STATISTICAL STUDY OF IMPACT OF SERVICES ON BALANCE OF PAYMENT IN PAKISTAN

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ABSTRACT

This study focuses upon the economic analysis of the influence of different export (E) and import (I) services on Pakistan balance of trade (BOT). Numerous statistical approaches are employed to evaluated the quarterly data of Pakistan from January, 2005 to June 2014. These techniques include Augmented Dickey Fuller (ADF) test, stepwise regression and variance inflation factor (VIF) to examine the influence of export and import of services upon the balance of payment (BOP) of Pakistan. The data stationarity is examined by employing ADF test. The findings revealed that the financial services (E), other business services of E and I have significant impact on the BOP in Pakistan. There is positive relationship of Other business services (E) and financial services (E) with BOT while other business services (I) have a negative relationship with BOP in Pakistan.
Key word: Balance of Payment, ADF, VIF, Stepwise Regression, Pakistan.

1. INTRODUCTION

Globally, each country has to achieve some target to have adequate balance of payment (BOP). The countries which do not have favorable balance of trade (BOT) have challenges in economic development and stability in economic activities. On contrary, a favorable BOT has a key role in developing the economy of a country. The BOT of an economy mainly comprises of imports (I) and exports (E). When the number of exports of a country are more than the number of imports (i.e. E>I), then the BOT is favorable while when I>E, there is unfavorable BOT in the country. The BOT has current account and along with capital account. While BOP shows both visible and invisible exports it means BOT is a part of BOP. The BOP includes all the international transactions of a country with all other international economies (Mishkin and Eakins, 2009). The favorable BOT is necessary in order to have optimal BOP in the economy.
On average, the economic growth of Pakistan is about 5% but the economy has not achieved its economic growth (Hussain, 2009). Among different

factors, the main barrier in achieving latent economic growth in Pakistan is due to the existence of unfavorable BOT. With time, the proportion of imports has increases more than the proportional increase in the number of exports creating a huge gap leading towards unfavorable BOT (Ali, 2009). Textile products have been a major product for export in Pakistan while the energy is mostly imported in the country. The rising oil prices in the international market with same (or slightly changed) textile prices has also contributed towards unfavorable BOT in Pakistan. Thus, it is essential to have a sound understanding of the influence of imports and exports on the BOT of Pakistan.
The main focus of the studies in the literature were on the impact of imports (commodities and goods) and exports (commodities and goods) on BOT in Pakistan. For example, Ali (2009) explored the BOT in Pakistan using different commodities such as manufacturing, textile, food and others. Alam and Ahmad (2011) investigated the influence on imports based on the exchange rate volatility in Pakistan using

autoregressive distributed lag (ARDL) model. Abbas and Raza (2013) studied the deficit on the Pakistan economy as an outcome of trade. The relationship between the devaluation of Pakistan's currency and the BOT of Pakistan was studied by numerous researchers see Akhtar and Malik (2000), Khan and Aftab (1995), Hassan and Khan (1994) and others. Akhtar and Malik (2000) investigated the price elasticity of export and imports in Trade of Pakistan with is main allied. In literature less attention given to the impact of export (services) and import (services) on BOT in Pakistan and they were studied with commodities not individually.

2. Literature Review

In the end of 2013, a Rs. 137.56 billion trade deficit was experienced by Pakistan. In this, the exports were about Rs. 243.387 billion while the imports were nearly Rs. 380.94 billion. The deficit in trade of the country reduced 3% in the beginning of the fiscal year 2013-2014 as the increase in exports was than imports in Pakistan.

In June 2003, a highest BOT (645.7 billion Rs.) was reported while the lowest was in December 2011 (-215.02 million Rs.). According to the PBS, the BOT was during 1957-2017 was about -200.29 billion Rs. on average (PBS, YEAR). The adverse BOT is an outcome of the higher number of imports than exports in Pakistan. In addition, there are many more macro-economic indicators which also contribute in it.

Goldstein and Khan (1978) examined eight developed countries during the time span of 1955 to 1970. They found that the imports demand and exports supply are closely associated with the rate of exchange prevailing in the country. Khan and Hasan (1994) found that the devaluation of the currency increases the BOT in Pakistan. Khan (1995) applied Marshall-Learner condition scenario in Pakistan and suggested that the economy can anticipate no or litter chance in its BOT by decreasing the value of its currency.

Husain (1998) studied Pakistan an elitist state economy. The findings revealed that in 1996, nearly 99% of the Pakistan exports contain commodities like leather, tobacco, fish, cotton etc. which is 20% more than in 1947. This showed a great improvement in exports because exports duties were reduced. The exports were increased rapidly after 1947 as an outcome of the increasing world trade while a decrease in the imports of consumer goods (40% to 15%) was observed during 1947-1996.

Aftab (2002) studied the short-run and long-run impact of the devaluation of exchange rate on the trade of Pakistan. The long-run impact was studied using Johansen's co-integration approach method to investigate elasticities of trade with the Marshall Lerner (ML) Condition. The study showed that the ML condition is satisfied for Pakistan in the long-run and real decline in Pakistani rupees used as policy tool to improve the BOT in the economy. Santo-Paulino and Thirlwall (2004) investigated the influence of trade liberalization upon imports, exports and BOT of developing nations. They studied twenty-two developing countries and found that the liberalization leads to increase the rate of imports more as compared to exports which had huge impact on the BOT and BOT of all countries. Akbostanci (2004) investigated short-run and long-run behavior of BOT on the exchange rate. The study showed that in the long-run period the decline in the value of the Turkish Lira has positive impact on the Turkish BOT. Mustafa, Nishat and Kemal (2004) examined the relationship between the exchange rate volatility and growth of Pakistan economy with trading partners using VEC model and co-integration method. The trading partners included European, ASEAN, SAARC etc. Their results indicated that the exchange rate volatility has negative influence on the growth of exports in Pakistan's trade with United Kingdom, Singapore, United States, Australia and Bangladesh. Kikuchi (2004) studied the impact of exchange rate volatility on bilateral exports in East Asian economies which include Philippines, South Korea, Indonesia, Thailand and Singapore. The study showed that the exchange rate volatility has positive relationship with South Korea, Philippines, Singapore and Thailand while it has negative relationship with Indonesia.

Husain (2009) explored the politics role in the growth of an economy. The image of a country is affected due to political instability and misgovernance in terms of Trade globally. In long-run period, the oil price rise in the international market, rupees devaluation and rise in country's debt to finance existing trade deficit has also contributed towards the negative BOT in Pakistan. Ali (2009) investigated the impact of imports and exports on the BOT in Pakistan using different statistical methods. The techniques included multiple linear regression, stepwise regression and principal component

analysis (PCA). The variables examined included manufacturing, textile, food and miscellaneous variables. The results showed that floor covering and strips, food products, cotton fabrics, live animals (imported to Pakistan), manufactured goods (imported to Pakistan), fuel and lubricants (imported to Pakistan) and leather (exported from Pakistan) have significant impact on the BOT of Pakistan. Mohammad (2010) empirically investigated the factors contributing in deficit of BOT using vector error correction (VEC) model on Pakistan during the period 1975 to 2008. Their findings revealed that the factors influencing the BOT in Pakistan are foreign direct investment (FDI), foreign income, real exchange rate and household consumption. Asif (2011) also pointed out that the decrease in the value of currency in Pakistan has positive impact on the BOT in the country.

2. Methods
2.1 ADF test
The model for the ADF unit root test is defined as:

$$\Delta y_t = \delta + \theta y_{t-1} + \sum_{g=1}^{k} \beta_g \Delta y_{t-1} + w_t, \qquad (1)$$

where $\theta = \alpha - 1$ and α is the y_{t-1} coefficient. The term Δy_t denotes the first difference of observed series y_t. The null and alternative hypothesis of ADF test is:

$$H_0: \theta = 0,$$
$$H_1: \theta \neq 0.$$

The acceptance of null hypothesis suggests that the problem of unit root exists in the data. While if null hypothesis is rejected, the data is said to be stationary.

2.2 Variance Inflation Factor (VIF)
The VIF approach is a way of determining the amount of collinearity among the explanatory variables. The existence of collinearity among the explanatory variables reduces the statistical significance of linear regression model. The VIF is defined as:

$$VIF = \frac{1}{1-R_l^2}; \quad l = 1,2,\dots,p \qquad (2)$$

where p is the number of explanatory variables and R_l^2 denotes the unadjusted coefficient of

determination. The interpretations of VIF are as follow:

(i)   If VIF=0, the variables are uncorrelated,
(ii)   If 1<VIF<5, there is moderate correlation among variables and,
(iii)   If 5<VIF<10, there is high collinearity among explanatory variables,
(iv)   If VIF>10, there exists severe collinearity problem.

This study has applied VIF approach to examine whether the correlation exists among explanatory service variables of exports and imports.

2.3 Stepwise Regression
The stepwise regression (SR) approach is a step-by-step iterative development of the regression model that comprises the identification of explanatory variables to be employed in the final model. It is an alternative approach to linear regression models. When the variables are correlated with one another indicating the presence of collinearity among explanatory variables, then the results of the linear regression model may be invalid. Thus, in this scenario the SR is adopted for the selection of best input variables for modeling by removal or addition of potential explanatory variables, and statistical significance is examined in every iteration. This study applies stepwise regression using backward elimination that deletes a single explanatory variable at a time, and then testing is employed to examine whether the removed variate is significant or not in modeling the BOP of services in Pakistan.

4. Data Collection and Descriptive Analysis
The data is collected from the official website of Pakistan Bureau of Statistic (PBS). The time period of data is from January 2005 to June 2014. The variables included in the study are exports (services) and imports (services) with trade values. The export (services) and import (services) is divided into eleven variables which include travel services, transportation, royalties and licenses, cultural and recreational, personal, insurance, government, financial construction, computer and information, communication and other business. These variables are used as explanatory variables of export (services) and (import) services and their impact is studied on the BOT in Pakistan.

Figure 1 and 2 shows the time series plot of export and import of Services in Pakistan during 2005 to 2014. It shows that the variables have distinct

patterns in the years. The exports have been decreasing over the period. While the imports have been increasing specifically relating to computer and information, communication, insurance and transportation services.
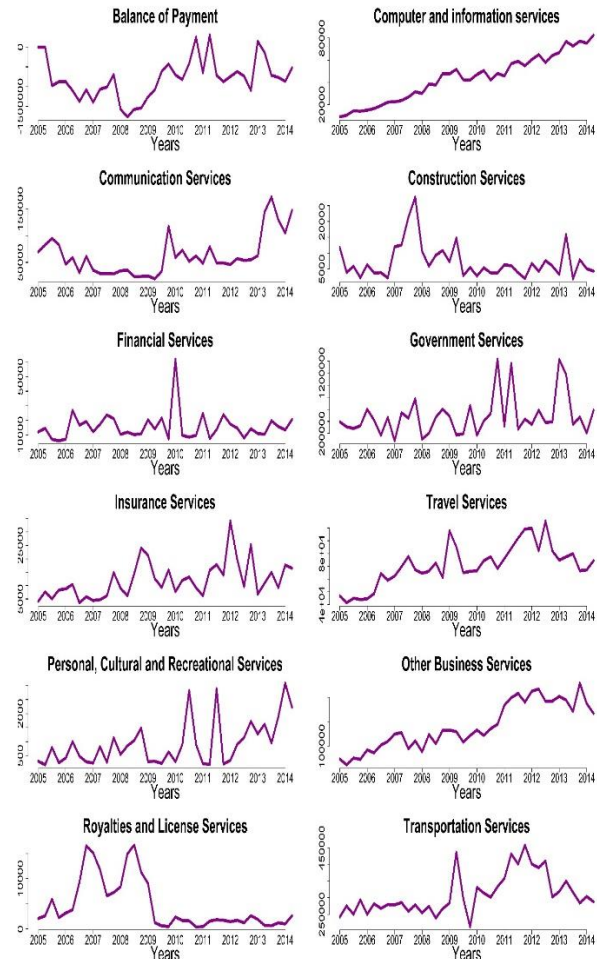

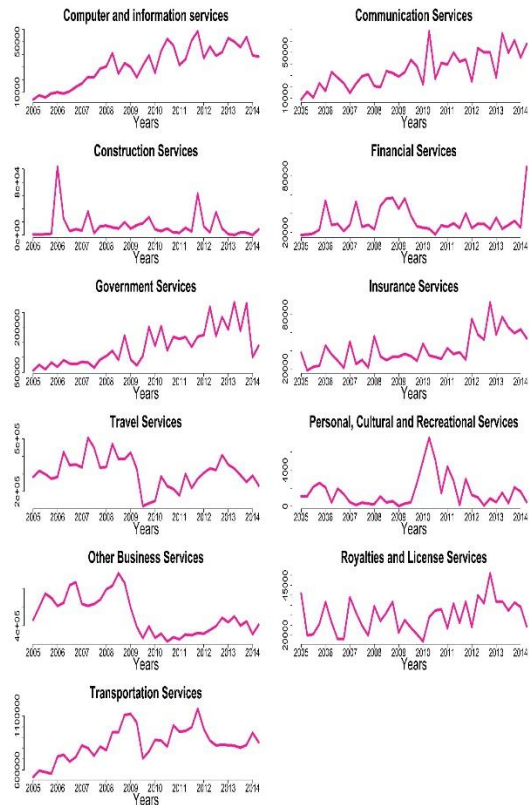**Figure 1:** Time series plot of Export of Services in Pakistan

Figure 2: Time series plot of Import of Services in Pakistan

4.1 Economic Model and testing of Hypothesis

To find the relationship between imports and export. This study used the Augmented Dickey Fuller Test (ADF test) which is used to check stationarity and non-stationarity in time series data. Unit root test is used for this purpose. To check the severity of multicollinearity among export and import services variables, this study used Variance Inflation Factor (VIF). At the end, Stepwise regression is used to find statistically significant variables for both export and import services which effects on balance of payment in Pakistan.

5. Empirical Results and discussion

Table 1 displays the ADF test results on the BOP and export (E) and import (I) service variables of Pakistan. The results indicate that the p-value for all export services variables except communication services, other business services, travel services and royalties and license services is less than 0.05 which means that the null hypothesis of ADF is rejected for Computer and information services (E), Construction services (E), financial services (E), government

services (E), insurance services (E), transportation services (E) and personal, cultural and recreational services (E). Among import variables, the other business services, transport services and travel services are found to be non-stationary and the remaining service variables are stationary at 5% level of significance.

Table 2 shows the ADF test results on the differenced services of export and import services variables. It is found that the differenced series of the communication services (E), other business services (E and I), travel services (E and I), royalties and license free services (E and I), and transport services (I) are stationary at 0.05 level of significance. variables (Export and Import) in Pakistan

Table 3 shows that there all the export services variables are correlated with each other indicating the presence of multicollinearity in the data. The However, VIF<10 for all export services variables which indicates that the level of collinearity is not severe. The VIF of computer and information services in exports is highest. By comparing the import service variables, it is found that the VIF value is highest for Government services and lowest for computers and information services. The VIF values indicate the presence of low multicollinearity in the data.

Table 1: ADF test results of the BOP and Services

Variable	Category	Statistic	Critical Value	P-value
BOP	-	-3.24*	-2.93	0.03
Computer and information services	Export	-3.86*	-3.54	0.02
Construction Services	Export	-3.96*	-2.94	0.00
Financial Services	Export	-7.05*	-2.94	0.00
Government Services	Export	-5.83*	-2.94	0.00
Insurance Services	Export	-4.28*	-2.94	0.00
Persona, Cultural and Recreational Services	Export	-4.27*	-2.94	0.00
Transportation Services	Export	-3.08*	-2.94	0.04
Communication Services	Export	-0.54	-1.95	0.48
Other Business Services	Export	-3.05	-3.54	0.13
Travel Services	Export	-2.54	-2.94	0.11
Royalties and License Services	Export	-1.36	-1.95	0.16
Communication Services	Import	-9.34*	-3.54	0.00
Computer and Information Services	Import	-3.97*	-3.54	0.02
Construction Services	Import	-5.89*	-2.94	0.00
Financial Services	Import	-3.19*	-2.94	0.03
Government Services	Import	-6.37*	-3.54	0.00
Insurance Services	Import	-5.71*	-3.54	0.00
Personal, Cultural and Recreational Services	Import	-2.13*	-1.95	0.03
Royalties and License Services	Import	-4.97*	-2.94	0.00
Other Business Services	Import	-2.40	-3.54	0.37
Transport Services	Import	-2.78	-2.94	0.07
Travel Services	Import	-2.83	-2.94	0.06

Note: * statistically significant at 5% level of significance

Table 2: ADF test on the Differenced series of services variables (Export and Import)

Variable	Category	Difference	Statistic	Critical Value	P-value
Communication Services	Export	First	-7.37*	-1.95	0.00
Other Business Services	Export	First	-8.76*	-3.54	0.00
Travel Services	Export	First	-8.09*	-2.94	0.00
Royalties and License Services	Export	First	-1.26	-1.95	0.19
Royalties and License Services	Export	Second	-3.54*	-1.95	0.00

Other Business Services	Import	First	-4.61[*]	-1.95	0.00
Transport Services	Import	First	-6.42[*]	-1.95	0.00
Travel Services	Import	First	-7.00[*]	-2.94	0.00

Note: * statistically significant at 5% level of significance

Table 3: VIF results on the Services Variables (Export and Import)

Variables	Category	VIF
Communication Services	Export	2.480
Computer and Information Services	Export	6.952
Construction Services	Export	1.308
Financial Services	Export	1.759
Government Services	Export	1.621
Insurance Services	Export	1.538
Other Business Services	Export	6.737
Personal, Culture and Recreational Services	Export	1.231
Royalties and License Services	Export	2.354
Transportation Services	Export	2.989
Travel Services	Export	4.089
Communication Services	Import	3.068
Computer and Information Services	Import	1.622
Construction Services	Import	1.654
Financial Services	Import	1.638
Government Services	Import	3.679
Insurance Services	Import	2.122
Other Business Services	Import	3.329
Personal, Culture and Recreational Services	Import	2.193
Royalties and License Services	Import	2.015
Transportation Services	Import	1.726
Travel Services	Import	3.011

5.1 Modeling BOP with services variables
5.1.1 Export service variables modeling
The estimated model equation for BOP using export service variables is given as:

$$\hat{y}_{BOP} = -1.959 \times 10^6 + 97.425X_{FS} + 5.656X_{OBS}$$

Table 4 shows that the overall summary of model. The coefficient of determination (R^2), adjusted R^2 and standard error of regression model is found to be 0.492, 0.461 and 3.552×10^5 respectively. This means that there is about 46% variation in the BOP of services in Pakistan is explained by the FS and OBS in exports of Pakistan and remaining 54% is due to other factors. Table 5 indicates that among eleven variables the OBS and FS variables of exports are highly significant variables in modeling BOP of services of Pakistan. The OBS and FS export variables have significant relationship with BOP of variables. It may be depicted that the if OBS exports are kept constant and FS exports are increased by $1000 USD, then the BOP of services of Pakistan will be increases by $5656 USD. Moreover, the coefficients of FS and OBS are positive which indicates that the FS (exports) and OBS (exports) have positive relation and direct impact on the BOP of services in Pakistan.

Table 4: Summary of model of export services variable

R	R^2	Adjusted R^2	Standard Error
0.701	0.492	0.461	3.55236×10^5

Table 5: Modeling BOP of services using export service variables in Pakistan

	Coefficients	Standard Error	t-statistic	Significance
(Constant)	-1.959×10^6	220277.796	-8.894	.000
Financial Services (FS)	97.425	21.984	4.432	.000
Other Business Services (OBS)	5.656	1.299	4.353	.000

5.1.2 Import service variables modeling
In this section, the modeling results of BOP of services with all import services variables is provided. The estimated model equation for BOP using import service variables is given as:

$$\hat{y}_{BOP} = -4703.085 - 1.577X_{OBS}$$

Table 7 reveals that the adjusted $R^2 = 0.489$ which means there is nearly 48.9% variation in the BOP of service in Pakistan explained by its linear relationship with OBS import variables and the remaining 51.1% is due to some other factors. Table 8 shows the modeling results of BOP of services

based on the import service variables. Based on step-wise regression all the variables except OBS is retained in the model. The OBS import variable has significant relationship with the BOP of services in Pakistan. It may be depicted that in the long-run period, if the OBS (import) increases by $1000 USD than the BOP of service will decrease by $1.577 USD. It may be deduced that the regression coefficient of OBS indicates that there is negative relationship between OBS (import) and BOP (services) in Pakistan.

Table 6: Summary of model of import services variable

R	R^2	Adjusted R^2	Standard Error
0.710	0.504	0.489	3.31183×10^5

Table 7: Modeling BOP of services using import service variable in Pakistan

	Coefficients	Standard Error	t-statistic	Significance
(Constant)	-4703.085	149291.432	-0.032	.975
Other business services (OBS)	-1.577	.272	-5.791	.000

6. Conclusion

In this study, the impact of service variables of export and import on the balance of payment of services in Pakistan is explored using different techniques. First, the stationarity of variables is examined using ADF test which indicates that majority of the variables are stationary at level. Next, VIF is used to examine the collinearity among the eleven services variables of export and import of Pakistan. The results showed that the existence of collinearity among variables. Further, using step-wise regression the BOP (services) of Pakistan is modeling for export and import variables. The BOP (services) has statistically significant relationship with Financial services (export) and other business services (export and import). This study can be extended by modeling BOP (services) using partial least square regression (PSLR) and vector autoregression (VAR).

Conflict of Interest:
The authors have no conflict of interest.

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