64)
(821) Furniture	-0.06(1.24)	0.09(1.20)	0.04(0.86)		8.19(1.51)	-0.29(1.57)	0.18(0.61)	-0.21(2.74)*
(841) Clothing except fur clothing	-0.02(0.65)	-0.00(0.05)	-0.06(1.14)	-0.06(1.58)	5.85(0.87)	-0.19(0.86)	-0.03(0.11)	-0.04(0.56)
(842) Fur clothing and articles of artifi	0.08(0.39)	0.00(0.00)	0.17(0.84)		-30.73(1.26)	1.02(1.22)	-1.811(1.28)	-0.17(0.52)

(851) Footwear	-0.16(1.65)	0.01(0.11)			19.89(2.17)*	-0.68(2.17)*	0.84(1.55)	-0.14(0.97)
(863) Developed cinematographic film	-0.14(0.83)				6.13(0.45)	-0.20(0.43)	0.02(0.02)	0.06(0.29)
(893) Articles of artificial plastic mate	-0.06(1.21)	0.08(1.56)			8.82(1.70)*	-0.30(1.70)	-0.02(0.07)	-0.12(1.56)
(941) Animals, n.e.s. incl. zoo animals, d	0.01(0.11)				2.53(0.20)	-0.09(0.21)	-0.23(0.30)	-0.08(0.44)
(8630) Cinematographic film, developed	-0.14(0.83)				6.13(0.45)	-0.20(0.43)	0.02(0.02)	0.06(0.29)

Notes: a. values inside the parenthesis next to each coefficient are absolute value of the t-ratio. While values in the parenthesis before the name of each industry are industrial codes

Table 2. Diagnostics Statistics for Pakistan's Exports Industries.

Industry	F at Opt lag	ECMt-1	LM	RESET	Normality	CUSUM	CUSUMS	Adj R2
(24) Cheese and curd	2.84	-0.55(3.43)*	0.15	0.001	1.69	S	S	0.18
(31) Fish, fresh & simply preserved	1.4	-0.11(0.97)	0.16	0.03	1.15	S	S	-0.06
(32) Fish, in airtight containers, n.e.s	5.58	-0.90(4.79)*	0.54	0.26	228.07	S	S	0.37
(51) Chemical elements and comRupees	2.3	-0.38(1.99)*	0.21	0.23	1.19	S	S	0.13
(53) Fruit, preserved and fruit preparat	2.81	-0.77(4.09)*	3.2	1.37	1.13	S	S	0.32
(71) Coffee	3.73	-0.28(1.95)*	0.42	0.53	0.94	S	S	0.46
(73) Chocolate & other food preptns. Con	2.99	-0.33(2.55)*	2.08	0.003	0.07	S	S	0.27
(81) Feed. Stuff for animals excl. unmil	1.46	-0.84(4.01)*	0.64	0.43	0.13	S	S	0.32
(99) Food preparations, n.e.s.	1.12	-0.47(2.63)*	2.17	0.04	1.51	S	s	0.09
(112) Alcoholic beverages	0.68	-0.05(0.60)	0.07	0.65	0.07	S	S	-0.07
(211) Hides & skins, exc.fur skins undress	1.64	-0.36(2.34)*	1.31	2.58	0.22	S	S	0.06
(212) Fur skins, undressed	3.13	-0.70(3.53)*	0.31	2.95	0.13	S	S	0.21
(231) Crude rubber incl. synthetic & recl	3.46	-0.39(2.28)*	3.47	5.78	24.4	S	S	0.09
(263) Cotton	3.14	-0.36(2.96)*	0.12	0.01	0.49	S	S	0.2
(291) Crude animal materials, n.e.s.	5.34	-1.11(5.61)*	0.97	0.004	1.78	S	S	0.45
(292) Crude vegetable materials, n.e.s.	1.99	-0.45(2.84)*	0.41	0.46	0.34	S	S	0.19
(341) Gas, natural and manufactured	5.18	-0.79(4.24)*	0.64	0.52	70.43	S	S	0.3
(411) Animal oils and fats	6.72	-0.71(4.12)*	0.5	0.36	4.22	S	S	0.3
(431) Anim./veg. Oils & fats, processed,	4.59	-0.71(-3.93)*	0.41	0.97	0.5	S	S	0.4
(521) Crude chemicals from coal, petroleum	8.46	-0.65(3.57)*	5.72	0.04	13.69	S	S	0.21
(532) Dyeing & tanning extracts, synth. T	3.06	-0.39(2.48)*	0.9	0.001	0.41	S	S	0.2
(561) Fertilizers manufactured	7.96	-0.70(5.03)*	0.33	1.03	6.19	S	S	-0.1
(571) Explosives and pyrotechnic products	2.33	-0.30(2.55)*	0.51	1.03	1.06	S	S	0.15
(599) Chemical materials and products, n.	0.95	-0.11(0.89)	3.54	3.43	3.74	S	S	-0.01
(613) Fur skins, tanned or dressed, inclu	2.2	-0.44(2.85)*	0.21	0.65	9.31	S	S	0.11
(629) Articles of rubber, n.e.s.	1.84	-0.32(2.45)*	0.5	1.43	18.44	S	S	0.19
(633) Cork manufactures	11.28	-0.92(5.87)*	1.02	0.16	0.09	S	S	0.51
(642) Articles of paper, pulp, paperboard	1.58	-0.35(2.42)*	1.96	0.93	1.26	S	S	0.17
(652) Cotton fabrics, woven ex. narrow or	1.08	-0.11(1.97)*	0.72	4.1	1.72	S	S	0.36
(657) Floor coverings, tapestries, etc.	3.23	-0.28(2.85)*	0.93	0.02	7.14	S	S	0.31
(662) Clay and refractory construction ma	0.5	-0.29(1.89)*	0.87	5.22	0.15	S	S	0.13
(664) Glass	1.96	-0.42(3.14)*	0.93	0.13	87.54	S	S	0.21
(665) Glassware	3.36	-0.30(3.63)*	0.36	0.04	0.42	S	S	0.37
(682) Copper	4.77	-0.81(3.89)*	0.57	0.98	0.02	S	S	0.36
(684) Aluminium	3.07	-0.79(4.67)*	0.76	0.46	5.36	S	S	0.48
(691) Finished structural parts and structure	7.28	-0.98(5.23)*	0.55	0.03	1.13	S	S	0.48
(696) Cutlery	2.47	-0.50(3.43)*	0.38	0.12	12.75	S	S	0.24
(712) Agricultural machinery and implements	3	-0.33(0.23)	1.54	3.65	3.6	S	S	0.16
(722) Electric power machinery and switch	1.97	-0.09(1.34)	0.28	0.05	0.58	S	S	0.31
(723) Equipment for distributing electric	3.52	-0.100(4.87)*	1.93	0.82	1.33	S	S	0.48
(725) Domestic electrical equipment	1.35	-0.13(1.40)	1.76	8.66	0.71	S	S	0.2

(726) Elec. apparatus for medic.purp., ra	5.08	-0.35(2.91)*	1.72	0.22	0.31	S	S	0.15
(821) Furniture	4.21	-0.54(2.96)*	1.97	3.49	2.78	S	S	0.26
(841) Clothing except fur clothing	1.88	-0.47(3.34)*	0.98	0.12	0.24	S	S	0.38
(842) Fur clothing and articles of artifi	2.96	-0.32(2.15)*	0.25	0.36	1.19	S	S	0.05
(851) Footwear	2.37	-0.14(1.67)*	2.27	8.55	14.41	S	S	0.07
(863) Developed cinematographic film	1.17	-0.40(2.39)*	0.07	2.04	5.4	S	S	0.12
(893) Articles of artificial plastic mate	3.73	-0.38(2.99)*	7.75	3	11.6	S	S	0.29
(941) Animals, n.e.s. incl.zoo animals, d	2.51	-0.57(3.20)*	0.11	1.12	0.07	S	S	0.17
(8630) Cinematographic film, developed	1.16	-0.40(2.39)*	0.07	2.04	5.4	S	S	0.12

Note: (a) Number inside parenthesis next to each coefficient is absolute value of the t-ratio.
(b) The upper bound critical value for F-statistics at the 10% level of significance is 4.10. This comes from Narayan (2005, Appendix, P. 1988).
(c) The critical value for the Lagrange Multiplier (LM) test of residual correlation is 3.84 at 5% level of significance.
(d) Ramsey RESET test for functional misspecification has critical value of 3.84 at 5% level of significance.
(e) Jarque-Bera normality test has a critical value of 5.99 at 5% level of significance.

Table 3. Estimated Coefficients for Pakistan's Commodity Imports Industries

Industry	SR Coefficients Estimates					LR Coefficients Estimates		
	ΔlnVt	ΔlnVt-1	ΔlnVt-2	ΔlnVt-3	Constant	Y the UK	RER	lnVt-1
(24) Cheese and curd	0.17(0.50)	-0.001(0.003)	0.06(0.13)	-0.11(0.32)	28.75(0.57)	-1.05(0.57)	0.66(0.26)	-0.33(0.57)
(31) Fish, fresh & simply preserved	0.06(0.72)	-0.02(0.37)			5.90(0.74)	0.21(0.76)	-0.55(1.25)	0.04(0.36)
(32) Fish, in airtight containers, n.e.s	-0.03(0.48)				0.31(0.05)	0.01(0.06)	0.02(0.06)	0.01(0.22)
(51) Chemical elements and comRupees	-0.05(1.02)	0.03(0.44)	0.04(0.89)		8.31(1.32)	-0.30(1.34)	0.18(0.54)	-0.11(1.35)
(53) Fruit, preserved and fruit preparat	-0.15(1.65)	-0.07(0.81)			6.08(0.65)	-0.23(0.68)	0.49(0.95)	-0.11(0.88)
(71) Coffee	-0.34(2.50)*	0.12(0.68)	0.001(0.007)		33.72(1.92)*	-1.24(1.96)*	1.79(1.88)*	-0.39(1.72)
(73) Chocolate & other food preptns. con	-0.04(0.71)	-0.01(0.20)	0.03(0.58)	0.02(0.57)	14.01(1.94)*	-0.50(1.94)*	0.54(1.51)	-0.06(0.75)
(81) Feed. Stuff for animals excl. unmil	-0.20(1.78)*				3.17(0.40)	-0.12(0.42)	0.10(0.21)	-0.07(0.63)
(99) Food preparations, n.e.s.	-0.04(0.79)				7.52(1.55)*	-0.27(1.57)	0.49(1.76)*	-0.07(1.11)
(112) Alcoholic beverages	-0.03(0.59)				7.97(1.60)	-0.28(1.58)	0.06(0.21)	-0.05(0.81)
(211) Hides & skins, exc.fur skins undres	-0.04(0.28)	0.58(2.13)*	0.29(1.59)		16.08(0.78)	-0.66(0.89)	0.58(0.53)	-0.81(2.77)*
(212) Fur skins, undressed	0.29(0.70)	0.52(0.83)	0.48(0.85)	-0.16(0.37)	-0.55(0.009)	-0.01(0.007)	-0.92(0.32)	-0.31(0.46)
(231) Crude rubber incl. synthetic & recl	-0.23(3.72)*	0.0003(0.04)	-0.01(0.23)		-7.55(1.005)	0.25(0.93)	-0.46(1.13)	-0.18(1.72)*
(263) Cotton	0.12(0.70)	0.08(0.48)			25.37(1.37)	-0.91(1.37)	0.51(0.49)	-0.10(0.41)
(291) Crude animal materials, n.e.s.	-0.07(0.76)	0.10(1.07)			4.44(0.43)	-0.14(0.39)	-0.008(0.01)	0.10(0.75)
(292) Crude vegetable materials, n.e.s.	0.08(1.85)*				1.79(0.58)	-0.05(0.46)	-0.09(0.50)	0.09(1.91)*
(341) Gas, natural and manufactured	0.10(0.30)				11.38(0.36)	-0.40(0.35)	0.20(0.11)	-0.03(0.07)
(411) Animal oils and fats	-0.14(0.76)	-0.12(0.45)	-0.07(0.29)	-0.05(0.29)	11.19(0.43)	-0.40(0.43)	1.33(1.02)	0.05(0.17)
(431) Anim./veg. Oils & fats, processed,	-0.10(0.86)	-0.29(1.65)	-0.27(1.67)*	-0.03(0.24)	-23.09(1.27)	0.84(1.29)	-0.97(1.07)	0.20(1.04)
(521) Crude chemicals from coal, petroleu	-0.84(1.78)*				24.56(0.58)	-0.97(0.63)	1.81(0.74)	-0.74(1.23)

(532) Dyeing & tanning extracts, synth. t	-0.30(2.18)*				3.55(0.37)	-0.13(0.38)	-0.07(0.13)	-0.12(0.81)
(561) Fertilizers manufactured	0.06(0.38)				-14.29(0.91)	0.52(0.92)	-0.66(0.73)	0.14(0.65)
(571) Explosives and pyrotechnic products	0.07(0.35)				-5.92(0.31)	0.22(0.33)	-0.88(0.82)	0.08(0.31)
(599) Chemical materials and products, n.	-0.03(0.91)	0.03(0.92)			6.79(1.65)	-0.25(1.68)*	0.08(0.37)	-0.10(1.94)*
(613) Fur skins, tanned or dressed, inclu	-0.07(0.45)				-4.49(0.31)	0.14(0.27)	-0.30(0.36)	-0.14(0.70)
(629) Articles of rubber, n.e.s.	-0.04(2.00)*	0.08(2.33)*	0.06(1.94)*	0.03(1.60)	15.64(4.33)*	-0.56(4.33)*	0.58(3.25)*	-0.10(2.54)*
(633) Cork manufactures	-0.15(0.96)	0.06(0.37)			9.62(0.56)	-0.36(0.58)	0.27(0.28)	-0.18(0.77)
(642) Articles of paper, pulp, paperboard	-0.05(1.28)				10.35(2.85)*	-0.37(2.83)*	0.33(1.56)	-0.05(0.96)
(652) Cotton fabrics, woven ex. narrow or	-0.10(1.89)*	-0.09(0.98)	-0.06(0.75)	-0.05(0.91)	19.99(2.07)*	-0.70(2.00)*	0.42(0.92)	0.08(0.77)
(657) Floor coverings, tapestries, etc.	-0.01(0.18)	0.06(0.58)	0.04(0.68)		2.09(0.25)	-0.08(0.28)	-0.27(0.62)	-0.13(1.19)
(662) Clay and refractory construction ma	-0.05(0.64)				5.52(0.68)	-0.21(0.72)	0.03(0.07)	-0.15(1.31)
(664) Glass	0.05(1.19)	0.10(1.76)*	0.05(1.37)		11.48(2.08)*	-0.42(2.10)*	0.60(2.05)*	-0.09(1.42)
(665) Glassware	-0.0009(0.02)	0.12(1.64)	0.04(0.71)	-0.01(0.23)	17.16(2.56)*	-0.63(2.59)*	0.86(2.58)*	-0.15(1.80)
(682) Copper	0.03(0.60)				-8.89(1.65)	0.31(1.60)	-0.71(2.30)*	-0.07(0.99)
(684) Aluminium	-0.11(2.47)*				4.06(1.01)	-0.15(1.09)	0.39(1.68)*	-0.11(2.06)*
(691) Finished structural parts and struc	-0.04(0.68)	-0.06(0.75)	-0.07(1.15)		21.20(2.46)*	-0.76(2.44)*	1.38(2.96)*	0.004(0.04)
(696) Cutlery	-0.11(0.92)				12.98(1.14)	-0.48(1.18)	-0.01(0.01)	-0.27(1.66)
(712) Agricultural machinery and implemen	-0.04(1.00)	0.03(0.51)	0.02(0.47)		5.92(0.96)	-0.22(0.47)	0.27(0.84)	-0.10(1.32)
(722) Electric power machinery and switch	-0.02(1.01)	0.05(1.90)*			13.04(4.46)*	-0.47(4.51)*	0.53(3.25)*	-0.12(3.08)*
(723) Equipment for distributing electric	-0.008(0.19)				8.60(2.39)*	-0.33(2.37)*	0.38(1.84)*	-0.03(0.59)
(725) Domestic electrical equipment	-0.07(1.71)*	0.23(2.52)*	0.17(2.28)*	0.06(1.26)	16.70(2.67)*	-0.63(2.79)*	0.73(2.34)*	-0.36(3.91)*
(726) Elec. apparatus for medic.purp., ra	-0.03(0.90)	0.0009(0.025)			15.38(4.01)*	-0.55(4.01)*	1.08(5.00)*	-0.05(1.08)
(821) Furniture	-0.03(0.78)	0.06(1.55)			7.52(1.65)	-0.28(1.74)*	0.30(1.19)	-0.19(3.08)
(841) Clothing except fur clothing	0.006(0.11)				-4.51(1.03)	0.16(1.01)	-0.08(0.31)	0.006(0.09)
(842) Fur clothing and articles of artifi	0.26(1.51)				-25.08(1.63)	0.90(1.63)	-0.13(0.15)	0.19(0.90)
(851) Footwear	0.009(0.10)	-0.02(0.23)	-0.06(0.66)		9.02(0.72)	-0.31(0.68)	0.04(0.06)	0.06(0.43)
(863) Developed cinematographic film	-0.06(0.60)				16.50(1.85)*	-0.59(1.84)*	-0.01(0.02)	-0.07(0.57)
(893) Articles of artificial plastic mate	-0.02(0.92)	0.05(1.19)	0.01(0.43)	-0.02(0.85)	14.96(3.14)	-0.51(3.12)*	0.51(2.23)*	-0.09(1.71)*
(941) Animals, n.e.s. incl.zoo animals, d	0.05(0.66)				3.01(0.38)	-0.10(0.34)	0.03(0.07)	0.04(0.41)
(8630) Cinematographic film, developed	-0.06(0.57)	0.009(0.08)			15.82(1.44)	-0.57(1.43)	-0.05(0.08)	-0.08(0.53)
Notes: a. values inside the parenthesis next to each coefficient are absolute value of the t-ratio. While values in the parenthesis before the name of each industry are industrial codes.								

Table 4. Diagnostics Statistics for Pakistan's Imports Industries								
Industry	F at Opt lag	ECMt-1	LM	RESET	Normality	CUSUM	CUSUMS	Adj. R2
(24) Cheese and curd	6.83	-0.60(2.80)*	0.32	3.28	3.6	S	S	0.1
(31) Fish, fresh & simply preserved	3.93	0.67(3.16)*	1	0.54	15.73	S	S	0.17
(32) Fish, in airtight containers, n.e.s	5.03	-0.79(4.22)*	0.53	3.18	4.98	S	S	0.31
(51) Chemical elements and comRupees	0.24	-0.30(1.95)*	4.31	0.01	7.39	S	S	0.04
(53) Fruit, preserved and fruit preparat	4.07	-0.70(3.94)*	0.47	0.14	1.77	S	S	0.32
(71) Coffee	4.67	-0.73(3.87)*	1.64	6.43	3.39	S	S	0.4
(73) Chocolate & other food preptns. Con	2.34	0.05(0.48)	0.29	1	0.78	S	S	-0.06
(81) Feed. Stuff for animals excl. unmil	2.55	0.62(2.90)*	0.22	5.74	5.04	S	S	0.12
(99) Food preparations, n.e.s.	1.98	-0.28(2.08)*	1.28	0.59	0.63	S	S	0.06
(112) Alcoholic beverages	1.3	-0.02(0.34)	1.96	4.78	0.32	S	S	-0.03
(211) Hides & skins, exc.fur skins undress	3.94	-0.79(4.36)*	1.59	3.81	12.35	S	S	0.34
(212) Fur skins, undressed	0.66	-0.30(1.49)	1.5	1.42	11.16	S	S	-0.08
(231) Crude rubber incl. synthetic & recl	3.36	-0.85(4.11)*	3.64	0.79	11.25	S	S	0.38
(263) Cotton	2.14	0.18(1,90)	4.21	0.19	1.73	S	S	0.02
(291) Crude animal materials, n.e.s.	2.85	-0.25(2.09)*	2.5	0.18	0.02	S	S	0.2
(292) Crude vegetable materials, n.e.s.	1.43	0.08(0.75)	0.41	0.36	0.05	S	S	0.05
(341) Gas, natural and manufactured	4.42	-0.85(4.44)*	0.48	0.04	1.36	S	S	0.34
(411) Animal oils and fats	4.69	-0.46(2.59)*	1.05	0.8	1.5	S	S	0.06
(431) Anim./veg. Oils & fats, processed,	8.33	-0.51(2.48)*	7.56	0.04	0.12	S	S	0.09

(521) Crude chemicals from coal, petroleum	3.61	-0.60(3.79)*	4.15	2.71	2.12	S	S	0.27
(532) Dyeing & tanning extracts, synth. T	3.18	-0.74(3.26)*	0.56	0.05	6.65	S	S	0.18
(561) Fertilizers manufactured	6.62	-1.04(5.50)*	0.54	0.3	1.05	S	S	0.44
(571) Explosives and pyrotechnic products	2.16	-0.40(2.69)*	0.51	4.07	0.5	S	S	0.08
(599) Chemical materials and products, n.	1.41	-0.22(1.60)	1.91	0.02	0.48	S	S	0.08
(613) Fur skins, tanned or dressed, inclu	3.41	-0.53(3.14)*	0.49	0.03	1.73	S	S	0.14
(629) Articles of rubber, n.e.s.	12.78	-0.47(3.89)*	0.52	5.01	1.12	S	S	0.36
(633) Cork manufactures	0.78	-0.37(2.46)*	0.85	0.58	2.25	S	S	0.02
(642) Articles of paper, pulp, paperboard	1.4	-0.07(1.04)	0.62	7.68	0.81	S	S	0.12
(652) Cotton fabrics, woven ex. narrow or	2.99	-0.12(1.76)*	1.33	0.48	2.71	S	S	0.4
(657) Floor coverings, tapestries, etc.	3.6	-0.16(1.36)	3.1	0.7	1.21	S	S	-0.05
(662) Clay and refractory construction ma	1.04	-0.27(2.12)*	1.57	2.67	1.63	S	S	0.04
(664) Glass	2.73	-0.48(3.09)*	0.42	0.37	1.04	S	S	0.21
(665) Glassware	1.09	0.49(2.95)*	8.15	0.21	1.9	S	S	0.24
(682) Copper	2.87	-0.52(3.51)*	2.27	3.15	1.76	S	S	0.36
(684) Aluminium	5.1	-0.46(4.10)*	0.43	0.003	1.11	S	S	0.33
(691) Finished structural parts and struc	4.91	-0.92(5.30)*	0.14	0.3	1.07	S	S	0.47
(696) Cutlery	1.001	-0.05(0.55)	0.08	0.0003	6.93	S	S	-0.01
(712) Agricultural machinery and implement	1.07	-0.51(3.12)*	3.75	0.18	7.58	US	S	0.1
(722) Electric power machinery and switch	3.37	-0.17(2.39)*	0.68	0.47	0.006	S	S	0.36

(723) Equipment for distributing electric	1.16	-0.15(1.44)	0.09	3.41	0.66	S	S	0.09
(725) Domestic electrical equipment	3.28	-0.52(3.78)*	4.24	0.57	2.6	S	S	0.4
(726) Elec. apparatus for medic.purp., ra	3.61	-0.44(4.40)*	0.74	1.25	27.66	S	S	0.48
(821) Furniture	1.76	-0.29(2.90)*	3.09	0.11	1.09	S	S	0.24
(841) Clothing except fur clothing	1.13	-0.26(2.15)*	7.24	0.26	0.47	S	S	0.07
(842) Fur clothing and articles of artifi	0.72	-0.12(1.32)	0.08	3.14	0.73	S	S	0.08
(851) Footwear	1.86	-0.11(1.19)	0.38	18.89	0.3	S	S	-0.09
(863) Developed cinematographic film	3.45	0.17(1.66)	5.73	0.01	41.84	S	S	0.06
(893) Articles of artificial plastic mate	4.68	-0.29(2.77)*	1.74	2.48	3.72	S	S	0.33
(941) Animals, n.e.s. incl.zoo animals, d	4.01	-0.72(4.06)*	0.38	1.28	1.56	S	S	0.27
(8630) Cinematographic film, developed	3.73	0.17(1.61)	5.36	0.02	37.86	S	S	0.01

Note: (a) Number inside parenthesis next to each coefficient is absolute value of the t-ratio.
(b) The upper bound critical value for F-statistics at the 10% level of significance is 4.10. This comes from Narayan (2005, Appendix, P. 1988).
(c) The critical value for the Lagrange Multiplier (LM) test of residual correlation is 3.84 at 5% level of significance.
(d) Ramsey RESET test for functional misspecification has critical value of 3.84 at 5% level of significance.
(e) Jarque-Bera normality test has a critical value of 5.99 at 5% level of significance.