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Long Run Relationship Between Exports, Imports and its Determinants of Medical Instruments: Case of Pakistan

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Abstract

Medical instruments are the popular export products of Pakistan and retain their competitive edge in this field of medical instruments. After the review of literature, this study aims to check the existence of a long-run relationship between export of medical instruments and import of medical instruments, export promotion program and exchange rate index. The empirical analysis used the monthly time series data for June 2003 to December 2017 released by State Bank of Pakistan. The unit root results directed to apply the Johansen Cointegration test, and the result of this lead to Vector error correction estimate. The finding of this study reveals that there is a positive and significant long-run relationship between medical instruments export and import of medical goods and exchange rate index. The study has policy implications for medical instruments, sector stakeholders and the Government of Pakistan.

Keywords: *Medical Instruments Export, Medical Import, Export Promotion Program, Cointegration Analysis, VEC Model, Impulse Response Function, AR Stability Test*

JEL Classification*: L61, M16, M21, P34*

INTRODUCTION

Medical instruments, sports goods and leather garments are the sectors in which Pakistan has specialised skills as compared to other countries of the world. Medical instruments export plays a vital role in the economic growth of Pakistan. Locally manufactured products exported to higher-income markets of United State of America, Germany, United Kingdom, France, Italy, United Arab Emirates, Japan, Brazil, Mexico and Russian Federation (Sialkot Chamber of Commerce, 2015) .

Medical instruments used to assist health care professionals during surgery such as in cutting, grasping, retracting and suturing. 9018 is the Harmonised commodity code, also known as HS code, which is further divided into 13 sub-categories, used to present medical goods at the international market. The contribution of 9018 HS code in the surgical export performance

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of Pakistan is around 99 per cent while 1 per cent contribution is of another variety of surgical goods (SMEDA, 2017).

Table 1.1 exhibit detail of products name involved under HS code 9018, and exporting to different parts of the world. These products have provided a great advantage and strong market position in the international market to the surgical exporters of Pakistan. In short, it can be saying that surgical products are unique goods, which are manufactured in Pakistan and served to all countries of the world at a very competitive price and unique quality.

Table 1:

Instrument HS code	Instrument Particulars
9018.11	*Electro-Cardiographs*
9018.12	*Ultrasonic Scanning Apparatus*
9018.13	*Magnetic Resonance Imaging Apparatus*
9018.14	*Scintigraphy Apparatus*
9018.19	*Electro-Diagnostic Apparatus*
9018.20	*Infra-Red Ray Apparatus*
9018.31	*Needles and Syringes*
9018.32	*Tubular Metal and Suture Needles*
9018.39	*Needles, Catheters, Cannulae Etc.*
9018.41	*Dental Drill Engines*
9018.49	*Dental Science Instruments*
9018.50	*Ophthalmic Instruments and Appliances*
9018.90	*Instruments for Medical, Surgical or Veterinary Sciences*

Source: SMEDA

It is observed that the annual growth rate remained at 3 per cent from 2013 to 2017, which is very low as compared to Bangladesh and India (SMEDA, 2017) . Sharaft Ali (2013) highlighted that international trading plays a vital role in establishing an economic relationship with other countries of the world. To smoothen the export performance, Government of Pakistan released incentive of 5 per cent as an export rebate on medical instruments. However, continuous decline in export performance (During the year 2017, medical instruments export declined by 4.6 per cent) make the trade deficit more. Thus, the government provide significant exemptions in sales tax provided through SRO 1125(I)/2011 and bear loss of sale tax due to this given exemptions, and estimated loss was equal to USD 454.262 billion. However, all these remedial measures were taken to increase the export performance of the country (Ministry of finance, 2017). One can understand the impact of macro-economic policies on the environmental situation of Pakistan by understating the relationship between export and import with other determinants. However, it is perceived that a positive and significant relationship between export and import; show macroeconomic policies of Pakistan have an effective result on stabilising international trade balance of Pakistan (Sharafat, 2013).

Research Gap

Export of medical instruments from Pakistan to the international market is an essential

driver for the uplifting economy. To our knowledge, this is the initial study, which is investigating the existence of a long-run relationship between export and import of medical products along with export promotion program and exchange rate index. This study is essential for medical instruments exporters and importers of Pakistan in order to understand the behaviour of medical instruments export with its other identified determinants for its growth and to keep financial risk at bay, along with analysis of Government of Pakistan macroeconomic trade policies.

Problem Statement

The purpose of this research study is to analyse the cointegration between export and import of medical instruments, export promotion program facilities given to medical instruments exporters and exchange rate index to know either Pakistan medical sector economy is in the obedience of international budget constraint or not and support medical instruments exporters in financial risk management.

Research objective

1. To explore the relationship between medical goods export and import of medical instruments.
2. To investigate the relationship between medical instruments export and export promotion program given to medical instruments sector of Pakistan.
3. To find out the relationship between medical instruments export and exchange rate index.

Research hypotheses

H_1 = Cointegration exist between export and import of medical instruments.

H_2 = Association happen between medical instruments export and export promotion program.

H_3 = Relationship occurs between the export of medical products and the exchange rate index.

This research is highly significant for export-cum-manufacturers or exporters of medical instruments in Pakistan in order to strengthen and keep a competitive edge in this field. However, continuous scientific research is important for the growth of this sector. This study will add knowledge to the existing literature using the latest monthly time series data and explore the new dimension of medical goods export behaviour.

LITERATURE REVIEW

The literature studying the relationship between export and import of developing or developed countries is extensive with different techniques and variables. This research is a unique and very new process as it only addresses the export of medical instruments of Pakistan and its long-run relationship with the import of medical instruments, export promotion program, exchange rate index. However, the various previous empirical literature study is as follow:

Husted (1992) examined the long-run relationship between export and import of the United States. He used the quarterly United State data of export and import from 1968 to 1988and found a long-run relationship between export and import of the U.S. economy. However, he observed a structural shift in the United States current account. However, he was not able to find out what were the causes behind this structural shift. Bahamani-Osokooee (1994) investigated the long-run cointegration analysis between the import and export of Australia. They used the quarterly data from 1966I to 1990IV of Australian export and import. Using engle cointegration technique and found that there is co-integration exist between export and import. They argued that Australian macroeconomic policy is very useful in developing export and import to converging towards the equilibrium stage in the long-run. Uddin (2009) observe the time-series relationship between export and import of Bangladesh. He considers yearly export and import data over the period 1972-73 to 2007-08. However, he found the long-run relationship between export and import performance of Bangladesh using cointegration analysis technique and vector error correction estimates. Based on results, he argued that Bangladesh export and import are not moving against the international budget constraint. Hye and Siddiqui (2010) explained the cointegration relationship between export and import of Pakistan with the help of cointegration analysis and variance decomposition analysis. He used the quarterly data of Pakistan export and import from 1985 to 2008. Based on results, he argued that export did not cause export but import effect export effectively. Mukhar and Rasheed (2010) tested the cointegration between export and import of Pakistan using cointegration techniques along with vector error correction method. They found cointegration between export and import of Pakistan using the quarterly data from 1972 to 2006. They also found a bi-direction relationship between export and import using granger causality test. Tiwari (2011) examined the long-run relationship between export and import of India and China. The study used quarterly data from 1985 to 2008 and found that the cointegration relationship between export and import exist in India but not in the case of China with the help of Gregory- Hansen cointegration technique. Based on results, he argued that Pakistan international budget constraint is unstable. Sharaft Ali (2013) used the granger causality test and Johansen cointegration test to analyse the long-run relationship between the export and import performance of Pakistan using the data for 1972 to 2012. He argued that cointegration present between export and import of Pakistan while error correction term value indicated that both import and export variables move towards long-run equilibrium. For this research study, it is hypothesised that the export of medical goods has a significant relationship with import performance of medical instruments from Pakistan.

Export promotion program is an essential part of trade policy of any economic trade policy to boost export movements. Haque and Kemal (2007) argued that rebates and refunds which are also part of export promotion program have a small positive impact on export performance of Pakistan in the short-run using annual data for 1979-2001 by applying cointegration technique. Imtiaz Ahmed (2015) examined the impact of changes in export promotion program on export performance using industry-level data over the time of 2001-11. He suggested the government of Pakistan to enhance and support export incentives program in order to keep the competitiveness of Pakistan textile sector, as there is a direct relationship between export incentives and export performance of Pakistan as compared to other developing countries. Osama et al. (2015) investigated the effectiveness of export promotion program on the export performance of Sudanese export firms. The study used the reliability test, exploratory factor analysis, correlation analysis, and hierarchical regression to measure inter-relationships. They

found a positive and significant relationship between export promotion program and export performance. In this research, we hypothesised that export promotion program specifically developed for medical instruments sector of Pakistan have a positive and significant long-run association with the export of medical instruments.

It is commonly perceived that management of the exchange rate is a critical function to boost the economic performance of the country. A different experience of developing and developed economies shows that significant overvaluation of exchange rate harm the export performance of the country as it is strongly supported by cross-country evidence (Johnson, 2007). Keshab and Armah (2005) examined the long-run relationship between export and import, exchange rate using annual data from 1970 to 2000. Cointegration analysis and error correction model confirm the long-run association and stable relationship between export and import, exchange rate in Ghana. Adhikary (2012) examined the impact of exchange rate along with foreign direct investment, trade openness and domestic demand using time series data for 1980 – 2009. They applied cointegration analysis along with the VEC model. However, he did not find any significant relationship between exchange rate and export performance of Bangladesh. Francis Kipkoech Chirchir et al. (2015) empirically investigated the relationship between exchange rate volatility and export performance of tea firms in Kenya. They used the census approach and average monthly data collected from different firms for five years. They found that exchange rate volatility significantly influences the export performance of tea firms in Kenya. AJINAJA Olatunde Topson et al. (2017) investigated the issue of the impact of fluctuating exchange rate on export performance of Nigeria using secondary data for 1982 to 2015. They applied the ordinary least square method and found a positive relationship between exchange rate and export performance of Nigeria. For this research, we hypothesised that the exchange rate index has a significant and positive long-run relationship with the export of medical instruments from Pakistan.

To sum up, empirical studies related to the relationship between medical export and import along with export promotion program and exchange rate index has not yet examined. Besides, the medical sector-specific characteristics such as technology level and industrial developments might create controversial results. However, this paper aims to contribute empirical knowledge by investigating the cointegration analysis between the export and import of medical instruments along with export promotion program and exchange rate index. This study considered export as dependent variable and imports, export promotion program and exchange rate index as independent variables. Most of the literature supports our research framework.

METHODOLOGY

Data description and analysis technique

The time-series approach considered to examine the cointegration between export of medical instruments and import of medical instruments, export promotion program and exchange rate index. To understand the results more deeply, monthly data selected for the experiment rather than annual data for 2003-2017. According to Beck and Levine (2004), using quarterly data is better than annual data in order to produce better results. On the other hand, Reily (2013) argued that monthly data is much better as it is easy to use in model and helpful to identify changes in trend and better for long-term strategic forecasting or evaluation.

It is worthwhile to note that data is free from small sample biases, which may provide efficient result parameters. The primary resource for the collection of the data is State Bank of Pakistan (SBP).

The data analysis consists of; (a) Unit root test using Augmented Dickey-Fuller (ADF) following Dickey-fuller (1979), (b) Optimal lags selection (c) Johansen Cointegration test, (d) VEC model.

Econometric Model

Equation 3.1 is the basic VECM model.

$$\Delta Y t = \beta 0 + \sum_{i=1}^{n} \beta i \Delta Y t - i + \sum_{i=0}^{n} \delta i \Delta X t - i + \varphi z t - 1 + \mu t$$

Equation 3.1

In equation 3.1, z is the error correction term (ECM) and are the ordinary least square residuals from the long-run cointegration regression;

$$Y_t = \beta_o + \beta_1 X_t + \varepsilon_t$$

Equation 3.2

While it could be defined as follow;

$$z_{t-1} = ECT_{t-1} = y_{t-1} - \beta_o - \beta_1 X_{t-1}$$

Variables explanation

Medical instruments export (LNEXPORT)

In this research study, medical instruments export is the dependent variable. Figure 3.1 presents the annual percentage change in export performance from 2003 to 2017. The highest percentage growth observed during 2006 and 2017 while highest declined detected in the third quarter of 2016.

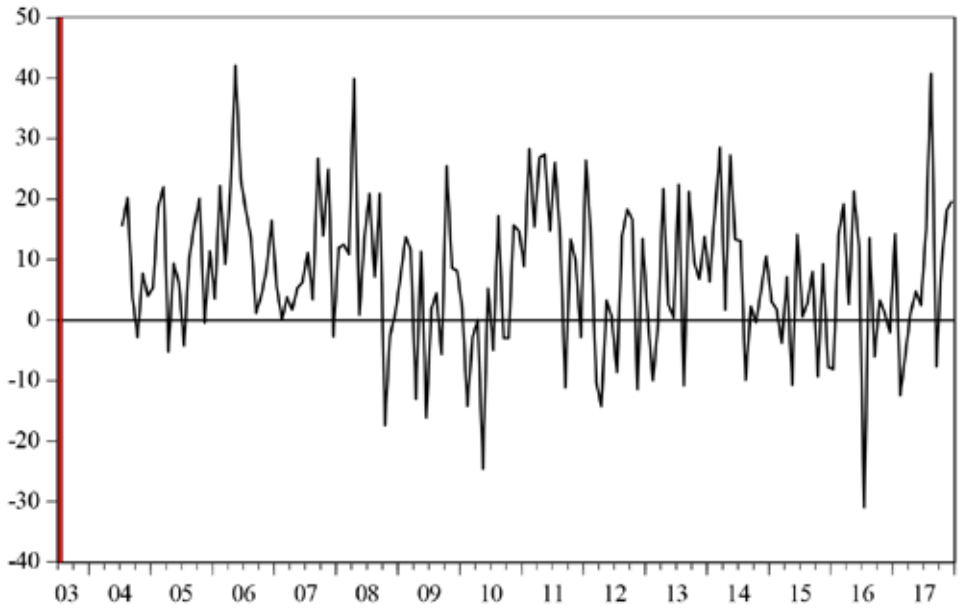

Figure 3.1: Annual percentage change in medical export, in %.
Source: Constructed by the author using State Bank of Pakistan economic data

Medical instruments import (LNIMPORT)

Import of medical products is the independent variable. Figure 3.2 explain the annual percentage change in import performance for the period of 2003 to 2017.

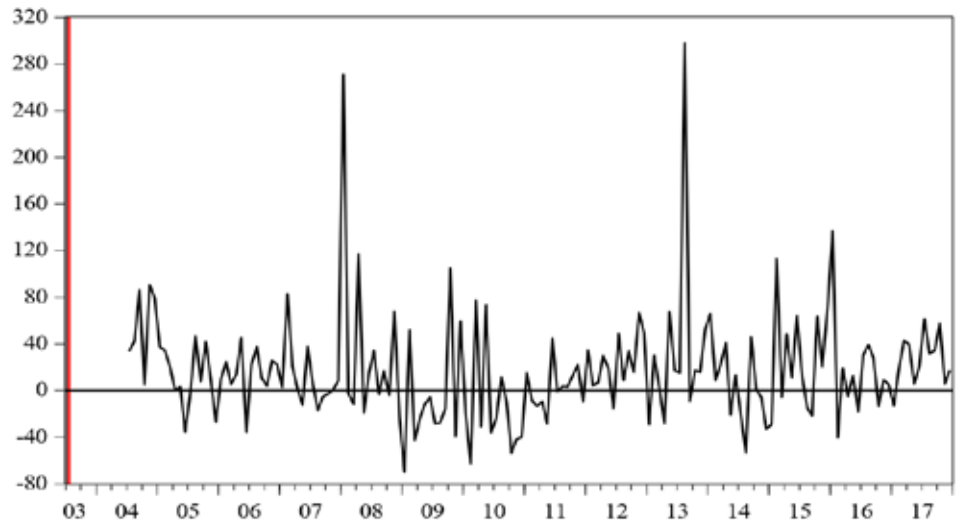

Figure 3.2: Annual percentage change in import, in %.
Source: Constructed by the author using State Bank of Pakistan economic data

The highest growth is detected in the third quarter of 2013, and the lowest declined observed during 2008-09.

Export promotion program (LNCREDIT)

Export promotion program is taken as the proxy of the credit facility given by banks to the medical sector of Pakistan. Cash incentive directly increases the export value as these are direct disbursements and directly impact export value (Ahmed, 2015). Therefore, it is included as the independent variable. Figure 3.3 exhibit the annual percentage change in export promotion program from 2006 to 2017. Highest positive percentage observed in 2011 while the lowest declined detected in 2013.

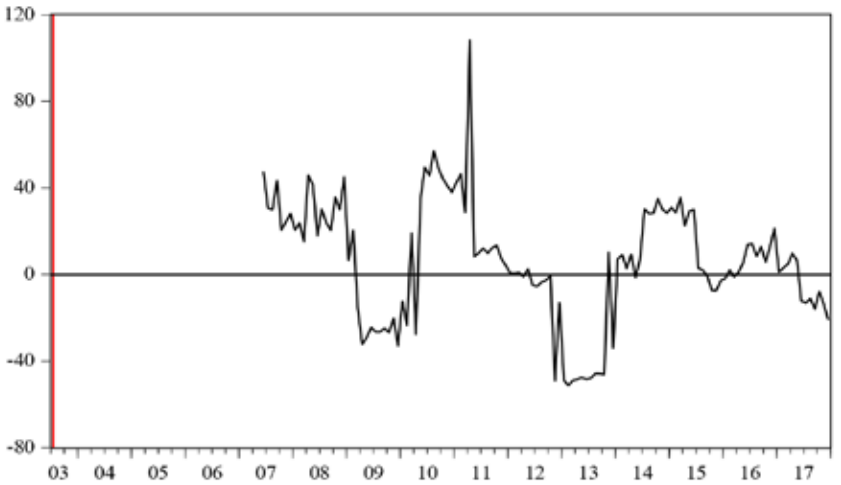

Figure 3.3: Annual percentage change in credit facility, in %.
Source: Constructed by the author using State Bank of Pakistan economic data

Exchange rate index (LNCURINDX)

Figure 3.4 explains the annual percentage change in the exchange rate index from 2003 to 2017. The highest percentage change observed in 2009, and the lowest in 2015.

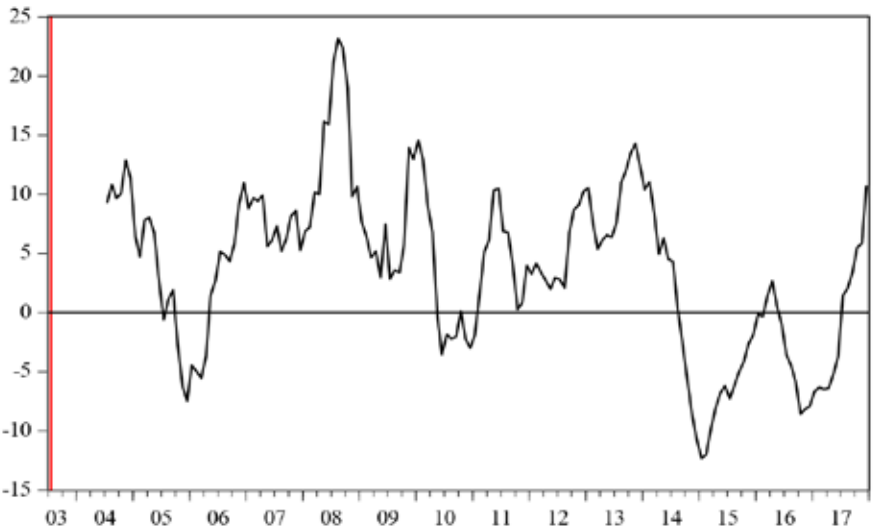

Figure 3.4: Annual percentage change in average of currency index , in %.
Source: Constructed by the author using State Bank of Pakistan economic data

The data is numerical and is the independent variable in this experiment, whereas it was constructed by taking an average of the exchange rate of Dollar, Euro and British Pound.

RESULTS AND DISCUSSION

Table 4.1 presents the statistical analysis of the data for the period of 2003 to 2017. The average of export is 24652.25 ($ 000) with the standard deviation of 6873.43. The average of import is 34984.93 ($ 000) with a standard deviation of 15753.12. The average credit is Rs. 6234.68 million with the standard deviation of 1383.20. The average of CURINDX is 107.04 with a standard deviation of 19.43.

Table 4.1: Descriptive Statistics

	EXPORT	IMPORT	CREDIT	CURINDX
Mean	*24682.25*	*34984.93*	*6234.68*	*107.04*
Median	*24806.81*	*30879.34*	*5905.54*	*113.40*
Maximum	*43527.22*	*102761.40*	*8708.39*	*142.83*
Minimum	*12014.15*	*11802.71*	*4001.35*	*71.42*
Std. Dev.	*6873.43*	*15753.12*	*1383.20*	*19.43*
Observations	*174*	*174*	*139*	*174*

Unit root

Unit root test is the most popular and initial test to examine stationarity of variables before conducting time series analysis; a time series will be stationary if data has constant mean and variance over time, but if variables are non-constant or non-variance then it will be called non-stationarity. Granger (1986) recommended to used unit root test as a pre-test to avoid spurious regression. Table 4.2 presents the results of the unit root test. Augmented Dickey-Fuller (ADF) test used to check the stationarity of the data by following Dickey-Fuller (1976). According to Sharafat (2013), ADF test is better than other tests as it consideration correlation between the error terms with the help of adjustment of one time differenced terms of dependent variables. All the variables are stationary at the first difference, which gives direction for Auto-Regressive Distributed Lag (ARDL), Vector Auto Regression (VAR), VECM model.

Table 4.2: ADF unit root test for stationarity

	Level		First difference		
Variables	**Intercept**	**Trend and intercept**	**Intercept**	**Trend and intercept**	**Nature**
LNEXPORT	*0.409*	*0.641*	*0.000**	*0.000**	*Dependent*
LNIMPORT	*0.068*	*0.004**	*0.000**	*0.000**	*Independent*
LNCREDIT	*0.131*	*0.348*	*0.000**	*0.000**	*Independent*
LNCURINDX	*0.366*	*0.670*	*0.000**	*0.000**	*Independent*

**MacKinnon (1996) one-sided p-values significant at 5 per cent level of significance*

Optimal lags and Johansen Cointegration Test

After the unit root test, mostly researcher faces the problem of an optimal number of lags selection and criteria as different lag and criteria produce different results during cointegration analysis (Emerson, 2007). Akaike information criteria (AIC) considered for selecting an optimal

number of lags for cointegration analysis. According to Liew (2004), AIC is superior to other criteria used for optimal lag selections during cointegration analysis with a large sample size as it covers true lags length. AIC recommends a maximum of 4 lags can be select for finding out a number of cointegration vectors (See table 4.3).

Table 4.3: Optimal Lag selection

Lag	AIC	SC	HQ
0	*62.453*	*62.542*	*62.489*
1	*61.428*	*61.870**	*61.607*
2	*61.152*	*61.946*	*61.475**
3	*61.135*	*62.282*	*61.601*
4	*61.073**	*62.573*	*61.682*
5	*61.105*	*62.957*	*61.857*
6	*61.126*	*63.332*	*62.022*
7	*61.189*	*63.748*	*62.229*
8	*61.270*	*64.182*	*62.454*

** indicates lag order selected by the criterion*

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

All variables are stationary at first difference; we can go for cointegration analysis. Table 4.3 exhibit that there is one cointegration equation in the model and shows that a long-run relationship exists between export and import of medical instruments, export promotion program, exchange rate index. Therefore, we reject the null hypothesis of no cointegration and accept the alternative hypothesis on the base of trace and maximum eigenvalue statistic at 5 per cent level of significance, and both tests show that at least one cointegration vector exists between dependent and independent variables at 95 per cent level of confidence; which indicate that VEC model can be applied instead of VAR model.

Table 4.4: Cointegration Rank Test (Trace and Maximum Eigenvalue)

Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	Trace Statistic Prob.**	Max-Eigen Statistic	Max-Eigen Statistic Prob.**
*None **	*0.413*	*176.305*	*0.000*	*70.759*	*0.000*
*At most 1 **	*0.322*	*105.546*	*0.000*	*51.680*	*0.000*
*At most 2 **	*0.205*	*53.866*	*0.000*	*30.577*	*0.000*
*At most 3 **	*0.161*	*23.289*	*0.000*	*23.289*	*0.000*

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level

** denotes rejection of the hypothesis at the 0.05 level*

***MacKinnon-Haug-Michelis (1999) p-values*

Notably, the value of the error correction term should be negative and significant in the VEC model to confirm the long-run equilibrium association between variables, and it is necessary (Adhikary, 2012). If error correction value becomes positive and insignificant than it shows there is no long-run equilibrium link between dependent and independent variables,

which is not a good sign.

Vector Error Correction Estimates

Table 4.4 exhibit the results of the VEC models estimates; all the long-run variables converted to normalised cointegration coefficients, as it is necessary to separate dependent variable from independent variables because VEC model produce combined results of dependent and independent variables. There is positive and significant long-run relationship found between export and import. Such a positive relationship is probably due to the high demand for import of steel of Pakistan and import of medical instruments raw material for forging process from different countries since 2003. This result tends to support the first hypothesis and fulfil the first objective of this research study by showing significant sign of association between export and import of medical instruments. Secondly, the positive association observed between export promotion program given to the medical sector of Pakistan. However, it is insignificant. On the other side, it is perceived that timely available financial services by banks assist exporters in minimising financial risk by starting timely operational activities and many other services related to the production of medical instruments. This result rejects the second hypothesis and completes the second research objective by the enlightening insignificant sign of cointegration between export and export promotion program. Thirdly, positive and long-run significant sign found between export performance of medical goods and exchange rate index. Thus, based on results, we accept the third hypothesis and third research objective completed with the positive and significant sign of association between medical instruments export performance and exchange rate index.

Table 4.5: Vector Error Correction Estimates

Cointegrating Eq		**CointEq1**		
DEXPORT(-1)		*1.000*		
DIMPORT(-1)		*0.078**		
		-0.032		
		[-2.463]		
DCREDIT(-1)		*0.359*		
		-0.378		
		[-0.952]		
DCURINDX(-1)		*264.061**		
		-74.628		
		[-3.538]		
C		*12.266*		
Error Correction:	**D(DEXPORT)**	**D(DIMPORT)**	**D(DCREDIT)**	**D(DCURINDX)**
CointEq1	*-2.016*	*8.501*	*-0.039*	*0.001*
	-0.387	*-1.661*	*-0.088*	*0.000*
	[-5.211]	*[5.119]*	*[-0.443]*	*[2.258]*

*Values in () show standard error value and value in [] show t-statistics; * indicate significant value*

The co-efficient sign of error correction term (CointEq1) is significant and negative as per expectation, and it should be between 0 and 1 (Latimaha, 2011). Import and exchange rate index are the variable, which can help export performance to correct its disequilibrium stage

and their relationship with export is significant at 5 per cent level of significance. However, their speed of adjustment is slow. The present study supports the findings of Keshab and Armah (2005), Haque and Kamaal (2007), Uddin (2009), Hye and Siddique (2010), Rasheed (2010), Sharafat Ali (2013), Imtiaz Ahmed (2015), and AJINAJA Olatunde Topson et al. (2017).

It is evident from the results of Johansen cointegration test and VEC model that export and import, export promotion program, exchange rate index is cointegrated together which show that long-run equilibrium relationship exists between dependent and independent variables, which shows observance of medical goods sector of Pakistan to the international constraint. The existence of a long-run relationship between export and import is essential for the Pakistan economy to the international budget constraint (Sharaft, 2013).

The long-run and positive relationship between export and import of medical instruments is very crucial for the growth of the medical sector of Pakistan because import plays a vital role through multiple ways such as import of steel or other raw material, material for forging of surgical instruments, modern technology machine as it directly influences the productive capacity in the economy. This sector is significant for the boosting economic performance of Pakistan. According to Shirazi and Minap (2004), import plays a crucial role in improving the export performance of Pakistan. The inflow of capital goods, material for forging, good quality steel at low rates directly influence the export performance of medical instruments which indirectly bring economic prosperity in Pakistan along with higher foreign exchange earnings and in result; develop the economy of Pakistan to get more access into the liberalised world markets whereas adoption of liberalised trade policy is necessary to import essential raw material and modern technology to enhance the productivity of medical sector of Pakistan. Thus, the higher the import, the higher the export of medical instruments of Pakistan.

The long-term link between export behaviour and import, exchange rate index is very important for exporters to minimise financial risk as much as possible low and it shows government performance in addition to uplift the exporters business activities. Timely available finance and less overvaluation of exchange rate gives extra cushion to exporters and help to continue business operation in the time of financial stress. Thus, higher the import of medical instrument, higher the exporter performance and same like that with exchange rate index.

Afterwards, impulse response function (IRF) applied to examine the effectiveness of the coefficients over time and to predict the reactions of the variable through positive standard deviation shock. According to Saeed Meo (2015), IRF is the useful technique after the use of VEC model to evaluate the performance of coefficients over time using one positive standard deviation shock and foresee their behaviour for upcoming periods. Therefore, we gave one standard deviation positive shock (± 2 S.E. innovations) to LNEXPORT. In this response, export performance will decline in the next two month, and afterwards, it will move upward and going to diminishing in 7 months, move upward again during eight months. In the second step, we gave one positive standard deviation shock to LNIMPORT and in result; export performance will gradually improve within next 5.5 months, afterwards, it will decline from 6 months and goes upward up to 8 months, and then it goes down. In the third step, we gave one positive standard deviation shock to LNCREDIT than export performance will show little sign of growth and reach at high during four-month and afterwards it will show little up and down. In the end, we gave one standard deviation positive shock to LNCURINDX than

export behaviour will improve for next one month, and lower down up to 4 months, then again it shows positive to sign up to 5 months and then again lowers down up to 7 months, from 8 months it again tends towards lower down and try to rise during the start of 10 months.

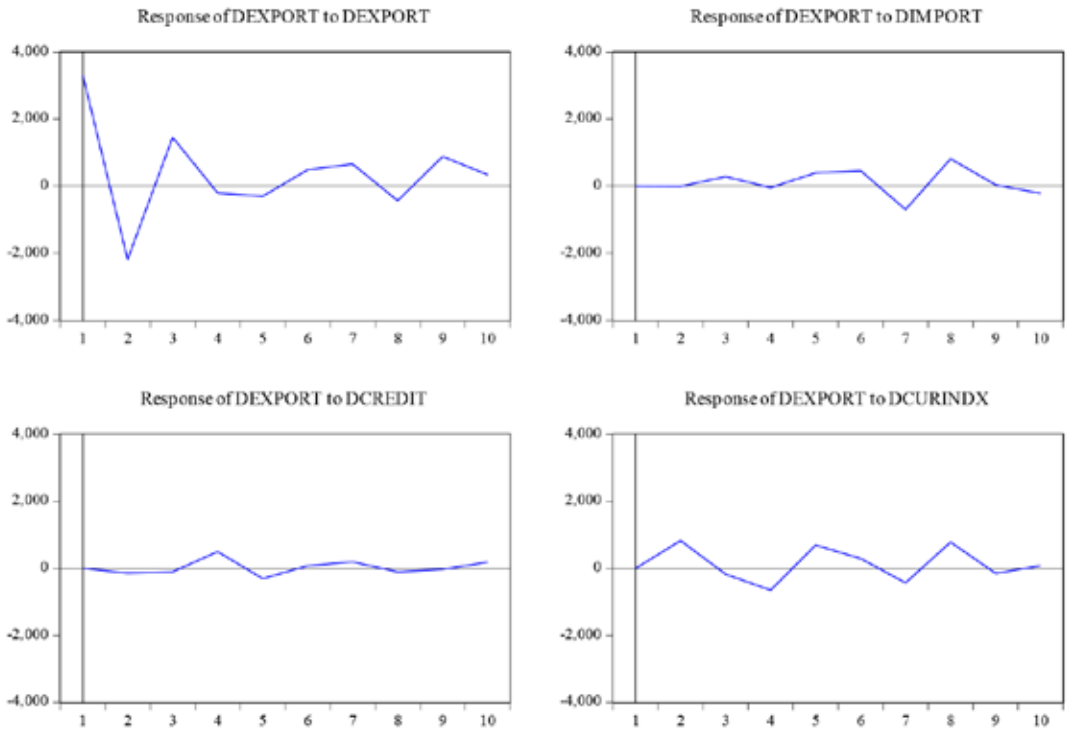

Figure 4.1: Response to Cholesky One S.D. Innovations
Impulse Response Function of LNEXPORT, LNIMPORT, LNCREDIT and LNCURINDX on LNEXPORT

The stability of the VEC model examined through AR characteristics polynomial. According to James (2014), all the roots should be inside the circle, in the case of the VEC model as it shows that the VEC model is structurally stable. Figure 4.2 indicates that the VEC model of this research study is stable as all the roots are inside the circle.

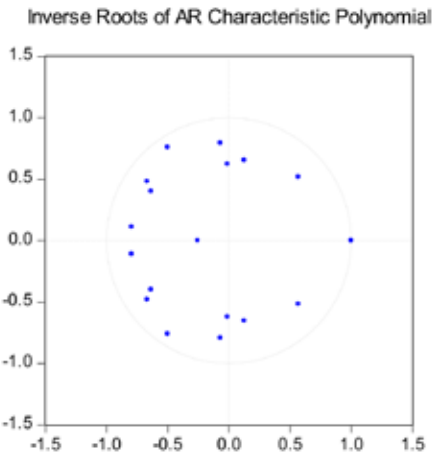

Figure 4.2: VEC model stability test

On the other side, stability is also measured with the CUSUM (cumulative sum of the recursive residual. CUSUM indicate that equation is stable as the cumulative sum is inside the area between the critical lines at 5 per cent level of significance. Second, the diagram represents the CUSUM of squares test, and it also shows that model is stable. However, little shift observes during October of 2013, but it is ignorable as shift move inside the area between critical lines at the same month. Thus, the model is stable.

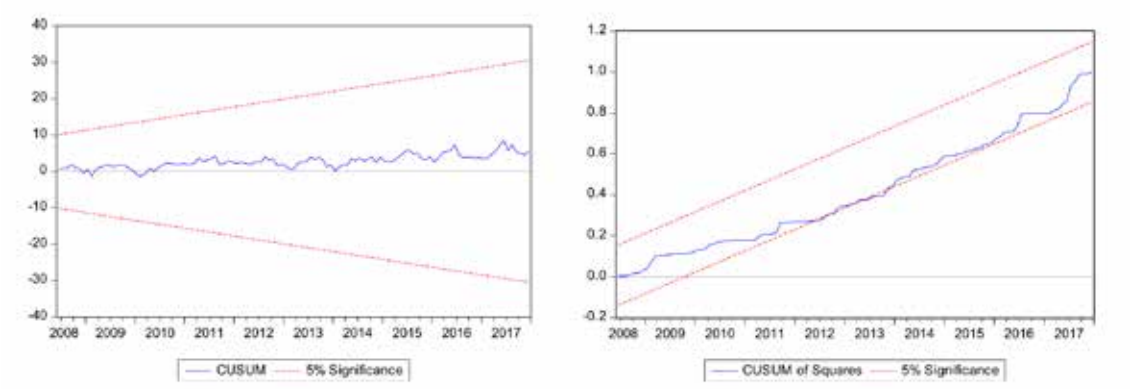

Figure 4.3:

In the end, residual diagnostic test performed. Table 4 present the probability value of each test and indicate that there is no problem of serial correlation, heteroskedasticity and normality.

Table 2.6:

Serial	Diagnostic Test	P-Value
1	*Breusch-Godfrey Serial Correlation LM Test:*	*0.050*
2	*Heteroskedasticity Test: Breusch-Pagan-Godfrey*	*0.061*
3	*Jarque-Bera Test*	*0.202*

CONCLUSION, IMPLICATIONS AND DIRECTION FOR FUTURE RESEARCH

This study aimed to investigate the influence of medical instruments import along with export promotion program facilities given to medical instruments sector of Pakistan, exchange rate index on export performance over the time of 2003 – 2017 using monthly time series data, by applying VEC model. Unit root results indicated that all the variables integrated into the first difference. Johansen cointegration test shows the presence of a long-run association between dependent and independent variables, cointegration result directed to used VEC model and error correction term confirmed the long-run equilibrium relationship existed between variables. The results indicate a positive and significant long-run relationship between export and import of medical export performance, along with exchange rate index. This indicates that the medical sector of Pakistan economy conforms to international budget constraint. Furthermore, impulse response function indicates a positive effect of import and exchange rate index on export behaviour of medical instruments.

The policy implications can be interpreted in the following points. First, there exists a long-term link between export of medical instruments with the import of medical instruments and exchange rate index. This gives direction to the Government of Pakistan and Surgical

Instruments Manufacturers Association of Pakistan (SIMAP) to utilise the investigated factors related to export performance on a long-term basis in order to benefit surgical sector of Pakistan. Second, the import of medical instruments found to be much-contributed variable in explaining the export. Thus, liberalised trade policy should be implemented to increase export while Pakistan is a highly import-oriented economy with unfavourable trade balances; however, appropriate trade policy will not affect import cost nor create an adverse effect on export performance of medical sector of Pakistan.

In the end, this study is not free from limitations. For instance, this study used medical instrument export as the dependent variable while import, export promotion program and exchange rate index as independent variables to examine cointegration and their effectiveness in explaining the long-term link. Different multiple indicators should adopt to explain medical instruments export behaviour along with changed measures, which may produce a different conclusion. Nonetheless, this empirical investigation adopted the latest cointegration and VEC model techniques to analyse the link between variables, which may provide an essential base for future research in Pakistan for medical instruments behaviour.

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