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Impact of Gross Domestic Products, Exchange Rates and Relative Price on Exports in Pakistan

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Authors' contributions

This work was carried out in collaboration between all authors. Author AH performed the research under the supervision of author KUZ, who provided guidance at each step of the study. Author KUZ also helped in designing of the study. Authors IH, Muhammad Niamatullah and Muhammad Naeem helped in data collection, data analysis and overall write-up of the manuscript with author AH, while author AR formatted, submitted and corresponding of the manuscript and also revised its final version.

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ABSTRACT

The empirical research was conducted to observe the impact of Gross Domestic Product, Exchange Rate, and Relative Price on the exports in Pakistan since last three decades. By plotting the correlogram of the variables, the problem of stationarity was experienced. In this regard, Augmented Dickey Fuller test was applied in order to make the data as non-stationary. Additionally, with the

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help of Engle-Granger or Augmented Engle-Granger, all variables under study were found co-integrated ($d\mu = -0.32\ \mu_{t-1}$) with t-statistic (-2.35). The results findings revealed that GDP and RP are positively correlated (+0.64) while Exports and ER are negatively correlated (-0.76). It was also noticed that GDP had positive significant impact on exports while ER observed negative significant impact on exports. Error Correction Model was also used and the insignificant value of equilibrium error term is (-0.11) with t-statistics (-0.95), therefore, it is concluded that the explanatory variables GDP, ER and RP had adjusted to changes in Exports in the same time period. Pakistan's exports consist of limited commodities which mainly comprise of textile goods. So new industries should be set up in order to increase export goods volume. Pakistan direction of export goods is mostly with the traditional exporting Partner i.e. USA, UK, Germany, Hong Kong and UAE; nearly 40% of total export's direction is to these countries but new market should be discovered to increase the export direction and volume.

Keywords: Augmented dicky fuller test; exports; ER; GDP; RP.

1. INTRODUCTION

According to the orthodox classical economist as well as the modern liberal economists, export is a good or a capital asset which is sold to the foreign countries. The trade is equivalent to an engine of economic growth. The rate and stages of economic growth is an indicator as well as the factors of entire process of national development. It reflects sustainable national policy for the achievement of pre-determined goals of growth. It depicts a defined economic policy, which has three major components, monetary policy, fiscal policy and commercial policy. All these components are very closely integrated, but commercial or trade policy of a country shows national indebted to other countries. Thus balance of payment states the size of exports and imports. We understand that exports are assets and imports are liabilities. In the entire scenario of foreign trade, exports play a very crucial role. If exports exceed imports the balance of payment is said to be positive and favorable which in itself shows the strength of national economy at a particular junctures. Conversely, dwindling exports reflect weakness of the economy in relation to the other countries, so exports receive added significance in all scientific analysis of the performance of national economy. Even in the past the export performance of the country receives prime emphasis and the strength of national economy was considered to be proportionate to the magnitude of exports. The classical economist, particularly David Ricardo so strongly advocated promotion of exports as the strong foundation of national growth. Obviously, the exports or national assets in foreign exchange are reflective of the growth of the nation's economy as well as its viability in the world market.

National exports particularly exports domination has been played a vital role in the world market. Exports, if organized and expanded promotes nation economy for high level of domestic production and efficiency. Exports also reflect the vitality of the national economy as measured by the acceptability of its goods and services in the world market. Exports sector generates foreign exchange earning which enhances national reserves or the imports or any other economic programme. Hence the economists, planners and reformers have always concentrated their attention on exports, its composition and its relation with other countries. In the long-run periods increase in exports promotes sound industrial development, which generate employment, production as well as development of the infrastructure for accelerated national investment.

The history of growth performance of various countries indicate that these countries had been achieving the targets of high exports through rigorous planning, for industrial investment, quality assurance, vigilant observation of the changes in the world market and meeting the changing demand of their exportable surplus. Pakistan's exports had been fluctuating at a high rate during the entire period under review. These fluctuations can be seen from the export data. Pakistan's exports increased from 12980 million rupees to 90183 million rupees during 1970's. Similarly export volume increased from 106469 million rupees to 390342 million rupees during 1980's. In the last decade Pakistan exports substantially increased from 443678 million rupees to 1029312 million rupees. These rapid changes were due to manifold factors, both internal and external. Pakistan had close commercial relations with selected countries

such as US (26.9%), Germany (4.6%), Japan (0.8%), Hong Kong (6.0%), Dubai (3.9%), UK (5.3%) and Saudi Arabia (2.3%). The total value of exports of these seven countries has been fifty percent of its total exports and the US had been single largest exports market for Pakistan, accounting for twenty seven percent of its exports. On the other hand export share of Japan with Pakistan is declining throughout the period its contribution is less than one percent. As regard composition of exports there had been substantial changes in the size of exports such as rice, cotton, and textile. Export composition has changed significantly since 1990. The exports have changed from primary products and semi-manufactured goods to manufactured goods, however Pakistan's exports are concentrated in a few items such as cotton, leather, rice, synthetic textile and sports goods.

Comparison of Pakistan's economic performance among the developing countries has been relatively exceptional from the last three decades. In term of GDP growth, Pakistan's economy has grown at an average annual rate of approximately 6 percent during the last thirty years. The present study can be hopefully useful for analytical and empirical analysis of export performance of Pakistan. This study includes the major determinants of export such as GDP, ER and especially Relative Prices. The higher the level of GDP causes of export expansion, because surplus of output can be exhausted in international markets. A fall in domestic prices due to exchange rate depreciation makes exports cheaper in international markets, resulting in an increased demand for exports. In empirical literature review of [1,2] find positive impact of GDP and depreciation on export growth. Rise in relative prices leads to increase inflation in Pakistan. Due to this increase in inflation, the real exchange rate of domestic country relative to the world exchange rate depreciates this depreciation in real exchange rate boost up export growth. In empirical literature [3,4] finds positive impact of relative export prices on export growth.

The span of time for the study has been taken as three decades (1978 to 2007) for the purpose of examining the development experience of Pakistan's economy and indicating a trend which may be extended through extrapolation of the curves and predicting for future. It is hoped that such forecasting may be helpful for Economic policy formation.

1.1 Justification of Exports Determinants

The export has various determinants, but the present study includes three variables of exports i.e. GDP, Exchange rate and Relative prices. These three variables cover the major determinants and trend of exports, similarly these variables are enough for this study because large amount of variables creates several problems. Therefore these three determinants of exports are justified and incorporated in this study.

2. DATA COLLECTION AND METHODOLOGY

2.1 Data Collection

All the data used is secondary data. It is collected from various sources like, statistics of Pakistan, Pakistan economic survey [5,6,7,8] financial statistics year book and International Financial Statistics (IFS). Exports and GDP have taken in real terms at the constant prices of year (1980-81) in million rupees. Both the variables have taken from Economic Survey of Pakistan using (1980-81) as a base year. The second variable is Exchange Rate. Real Exchange rate has also taken from Pakistan Economic Survey and statistical supplement etc. We have taken exchange rate just against American dollars ($US/PAK rupee). Price-weighted real exchange rate is used in the analysis and is calculated by the formula. $RER= ER*P^f / P^d$

Where, RER denotes real exchange rate, ER denotes nominal exchange rate measured in rupee per dollar, P^f denotes foreign prices and P^d denotes domestic prices. It is to be noted here that for P^f used the data of world consumer price indices and for P^d used the data of domestic consumer price indices. Dividing domestic price indices by world price indices is another variable of our research namely Relative Prices.

The third variable is Relative Prices. This variable was complicated to some extent, as there was no published data available for this variable. This variable is created as dividing Domestic Consumer Price Indices (DCPI) by the World Consumer Price Indices (WCPI). Domestic or Pakistan CPI is available in Pakistan Economic Survey, while the world CPI is available in International Financial Statistics (IFS). First the researcher applied both the CPIs for year 2000=100 and then divided domestic

CPI by world CPI thus obtained the Relative Prices variable. All the variables are measured in Pakistani rupees at current prices of 1980-81 as base year. Annual time series data is used in the present study. The time period from 1978 to 2007 is used with the purpose to see the three decade performance of Pakistan's export. At the time of collection, data was available up to 2007, therefore the data of three decades used from 1978 to 2007.

2.2 Methodology

To attain the required objectives, the following econometric model is proposed. Since single equation model is easy to estimate, so linear equation model used for the analysis of results. There are various studies available in the literature using single and linear equation model for determinants of exports.

$$Exp = f(GDP, ER, RP),$$

Where

Exp = Export, GDP = Gross Domestic Products, ER = Exchange Rate, RP = Relative Prices

The above equation can be presented in the following econometric model.

$$Exp = \beta_o + \beta_1 GDP - \beta_2 ER + \beta_3 RP + \mu,$$

Where $\beta_1 > 0$, $\beta_2 < 0$ and $\beta_3 > 0$

2.3 Augmented Dickey-Fuller (ADF) Test/ (The Unit Root Test)

The Augmented Dickey Fuller test (ADF) is used to check the stationarity of the time series data. A test of stationarity or nonstationarity has become widely popular over the past several years. The idea behind this test is that if we have the non-stationary time series data then we cannot apply the usual OLS regression. If we apply the first difference of the variables we will get rid of the non-stationarity problem. Several of the computer software has built in ADF test. We used Eview econometric software in this research work.

2.4 Cointegration

The basic concept behind cointegration is the existence of long-run steady state equilibrium. In steady state equilibrium, economic variables take the same values from period to period $X_t = X_{t-1} = X_{t-2} = \cdots .X^*$ until the period is disturbed. If an economic time series Y_t follows a random walk its first differences form a stationary series. In this case Y_t is said to be an integrated process of order (I) and denoted I (1). On the other hand, if Y_t is stationary, then it is intergrated of order zero and denoted I (0). Infact in a situation where the variables are cointegrated the least squares estimator works better in that it converges to the true parameter value faster than usual.

3. RESULTS AND DISCUSSION

Table 1 shows the correlation coefficients of all variables. Here the correlation between EX and GDP is very strong as its value is 0.9633. It means that there is strong positive correlation between EX and GDP. Similarly there is strong negative association between EX and ER as its value is - 0.7567. EX and RP have positive association but it is not very strong as its value is 0.4842. In the same way there is strong negative correlation between ER and GDP (-0.8977), positive correlation between RP and GDP (0.6394) and strong negative association between RP and ER (- 0.8082). These results are just the same as we have illustrated in the error correction model.

Fig. 1 shows the data for GDP and EXP, Fig. 2 presents ER and Fig. 3 presents RP variables. A visual plot of the data is usually the first step in the analysis of any time series. The first impression that we get from these figure is that all the time series shown in Figs. 1 and 2 seem to be trending upward, while Fig. 3 shows negative trend with fluctuations. Broadly speaking we can say that our data is non-stationary.

Another simple test of stationarity is based on the autocorrelation function (ACF). The presentation of all the time series is in Fig. 4. This figure presents the correlogram of GDP, Fig. 5 presents the correlogram of Exports, Fig. 6 presents the correlogram of RP and Fig. 7 presents the correlogram of ER. In these figures the autocorrelation coefficient starts at a very high value and declines slowly towards zero as the lag lengthens. Thus it seems that time series data are nonstationary, it may be nonstationary in mean or variance or both. For the choice of lag length applied the rule of thumb of one-third the length of the time series. Since the economic data under observation have 30 observations, by

this rule there will be 10 lags. Fig. 4 shows the joint hypothesis that all the Auto Correlation Function (ACF) up to 10 lags are simultaneously equal to zero. The last columns show the probability of obtaining the Q-stat value. The values of time series at lag 10 are (92.855), (81.010), (70.641), (113.87) for GDP, Exports, RP and ER simultaneously. The probability of obtaining such a high values are zero. It means that all the time series are non-stationary.

Table 1. Results of empirical analysis

	EX	GDP	ER	RP
EX	1.000000	0.963334	-0.756753	0.484201
GDP	0.963334	1.000000	-0.897781	0.639488
ER	-0.756753	-0.897781	1.000000	-0.808292
RP	0.484201	0.639488	-0.808292	1.000000

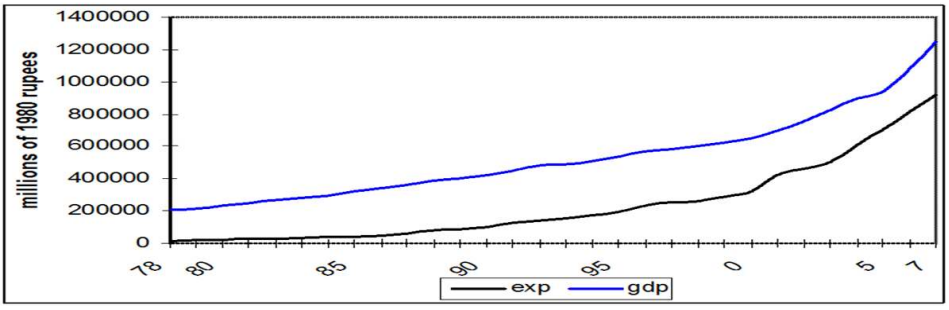


Fig. 1. GDP and exports of Pakistan (1978-2007) (annually)

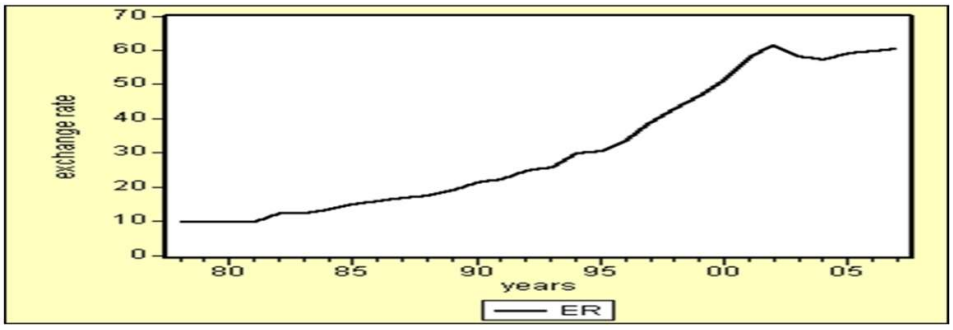


Fig. 2. Exchange rates of Pakistan (1978-2007)

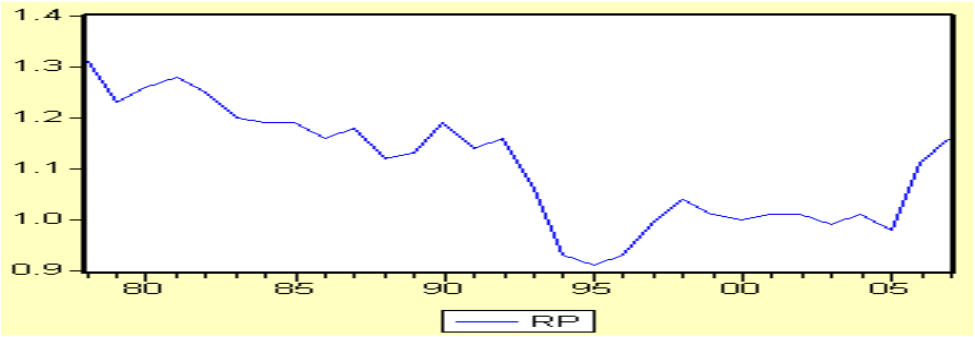
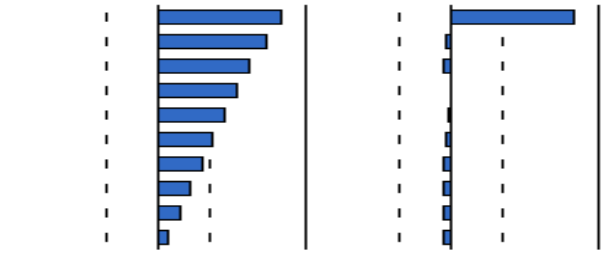


Fig. 3. Relative prices of Pakistan (1978-2007)

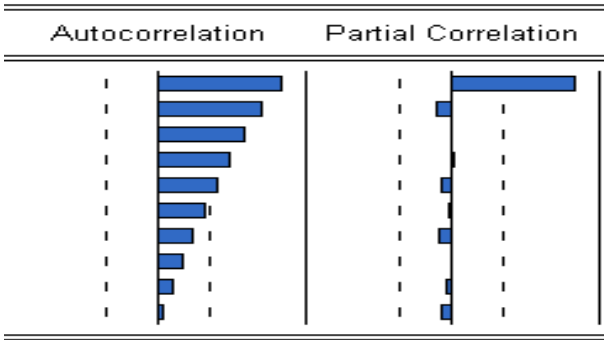
Date: 02/23/10 Time: 13:07
Sample: 1978 2007
Included observations: 30



	AC	PAC	Q-Stat	Prob
1	0.876	0.876	25.378	0.000
2	0.758	-0.036	45.093	0.000
3	0.647	-0.042	59.960	0.000
4	0.550	-0.001	71.137	0.000
5	0.465	-0.010	79.446	0.000
6	0.386	-0.032	85.392	0.000
7	0.305	-0.055	89.286	0.000
8	0.226	-0.053	91.519	0.000
9	0.151	-0.045	92.556	0.000
10	0.079	-0.048	92.855	0.000

Fig. 4.Correlogram of Pakistan GDP, 1978-2007

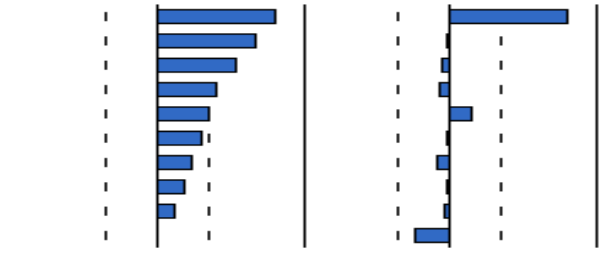
Date: 02/23/10 Time: 13:10
Sample: 1978 2007
Included observations: 30



	AC	PAC	Q-Stat	Prob
1	0.869	0.869	25.007	0.000
2	0.729	-0.107	43.245	0.000
3	0.607	-0.006	56.364	0.000
4	0.510	0.022	65.981	0.000
5	0.414	-0.065	72.569	0.000
6	0.330	-0.011	76.912	0.000
7	0.240	-0.084	79.307	0.000
8	0.166	0.003	80.513	0.000
9	0.100	-0.039	80.968	0.000
10	0.030	-0.079	81.010	0.000

Fig. 5. Correlogram of Pakistan exports, 1978-2007

Date: 02/23/10 Time: 20:09
Sample: 1978 2007
Included observations: 30



	AC	PAC	Q-Stat	Prob
1	0.835	0.835	23.068	0.000
2	0.690	-0.022	39.398	0.000
3	0.557	-0.044	50.435	0.000
4	0.426	-0.075	57.138	0.000
5	0.367	0.148	62.298	0.000
6	0.312	-0.014	66.186	0.000
7	0.240	-0.093	68.592	0.000
8	0.181	-0.023	70.018	0.000
9	0.117	-0.027	70.639	0.000
10	-0.007	-0.253	70.641	0.000

Fig. 6. Correlogram of RP, 1978-2007

The above methods of detecting non-stationarity are the general ones. A test of stationarity that is most commonly used is the (ADF) unit root test. Before applying this test it is necessary to understand the meaning of stationary. A stochastic process is said to be stationary if it satisfies three conditions. Firstly, the series should exhibit mean reversion and it fluctuates around a constant long-run mean. Second, the variance of the series should be constant over

time. Third, the value of auto-covariance between two-time periods depends on the distance or lag between the two time periods and not on the actual time at which the covariance is computed. Unit root test applied to check the stationarity. The results of this test are given in the following Table 2.

Table No. 2 shows the results of ADF in level with trend and without trend, and results of ADF in first difference with trend and without trend. The idea behind this test is that if there is non-stationary time series data then it can be applied the usual OLS regression. Therefore if we apply the first difference of the variables we will get rid of the non-stationarity problem. In the literature the tau statistic or test is known as the Dickey-Fuller (DF) test, in honor of its discoverers. The actual procedure of implementing the DF test involves several decisions. In the implementation of unit root test a random walk process may have no drift or it may have drift or it may have both deterministic and stochastic trends. To allow for the various possibilities, the DF test is estimated in three different forms, that is under three different null hypotheses.

XP_t is a random walk:

$$\Delta XP_t = \delta X_{t-1} + \mu_t \quad (4.1)$$

XP_t is a random walk with drift:

$$\Delta XP_t = \beta 1 + \delta XP_{t-1} + \mu_t \quad (4.2)$$

XP_t is a random walk with drift

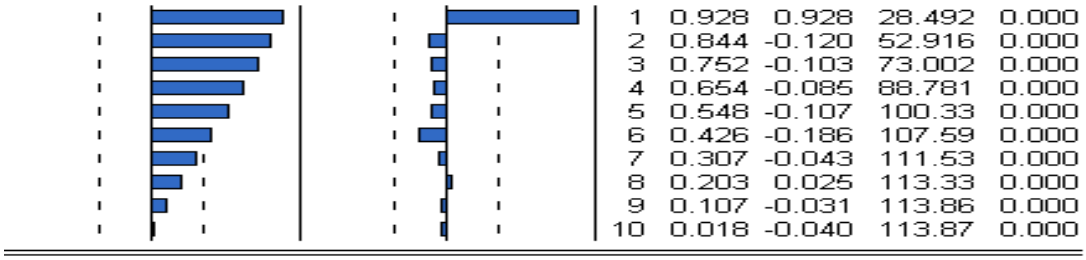
Around a stochastic trend:

$$\Delta XP_t = \beta_1 + \beta 2_t + \delta XP_{t-1} + \mu_t \quad (4.3)$$

Where *t* is the time or trend variable. In each case, the null hypothesis is that δ=0; that is, there is a unit root — the time series is nonstationary. The alternative hypothesis is that δ is less than zero, that is the time series is stationary. If the null hypothesis is rejected, it means that XP_t is a stationary time series with zero mean in the case of (4.1), that XP_t is stationary with a nonzero mean in the case of (4.2), and that XP_t is stationary around a deterministic trend in (4.3).

We applied the above three equations i.e. (4.1), (4.2) and (4.3) for each variable (Exp, GDP, ER and RP) and obtained the results given in Table 1. Our primary interest here is in the t (=τ)[i] values of the coefficients [9]. If the computed absolute value of the tau statistic (|τ|) exceeds the DF or MacKinnon[ii] critical tau (τ) values, we reject the hypothesis that δ=0, in which case the time series is stationary. On the other hand, if the computed |τ| does not exceed the critical true value, we do not reject the null hypothesis, in which case the time series is nonstationary [10].

Date: 02/23/10 Time: 20:45
Sample: 1978 2007
Included observations: 30



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.928	0.928	28.492	0.000
		2	0.844	-0.120	52.916	0.000
		3	0.752	-0.103	73.002	0.000
		4	0.654	-0.085	88.781	0.000
		5	0.548	-0.107	100.33	0.000
		6	0.426	-0.186	107.59	0.000
		7	0.307	-0.043	111.53	0.000
		8	0.203	0.025	113.33	0.000
		9	0.107	-0.031	113.86	0.000
		10	0.018	-0.040	113.87	0.000

Fig. 7. Correlogram of ER, 1978-2007

Table 2. Results of unit root test

Variables	ADF in levels		ADF in 1ST difference		I(0)
	Without trend	With trend	Without trend	With trend	
EXP	6.205203	1.277978	-2.999086	-5.228885	I(1)
GDP	4.964010	2.783363	-2.986754	-3.701019	I(1)
RP	-1.585720	-2.076907	-5.011978	-5.016257	I(1)
ER	-1.885006	-0.964213	-6.920602	-8.190622	I(1)

Critical value at 5% (without trend) = -2.9705, Critical value at 5% (with trend) = -3.5796

The results of our data shows that all the variables have the problem of unit root i.e. non-stationarity. The above table shows that the values of Exp and GDP without trend in level form have positive δ values, but since a positive δ value would imply that ρ >1. Although a theoretical possibility, we rule this case out because in this case the Exp and GDP values would be explosive, since these are first-order difference values, the so-called stability condition requires that $|\rho| < 1$. Similarly the value of RP and ER in level without trend (-1.5857, -1.8850) are less then the critical tau values (-2.9705) respectively. In 3rd column of the table all the values have changed but no variable is stationary, because the estimated values (EXP,GDP, ER, RP) are less than the critical tau value at 5% with trend (-3.5796) in absolute terms.

On the other hand when we take first difference of the variables then the result is stationary. Table 2 shows that all the variables are stationary in 1st difference without trend, as the absolute values of these variables .i.e. (EXP,GDP, RP and ER) are (-2.99986, -2.98654, -5.011978, -6.920602) respectively, which exceeds the critical tab value (-2.9705). Similarly 5th column of the table show the values of all variables in 1st difference with trend. In this column all the variable are stationary of order I (1), because the estimated t values (-5.228885, -3.701019, -5.016257, -8.190622) exceed the critical tau value (-3.5796) in absolute terms, therefore we conclude that our time series data is first difference stationary. It means that our variables are stationary in first difference both with trend and without trend. So on the basis of graphical analysis, the correlogram, and the Dickey-Fuller test, the conclusion is that for the yearly period of 1978-2007, our time series data was nonstationary; i.e., it contains unit root.

It is also concluded that GDP and RP are positively associated with Exports. But our result shows that there is insignificant positive relationship between Relative Prices and Exports. This result also matches with some of the recent studies that no systematic relationship between trade balances and relative prices is discernible from the empirical research (Reinhart 2009). ER is negatively associated with exports similar results are also described by [11,12,13, 14,15,16,17]. Our study results show that GDP has positive statistically significant impact on exports. similarly ER has negative statistically significant impact on exports. On the other hand RP have positive but insignificant impact on exports.

3.1 Testing for Cointegration

When we regress a non-stationary time series on another non-stationary time series it produces spurious regression. The main feature of this method is that the residual obtained from the above regression will be stationary of order 1(1). To test the cointegration we used the Engle-Granger or Augmented Engle-Granger (AEG) test. First of all we regressed EXP on GDP, RP and ER and obtained the following regression.

$$EXP = \beta_0 + \beta_1 GDP + \beta_2 RP - \beta_3 ER + \mu$$

EXP = -1286970 + 1.227755GDP +728529.6RP -5046.874ER
t-statistics (7.9167) (6.8242) (5.7403 (-2.5120)

Table 3. OLS results of EX on GDP, RE and ER

Variable	Coefficient	Std. error	t-statistic	Prob.
GDP	1.227755	0.179911	6.824237	0.0000
RP	728529.6	126914.5	5.740318	0.0000
ER	-5046.87	2009.076	-2.512038	0.0185
C	-1286970.	162563.6	-7.916718	0.0000
R-squared	0.969232	Mean dependent var		290240.0
Adjusted R-squared	0.965681	S.D. dependent var		303443.7
S.E. of regression	56213.85	Akaike info criterion		24.83528
Sum squared resid	8.22E+10	Schwarz criterion		25.02211
Log likelihood	-368.5292	F-statistic		273.0071
Durbin-Watson stat	0.61114	Prob(F-statistic)		0.000000

Source:- Author research

The detail explanation of this regression is given in the following table. The coefficients of all the variables have correct signs. All the variables are statistically significant, i.e. all the variables are statistically significantly different from the null hypothesis that there is no relationship between EXP and the three explanatory variables. As the Durbin-Watson d value is very low, therefore we can say that there is a strong positive autocorrelation in this regression. The R^2 (Coefficient of Determination) value of about 0.96 mean that about 96 percent of the variation in Exports is explained by GDP, ER and RP. We can interpret the above regression coefficients as following.

Holding constant RP and ER as GDP increases by one rupee; EXP goes up by 1.22 rupees on average. To make it more economically interpretable, if GDP goes up by a hundred rupees, on average export goes up by about 122 rupees. Same is the interpretation of the other two variables. In case of ER, appreciation in ER leads to decrease exports by about 5046.87 rupees on the average. Here the negative sign of ER means that as the value of our rupee decreases the prices of our exports also declines for the foreigners or in the world market. It means that a little amount of foreign currency, say dollar will be able to get a huge amount of our exports. Therefore when the prices of our exports are low in the world market, every country will try to import more of our goods which increase the entire volume of our exports. In short the negative sign of ER show that, as ER appreciate by a rupee it causes decrease in export by about 5046.87 rupee on average or it means that as ER depreciates by a rupee it increases exports by about 5046.87 rupee, so there is negative relationship between exports and exchange rate. The RP value (728529.6) shows that there is positive relation between RP and exports. As it has mentioned in the previous chapter that we introduced RP by dividing domestic CPI by world CPI, the interpretation of this relation is such that when RP increases it leads to increase inflation in Pakistan, due to this increase in inflation the real exchange rate of Pakistan relative to the world exchange rate decreases. This decrease in real exchange rate leads to increase in exports of Pakistan. In other words we can say that on average the goods of the country whose real exchange rate is decreasing are becoming cheaper relative to the goods of the other country, as in case of Pakistan whose exchange rate is decreasing continuously from the previous some decades. So from the above result (728529.6) we can say that a one rupee increase in RP leads to increase exports by about 728529.6rupees and vise versa. Given that the time series are individually non-stationary, there is the possibility that this regression is spurious. To check the possibility of spurious regression the researcher is going to perform a unit root test on the residuals obtained from the above regression. The regression is as following:

$d\mu = \mu_{t-1,}\ d\mu = -0.317461\ \mu_{t-1,}$
$t = (-2.351391), R^2 = 0.1638\ d = 1.6942$

Since the computed τ (=t) (-2.35139) value is larger than the critical tau (-1.9530) value at (5%) in absolute terms. The conclusion is that the residuals from the above regression are I (0), i.e, they are stationary. Hence one can call the estimated equation the static or long run relationship function and interpret its parameter as long run parameters.

3.2 Error Correction Model (Mechanism) ECM

In the above procedure it is showed that the variables are cointegrated; that is there is a long term, or equilibrium relationship between them. Of course in the short run there may be disequilibrium. Therefore one can treat the error term as the equilibrium error. This error term can be used to tie the short-run behavior of Exports to its long run values. The error correction model (ECM) first used by Sargan and later popularized by Engle and Granger corrects for disequilibrium. An important theorem, known as the Granger representation theorem, states that if two variables Y and X are cointegrated, then the relationship between the two can be expressed as ECM. The ECM model can be used as follows:

$$d(EXP) = \beta_0 + d(\beta_1 GDP) + d(\beta_2 RP) - d(\beta_3 ER) + \beta_4 \mu_{(t-1)} + \mu_t \ldots\ldots\ldots,$$

(Where "d" is first difference operator, μ_t is a random error term, and $\mu_{(t-1)}$ is the one period lagged value of the error from the co-integrating regression).

$$D\,EXP = -16343.05 + 1.818246\,GDP + 128523.6RP - 3107.3ER - 0.11320\,\mu_{(t-1)}$$
t values (-1.2529) (4.7876) (1.0807) (-2.1522) (-0.9511)

Table 4. Regression of error term on its 1st difference

ADF test statistic	-2.351391	1% Critical Value*	-2.6453
		5% Critical Value	-1.9530
		10% Critical Value	-1.6218

*MacKinnon critical values for rejection of hypothesis of a unit root.
Augmented Dickey-Fuller Test Equation
Dependent Variable: D(μ)
Method: Least Squares
Date: 02/23/10 Time: 17:03
Sample(adjusted): 1979 2007
Included observations: 29 after adjusting endpoints

Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
μ(-1)	-0.317461	0.135010	-2.351391	0.0260
R-squared	0.163832	Mean dependent var		-1489.130
Adjusted R-squared	0.163832	S.D. dependent var		42320.04
S.E. of regression	38698.38	Akaike info criterion		23.99886
Sum squared resid	4.1910	Schwarz criterion		24.04601
Log likelihood	-346.9834	Durbin-Watson stat		1.694251

Source:- Author research

Table 5. Results of error correction model

Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
D(GDP)	1.818246	0.379777	4.787672	0.0001
D(RP)	128523.6	118919.9	1.080758	0.2905
D(ER)	-3107.324	1354.870	-2.152260	0.0343
μ(-1)	-0.113209	0.119028	-0.951112	0.3510
C	-16343.05	13044.11	-1.252906	0.2223
R-squared	0.544493	Mean dependent var		35045.93
Adjusted R-squared	0.468575	S.D. dependent var		37837.67
S.E. of regression	27583.25	Akaike info criterion		23.44339
Sum squared resid	1.83E+10	Schwarz criterion		23.67913
Log likelihood	-334.9292	F-statistic		7.172125
Durbin-Watson stat	2.136996	Prob(F-statistic)		0.000601

Source:- Author research

ECM equation 3.3 states that d (EXP) depends on d (GDP), d (RP), d (ER) and also on the equilibrium error term. If the later is nonzero, then the model is out of equilibrium. Suppose d EXP is zero and $\mu_{(t-1)}$ is positive. This means d EXP_{t-1} is too high to be in equilibrium, that is d EXP_{t-1} is above its equilibrium value. Since β_4 is expected to be negative, the term $\beta_4\mu_{(t-1)}$ is negative and, therefore, d EXP will be negative to restore the equilibrium. That is if d EXP is above its equilibrium value, it will start falling in the next period to correct the equilibrium error, hence the name ECM. By the same token, if $\mu_{(t-1)}$ is negative (i.e., EXP is below its equilibrium value), $\beta_4\mu_{(t-1)}$ will be positive, which will cause d EXP to be positive, leading d EXP to rise in period t. thus, the absolute value of β_4 decides how quickly the equilibrium is restored. Further detail of the above regression is given below in Table 5 (above).

These are fairly satisfactory results. This table shows that short-run changes in GDP and RP have positive impact on EXP while ER has negative impact on Exports. The results also show that Relative Prices have some positive impact on Export but not statistically significant impact. The other two variables i.e., GDP and ER are statistically significant. It means that changes in GDP have positive impact on Exports and changes in Exchange rate have negative impact on exports. Statistically, the equilibrium error term is about zero, suggesting that the explanatory variables GDP, ER and RP adjust to changes in exports in the same time period. R^2 and adjusted R^2 have sensible values. It means that 54 or 46 percent of variation in export is explained by the above three variables (GDP, RP, ER), hence it is clear that other variables except GDP, RP and ER also influence exports. One can interpret 1.8182, 128523.6 and -

3107.324 as short run changes in EXP by GDP, ER and RP. One can also compare the long run and short run values of the above estimated regression. Summing up, it is concluded that GDP and ER have statistically significant impact on Export while the impact of RP is insignificant.

4. CONCLUSIONS

1. The exchange rate and GDP are cointegrated with each other but there is no causality in either direction.
2. The above study concluded that first to increase the economic activity of Pakistan, which should more focus on exports, because deprecation in exchange rate ultimately increase the exports profit and also should less relay on imports. Pakistan is an importing economy and exports of Pakistan is less influence on its GDP, so exchange rate deprecation can increase its foreign debt and also more burden on whole economy, so it should increase its exports and less influence on imports.
3. The authors arrived at conclusion that export was positively influenced by GDP (1.8182) and negatively affected by ER (-3107.324). It is clearly evident from findings that policy makers may be aware of the two opposite variables (GDP, ER) while making their export policies. The results provide that RP have some positive impact on exports, it means that policy maker should not be worried about this variable because it does not affect exports substantially. If government intends to enhance its GDP, there is need to increase exports on one hand and to ensure the decline of ER.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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