A Twin Deficit Hypothesis: The Case Study of Pakistan

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Abstract

This paper analyses the twin deficit reaction function for Pakistan economy covering the period of 1973-2017. Empirical analysis is based on Vector Autoregressive (VAR) technique with its extension impulse response functions and Granger causality. Results show that the trade deficits directly cause the budget deficits and the budget deficit influences the trade deficit through different channels. The most familiar linkage is causality flowing from budget deficits to inflation to rate of interest to capital inflows to exchange rate (currency appreciation) and finally the trade deficits.

Keywords: Twin Deficit, VAR, Granger Causality, Impulse Response Function, Pakistan
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I. Introduction

Most countries are facing ***Twin Deficit*** (budget deficit and trade deficit). The two deficits are to be either correlated, in the scene that former affects the latter one or the latter affects the former deficit (Helmy, 2018). There are different conceptions about this hypothesis that some economists are of view that the budget deficit is caused variable and trade deficit is effected one, while, the others are of viewpoint that the trade deficits are causing the budget deficit (Kumar, 2016; Akanbi & Sbia, 2018; Soukiazis, Antunes & Kostakis, 2018). The relationship of the Twin Deficits is important for the policy formation, implementation and effective response from the policy (Ahmad, Aworinde & Martin, 2015). The reasons for this relationship are:

- These deficits lead to the indebt from the domestic as well as foreign financial institutes
- These put an excessive burden on the future generation

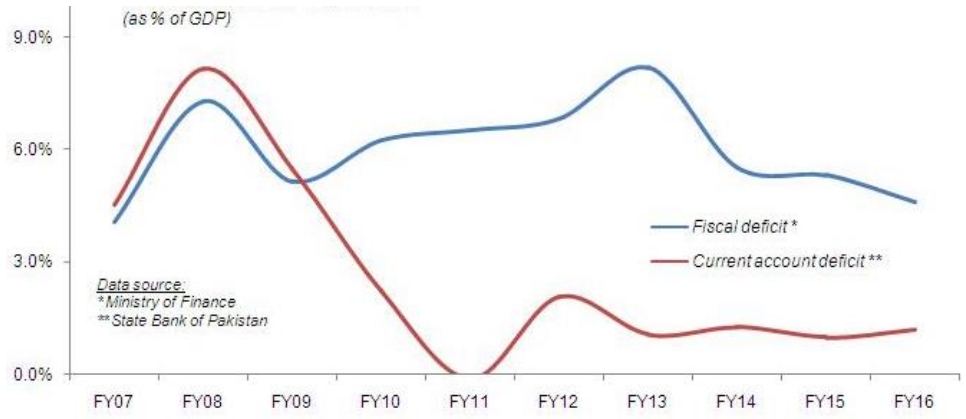


Figure 1: Twin Deficit of Pakistan over the Last Decade

The Current Account Deficit (CAD) is caused by the increasing of the Budget Deficit (BD). Thus, CAD can only be lessened if and only if the policy addresses the BD (Blecker, 2016). While, if there does not exist a Causal Relation of CAD and BD that is there are other factors for the CAD, then, the reduction in the Fiscal Deficit can't mitigate the Trade Deficit Dilemma. The linkage of the BD and CAD is through the movement of the interest rate (r) and the exchange rate (ER). To lessen the BD, the government follows different tools of increased interest rate to encourage the saving rate in the economy. As a result, there we have a Capital Inflow in the economy, which improves the CAD (Opoku, 2017). On the contrary, to avoid the CAD, the policy of Devaluation is adopted, which leads to lower Imports and more of Exports. Similarly, the Imports Policy of Quota and Tariff lead to discouraging the imports and somehow generating the revenue for the government, which anyhow decreases the Fiscal Deficit (Breuer & Nam, 2018). The channel between the CAD and BD is as follow:

- BD→Increase in Real Domestic Assets→Attracts the Foreign Investment→ Appreciation of Domestic Currency.
- The CAD→ Appreciation of Domestic Currency.

In this case, there it can be observed that BD ←→ CAD. Thus, the entire Current Account Deficit (CAD) and a portion of Budget Deficit (BD) are financed through the Net Capital Inflow. A higher Public Deficit is associated

with the appreciation of Real Exchange Rate and Higher Output. This leads to attracting the Foreign Investment and Appreciation of Domestic Currency, which contribute to Trade Deficit. This Deficit creates hurdles for the growth and development of the economy (Bayramoğlu & Öztürk, 2018).

$$\text{If } G\uparrow \rightarrow BD\uparrow \rightarrow i\uparrow \rightarrow I^{f}\uparrow \rightarrow CA \rightarrow M\uparrow \rightarrow X\downarrow \rightarrow (X\text{-}M)\downarrow \rightarrow CAD\uparrow$$

Meaning that the twin Deficit Hypothesis is holding. Where G= Government Expenditures, BD = Budget Deficit, i= Interest Rate, I^{f} = foreign Investment, CA = Currency Appreciation, M = Imports, X= Exports, (X-M)= NX= Net Exports and CAD= Current Account Deficit (Trade Deficit). The following graph shows the different relations of Twin Deficits (Bhat & Sharma, 2018).

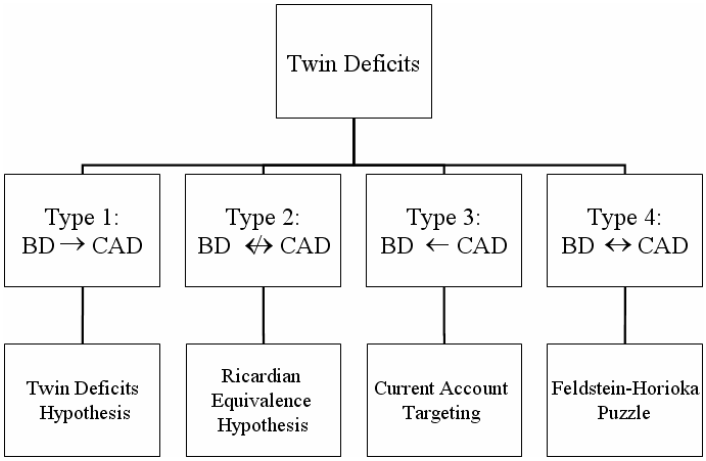


Figure-1

This is brief overview of the twin deficits, including the Twin Deficit Hypothesis and Ricardian Equivalence Hypothesis, discussed in the section of the introduction. The next is about the Literature Review, work done by different economist regarding the Twin Deficits. Section 3 put light on the methodology, used to check the different estimates. The next section 4 deals with the empirical estimates of this paper. Finally, the last section provides the concluding remarks along with little policy options. The work done is elaborated in appendixes at the end.

II. Literature Review

The theoretical backbone of the Twin Deficits Hypothesis is related to the economist Keynes, Ricardo, Mundell, Fleming, Barro, etc. Keynesian viewpoint regarding the twin deficits focused on the fiscal side (Akanbi & Sbia, 2018). He argued to diminish the budget deficit by using the tool of open market operation (bonds markets). On the other hand, the Ricardian approach favored taxation to tackle the budget deficit. The budget deficit causes the current account deficit stated by the Mundell-Fleming. The tax cut policy has no impact on other macroeconomic variables said by Ricardo while, according to Keynesian tax cut discourages saving in short-run which leads to not only budget deficit but also to trade deficit through an increase in consumption (Karras, 2019).

Sofia and Paleologou (2011) found that the two deficits are positively linked and the direction of causality is running from the current account to the budget deficit; based on the study of twin deficit hypothesis for Greece

(Vamvoukas, 1997, 1999) and Bangai (2006) found that there is a strong long-run twin deficit relation without specifying the type of the underlying hypothesis. This study also estimated the relationship of the twin deficits for Greece through multivariate Vector Error Correction framework (VECM) for the annual data from 1960 to 2007. The purpose of this study was to identify which of the deficit is of more significance for policymakers for making the correct decisions to overcome situations of economic turmoil in the country.

Similarly, Chen (2006) conduct a study to find out the positive relationship between federal budget deficits and the 5-year Treasury bond rate as well as between the twin deficits in the U.S. Under this policy paper, he used monthly data from 1975 to 2004 and adopted the three-equation dynamic linear system as follow; 1) Federal budget deficits equation, 2) Trade deficits equation, and 3) Exchange rate to the contemporaneous interest rate equation. His findings are: there exists a long-run relationship between budget deficits and interest rate as well as between budget and trade deficits.

Holmes (2011) extended the study of Leachman and Francis (2002) that fiscal deficits contribute towards current account deficits. He focused on the Bajo-Rubio et al. (2006) study for its empirical results based on the linear model as a bi-variate linear Co-integrating VAR model for testing the validity of twin deficit hypothesis for the US; quarterly data from 1947 to 2009. The basic purpose of this study was to check the long-run positive relationship based on the short-run dynamic behavior of the twin deficits. On the behalf of his empirics, he wrapped up that a positive co-integrating relationship is present between the US current account and budget balances and through the vector error correction model based on short-run dynamics indicates a long-run causality between the two balances (balance budget and current account balance) can move in either direction.

Another study (Chang and Hsu, 2009) attempt to investigate the causality relationship between the twin deficits for five North European countries (Denmark, Finland, Iceland, Norway, Sweden), Four Asian Tigers (Hong Kong, Korea, Singapore, Taiwan) and the United States. It expanded the previous study made by Abell (1990), Gordon (1986), Laney (1984), McKinnon (1980, 1990), Miller and Russek (1989) that there is co-movement between the budget deficit and the current account deficit in the United States as well as of Anoruo and Ramchander (1998) who discovered that trade deficit causes fiscal deficit in some of the Asian countries. In this study, they tried to capture the findings that out of four possible causation linkages between budget deficit (BD) and current account deficit (CAD) i.e. BD causes CAD; CA causes BD; BD and CAD both cause each other or BD and CAD are independent, which one holds for the selected countries. It covers the annual data for 1980 to 2007 and VAR model is applied to testify this casual relation of trade deficit and budget deficit. This study results in some support for the twin deficits hypothesis although the strength of the relationship varies across countries and causality leads from the current account to budget deficits.

Additionally, Tang and Lau (2009) tried to examine the impact of private savings and investments regarding the twin deficits hypothesis. He used the quarterly data for US economy for his work from 1973Q1 to 2008Q3 and applied OLS technique, log-linear without intercept form of the two related variables with a twin deficit (current account deficit; CAD and budget deficit; BD). He concluded that the budget deficit elasticity decreases which support the statement of Cavallo (2005) that how much budget deficits explain current account deficits. Also,

(Lau and Haw, 2003) checked the causal relationship between the twin deficit for the two Asian countries i.e. Malaysia and Thailand. This work is done by using quarterly data; starting from 1976:1 to 2000:4 for Thailand; for Malaysia, it ends at1998:2. It leaned on the study of Piersanti (2000) and Akbostanci and Tunç (2001) which support the Keynesian view that suggests not only positive but also unidirectional causality that runs from budget deficit to current account deficit. from this study the causality run from budget deficit to current account deficit (Keynesian paradigm) for Thailand and bi-directional causality for Malaysia. The implication of this consequence is that regarding the twin deficit hypothesis found in Thailand, the budget cuts correct the current account deficit directly as well as indirectly through interest and exchange rates and for Malaysia, where the two-way causality is detected, indicates endogeneity to both budget cut and current account targeting.

Another study of (Rauf and Khan, 2011) put light on the relationship between the trade deficit and budget deficit in case of Pakistan. It advanced the studies done by Burney and Yasmeen (1989), Burney and Akhtar (1992), Kazmi (1992), Anjum et al (2000), Tahir et al(2007), Ahmad Nawaz Hakro (2009). It is the sequence of the data from 1980 to 2009 which justifies that the external sector of Pakistan's economy is not in balance which leads to an imbalance of fiscal sector and proved that budget deficit is mainly caused by the trade deficit. The two deficits (trade deficit and budget deficit) are closely related, argued by Lany (1984) that fiscal deficit strongly causes the external deficit.

A study incorporated by Nawaz (2009) who took the sample period from 1948 to 2005 and used the quarterly data and applied VAR model to estimate the data with respect to Pakistan economy showed that causality link of deficits starts from budget deficits, shifts to prices and affects interest rate as well as capital flows through exchange rates and finally hits trade deficits. There is no evidence in favor of the Ricardian Equivalence Hypothesis (REH) in Pakistan, as the work is done by Kazmi (1991, 1992) Furthermore, (Saeed and Khan, 2012; Ali, 2011; Ali, 2015; Ali and Rehman, 2015; Afzal et al., 2013; Ali and Bibi, 2017) examined the validity of REH for Pakistan and the results remained same means there is no change over two decades.

III. Research Methodology

This part describes the nature of the variables, format, and sources of the data. Researchers have attempted to describe the methodology used for the structure of the model for estimation of results and prediction of the next time period. It comprises the econometric techniques which are used in this paper and also provides the explanations for the use of that technique. It consists of three main sections which are econometric model, variables, and the data. Simply, it put lights on the concepts and methods applied and techniques.

III.I. Variables Construction

The variables used in this paper are: Budget Deficit (BD) and Trade Deficit (CAD), defined as following; The ***Budget Deficit*** (BD) is the shortage of the government spending or it is the amount by which the government revenue falls short of the measures of government spending. Budget Deficit is opposite of budget surplus i.e. if the positive budget surplus indicates that there is a negative budget deficit and similarly, if the budget surplus is negative, then there exists a positive budget deficit. Simply, the budget deficit is the situation when $G < R$, where G represents what is to be the government expenditures and R is the total collected revenue of the government.

The ***Trade Deficit*** (mostly known as the Current Account Deficit; CAD) is the situation when the total imports of the goods and services along with the transfers (remittances, debt services, etc.) are far greater than the exports of the goods and services along with the transfers of a nation. Similarly, there can exist a trade surplus which is against of trade deficit; means a positive trade deficit highlights a negative trade surplus and vice-versa. Symbolically, if X < M is the situation of Trade Deficit, where X is the exports and M is the imports (both including the goods and services with transfers). In other words, NX (net exports) = X – M < 0; is what said to be the current account deficit (CAD).

III.II. Vector Autoregressive (VAR) Model

The **VAR** (vector autoregressive model) is used for checking the causal relation of two deficits. It provides a simple means of explaining or predicting the values of a set of economic variables at any given point in time (Wooldridge, 2015). It is a straightforward, powerful statistical technique used for forecasting. It is frequently used in the estimation of the reaction function and also considers the endogeneity issue in the estimation. The VAR technique requires stationary data, and for the variables in this study, the autocorrelation functions of various transformations are examined in order to select that which is most parsimonious. One of the key issues in time series econometrics is the stationary of the variables (Asteriou & Hall, 2015). The variables are tested for the presence of Unit Root Test by applying the Augmented Dickey-Fuller test. All the variables found to be integrated of order 0 i.e. all are having a constant mean along with a constant variance. Hence, the series is stationary. (Appendix 1).

III.III. Econometric Model

The followings are the representative equations for analyzing the twin deficit causality.

$$BD_t = \alpha_0 + \alpha_1 * BD_{t-i} + \alpha_2 * CAD_{t-i} + u_{1t} \quad \text{---------- (1)}$$

$$CAD_t = \beta_0 + \beta_1 * BD_{t-i} + \beta_2 * CAD_{t-i} + u_{2t} \quad \text{---------- (2)}$$

These equations can be represented in the form of vector as below:

$$\begin{bmatrix} BDt \\ CADt \end{bmatrix} = \begin{bmatrix} \alpha 0 \\ \beta 0 \end{bmatrix} + \begin{bmatrix} \alpha 1 & \alpha 2 \\ \beta 1 & \beta 2 \end{bmatrix} \begin{bmatrix} BDt - i \\ CADt - i \end{bmatrix} + \begin{bmatrix} e1t \\ e2t \end{bmatrix} \quad \text{---------- (A)}$$

III.IV. Granger Causality Test

For checking the economic implications of the model, it is necessary to formulate the hypothesis testing by imposing no restrictions on the lag of variables. The Granger (1969) approach to the question of whether *x* causes *y* is to see how much of the current *y* can be explained by past values of *y* and then to see whether adding lagged values of *x* can improve the explanation. *y* is said to be Granger-caused *x* by if *x* helps in the prediction of *y*, or equivalently if the coefficients on the lagged *x*'s are statistically significant (Asteriou & Hall, 2015). Note that

two-way causation is frequently the case; *x* Granger causes *y* and *y* Granger causes *x*. It is important to note that the statement "*x* Granger causes *y*" does not imply that *y* is the effect or the result of *x*. Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term (Wooldridge, 2015).

III.V. Impulse Response Function

Sims introduced a more popularized VAR, known as Innovation Accounting (Wooldridge, 2015). The term usually refers to tracing out the system's reaction to a shock (innovation) in one of the variables. By generating impulse response function, it expresses each of the variables of the system as functions of current and past disturbances using the coefficients of these disturbances or shocks, one can then trace out over time the response of any variable to a given shock to another variable (Asteriou & Hall, 2015). The entire path of the affected variable is called an impulse response function. For instance, shock in the budget deficit and trade deficit, the effect of an increase in one deficit or in the other deficit may be of the interest. Since our interest is not in the mean of the variables but just their variation through time, at which the variable is convergent to its equilibrium.

III.VI. Data Sources

This paper uses the annual data of two variables (budget deficit (BD) and trade deficit (CAD)) of Pakistan. The data retrieved from 1973 to 2017 from World Development Indicators (WDI). The nature of the data is that: over the given time period, both variables remained to be negative. The budget deficit (negative nature) is resulting from the higher and non-developing expenditures of government, indicating poor governance; while the resources (revenues) are scared. The trade deficit (negativity) is resultant from the imports of heavy capital, luxuries for the elite class and lower-priced and fewer durables (parish able goods) exports i.e. agricultural products, produced by the layman.

IV. Estimations and Results

IV.I. VAR Optimal Lags

The model is estimated by using Stationary series of current account deficit (CAD) and the budget deficit (BD). For choosing the correct forecasting model, different VAR orders are computed. Firstly, the VAR of the lag interval of 1 is estimated (Appendix 2). Further, it is used to find out the optimal lags through the lag length criteria. At the 4 lag specification, under the AIC (Akaike information criterion) and SC (Schwarz information criterion), the efficient lags are 4. But, when criteria of 6 lags are implicated, it provided that under the AIC (Akaike information criterion), the best results can be obtained at 6 lags in VAR; on the contrary, SC (Schwarz information criterion) indicated that 5 lags are sufficient to capture the efficient prediction (Appendix 3). Then, the VAR model is estimated with the lag length 4, 5 and 6 (Appendix 4)

IV.II. Granger Causality

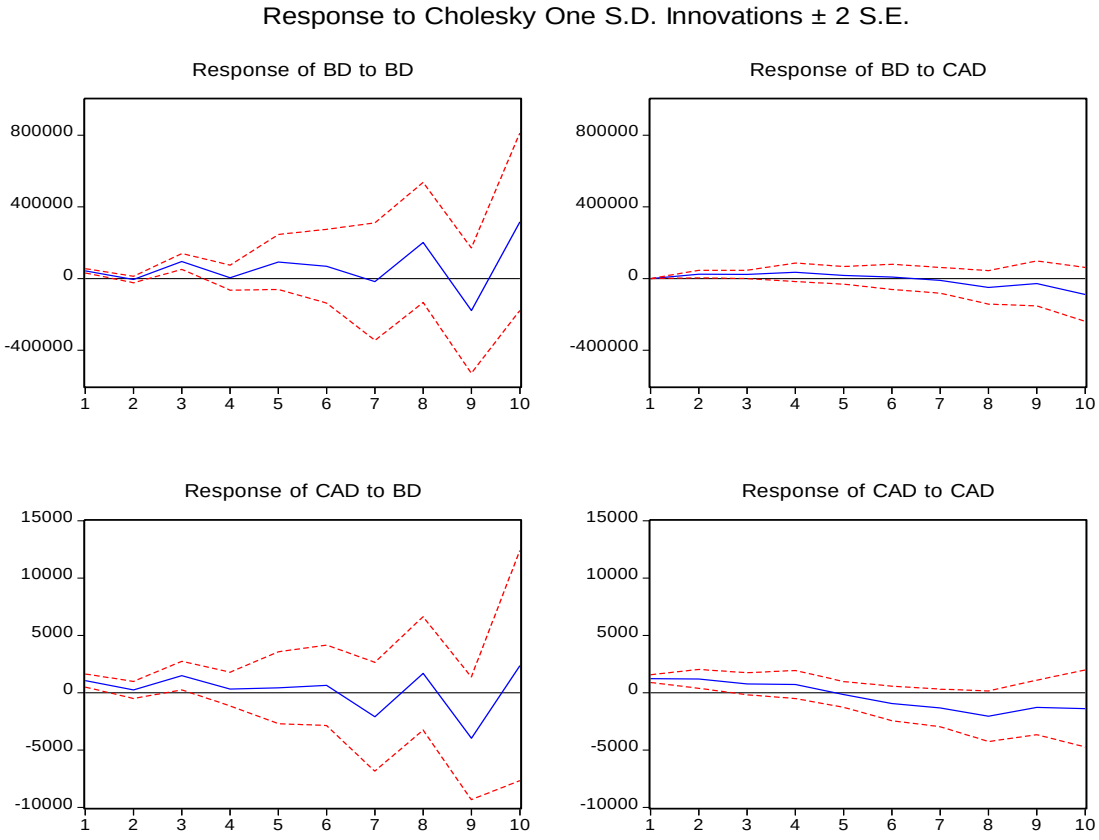
The Granger Causality using the 4 lags results in Bi-Directional Causation is found in the BD and CAD i.e. the Null Hypothesis is rejected; stated as below:

1) H_0 = CAD does not Granger Cause BD
2) H_0 = BD does not Granger Cause CAD

But, when 5 and 6 lags are to be included in this test of Causality, it provided the results as a Uni-Directional Causation means the CAD is causing the BD and the reverse is not holding i.e. the Null Hypothesis: (CAD does not Granger Cause BD) is rejected and the Null Hypothesis: (BD does not Granger Cause CAD) is accepted. If 8 lags are incorporated in this Causality test, there again a Uni-Directional Causation is found. But, this time BD is causing the CAD i.e. 1st Null Hypothesis is Accepted and the 2nd Null Hypothesis is Rejected (Appendix 5).

IV.III. Impulse Response Function

It provides the responses in the causation variables (BD, CAD) due to Innovation, Shocks or the Error term. Due to change of the other determinants of these variables at Standard Level, the way of the convergences, in the following time say ten is as follow; When there is a shock or innovation is provided to the determinants of BD, its response to BD in the following ten (10) years is as; It starts to converge after 2nd time period, from the equilibrium level. It is significant till 4th period (criteria for significance: the positive value of the value). It converges at 4th time, significant 7th time period and before as well as after 9th time period. Afterward, there is Divergence.



The response of BD to CAD is: there is a little fluctuation in it but a long time divergence i.e. from the time period one to time period six, it is observed the divergence. At 7th time period, there is convergence, afterward again divergence. If the innovations provided to CAD, its response follows; Response of CAD to BD: at 2nd time period, it converges and remains significant till 6th period. After the 6th period to till 8th, it is divergent. Afterward, there

is convergence before the 10th time period. The response of CAD to CAD: from the initial time to till 5th time period, the effect of CAD to CAD is significant. At 5th period, it converges to its equilibrium level and then it starts to diverge i.e. insignificant till the last time period (10th) included in the prediction (at 8th the divergence is at maximum).

V. Conclusions and Policy Recommendations

This paper has estimated twin deficit reaction function for Pakistan for the period 1973-2017 to identify the fiscal and trade policy in Pakistan. For this purpose, the included variables in the reaction function: budget deficit and trade deficit. For the analysis, the VAR technique is used to estimate impulse response functions. The importance of the VAR technique is based on the causality test and the impulse function that highlight the importance of economic variables; here which are a budget deficit and trade deficit. The model suggests that changes in either deficit i.e. budget or trade deficits in Granger-causal sense. The result shows that trade deficits directly cause the budget deficits and the budget deficit influences the trade deficit through different channels. The most familiar linkage is causality flowing from budget deficits to inflation to rate of interest to capital inflows to exchange rate (currency appreciation) and finally the trade deficits. In order to reduce the pressure on currency (rupee) and avoiding the trade deficits, the policymakers usually focus on the devaluation as the policy prescription rather than proper channels of lessening the un-productive and non-developmental expenditures (worsening the budget deficit). Thus, budget and trade deficits are the primary ills of the economy, creating economic imbalances, indebtedness, and distortions in the market. The policy option in this context is to minimize the government intervention (lesser government expenditures {G}), balanced budget (government expenditures {G} must be equal to revenues {R}) and a measure of effectiveness in trade (exports {X} must be greater than imports {M}).

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Appendix

Appendix 1

Stationary of Series: Unit Root Test:

(Augmented Dickey-Fuller test statistic

When applied to BD:

Null Hypothesis: BD has a unit root Exogenous: None Lag Length: 7 (Automatic based on SIC, MAXLAG=7)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		4.869489	1
Test critical values:	1% level	-2.67429	
	5% level	-1.9572	
	10% level	-1.60818	
*MacKinnon (1996) one-sided p-values.			

Here, ADF t-stat (= 4.869489) is greater than all Critical values in absolute terms, indicates to reject Null Hypothesis: BD has a unit root (series is Non-Stationary). So, BD is a Stationary Series, with no Intercept and no trend, using the lag length 7 and the Schwarz information criterion. When applied to CAD:

Null Hypothesis: CAD has a unit root Exogenous: Constant, Linear Trend Lag Length: 4 (Automatic based on SIC, MAXLAG=7)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.30924	0.0008
Test critical values:	1% level	-4.27328	
	5% level	-3.55776	
	10% level	-3.21236	
*MacKinnon (1996) one-sided p-values.			

Here, ADF t-stat (= -5.30924) in absolute term is greater than all Critical values in absolute terms, implies that to reject Null Hypothesis: CAD has a unit root (series is Non-Stationary). So, CAD has a Stationary Series, with Intercept and trend, using the lag length 4 and under the Schwarz information criterion.

Appendix 2: VAR with 1 Lag Length

Vector Autoregression Estimates Sample (adjusted): 1981 2017 Included observations: 29 after adjustments

Standard errors in ( ) & t-statistics in [ ]		
	BD	CAD
BD(-1)	0.909853	0.001091
	(-0.1778)	(-0.00424)
	[5.11738]	[0.25742]
CAD(-1)	3.137763	0.808233
	(-8.7992)	(-0.20973)
	[0.35660]	[3.85372]
C	-25535.7	-554.815
	(-23445.2)	(-558.814)
	[-1.08916]	[-0.99284]
R-squared	0.733953	0.609022
Adj. R-squared	0.713488	0.578947
Sum sq. resids	2.17E+11	1.23E+08
S.E. equation	91407.27	2178.682
F-statistic	35.86361	20.24998
Log likelihood	-370.835	-262.474
Akaike AIC	25.78173	18.30853
Schwarz SC	25.92318	18.44997
Mean dependent	-162305	-2488.69
S.D. dependent	170769.2	3357.574
Determinant resid covariance (dof adj.)		1.30E+16
Determinant resid covariance		1.05E+16
Log likelihood		-617.191
Akaike information criterion		42.97868
Schwarz criterion		43.26157

Appendix 3

Appendix 3.1: VAR, Optimal Lag Length, with 4 Lags

VAR Lag Order Selection Criteria
Endogenous variables: BD CAD
Exogenous variables: C
Sample: 1973 2017
Included observations: 26

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-584.4705	NA	1.34E+17	45.11312	45.20989	45.14098
1	-555.656	50.97956	1.99E+16	43.2043	43.49463	43.28791
2	-543.1525	20.19793	1.04E+16	42.55019	43.03407	42.68953

3	-535.1896	11.63805	7.83E+15	42.24535	42.92279	42.44043
4	-525.2009	13.06218*	5.10e+15*	41.78468*	42.65567*	42.03550*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Here, the techniques LR, FPE, AIC, SC and HQ indicate that the sufficient lags for estimating a VAR model is 4.

Appendix 3.2: VAR, Optimal Lag Length, with 6 Lags

VAR Lag Order Selection Criteria

Endogenous variables: BD CAD

Exogenous variables: C

Sample: 1973 2017

Included observations: 24

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-540.29	NA	1.45E+17	45.19081	45.28898	45.21685
1	-514.55	45.04393	2.37E+16	43.37919	43.67371	43.45733
2	-502.958	18.3552	1.27E+16	42.74646	43.23732	42.87669
3	-495.117	11.10812	9.46E+15	42.42638	43.11358	42.60869
4	-486.23	11.10871*	6.56E+15	42.01913	42.90267	42.25353
5	-479.731	7.040009	5.72E+15	41.81092	42.89081*	42.09742
6	-474.25	5.024407	5.65e+15*	41.68749*	42.96372	42.02608*

* indicates lag order selected by the criterion

Here, the techniques FPE, AIC and HQ indicate that the optimal number of lags is 6, while SC implies that 5 lags are sufficient, for the least parameters in estimation process.

Appendix 4: VAR model Estimation, with 4 Lags

Vector Autoregression Estimates

Sample (adjusted): 1984 2017

Included observations: 26 after adjustments

Standard errors in ( ) & t-statistics in [ ]

	BD	CAD
BD(-1)	-0.62269	-0.0186
	(-0.27185)	(-0.01022)
	[-2.29060]	[-1.81954]

BD(-2)	1.725403	0.025588
	(-0.38719)	(-0.01456)
	[4.45623]	[1.75778]
BD(-3)	1.405533	0.023422
	(-0.52336)	(-0.01968)
	[2.68559]	[1.19036]
BD(-4)	-1.13388	-0.02614
	(-0.43776)	(-0.01646)
	[-2.59020]	[-1.58837]
CAD(-1)	19.99191	0.981279
	(-8.17103)	(-0.30721)
	[2.44668]	[3.19418]
CAD(-2)	11.58156	0.042647
	(-9.61177)	(-0.36138)
	[1.20494]	[0.11801]
CAD(-3)	-18.4927	-0.23972
	(-10.2993)	(-0.38722)
	[-1.79553]	[-0.61908]
CAD(-4)	-29.5913	-0.9133
	(-9.81318)	(-0.36895)
	[-3.01547]	[-2.47543]
C	-14404.9	-1614.6
	(-22283.4)	(-837.795)
	[-0.64644]	[-1.92720]
R-squared	0.957521	0.854199
Adj. R-squared	0.937531	0.785586
Sum sq. resids	3.18E+10	44907988
S.E. equation	43229.66	1625.314
F-statistic	47.90014	12.44962
Akaike AIC	24.45387	17.89221
Schwarz SC	24.88936	18.32771
Mean dependent	-178823	-2657.08
S.D. dependent	172962.1	3510.031
Determinant resid covariance (dof adj.)		2.82E+15
Determinant resid covariance		1.20E+15
Log likelihood		-525.201
Akaike information criterion		41.78468
Schwarz criterion		42.65567

Appendix 5: Granger Causality

Appendix 5.1: When the Granger Causality Test is checked for BD and CAD, using 4 lags; it results in as follow;

Pairwise Granger Causality Tests Sample: 1973 2017 Lags: 4			
Null Hypothesis:	Obs	F-Statistic	Probability
CAD does not Granger Cause BD	26	12.9971	5.00E-05
BD does not Granger Cause CAD		2.33085	0.09753

Here, the Null Hypothesis are rejected i.e. Bi-Directional Causality of BD and CAD.

Appendix 5.2: When the Granger Causality Test is checked for BD and CAD, using 5 lags; it results in as follow:

Pairwise Granger Causality Tests Sample: 1973 2017 Lags: 5			
Null Hypothesis:	Obs	F-Statistic	Probability
CAD does not Granger Cause BD	25	7.08476	0.0017
BD does not Granger Cause CAD		1.54647	0.23855

Here, the first Null Hypothesis is rejected and second Null Hypothesis is accepted i.e. Uni-Directional Causality from CAD to BD is found.

Appendix 5.3: When the Granger Causality Test is checked for BD and CAD, using 8 lags; it results in as follow;

Pairwise Granger Causality Tests Sample: 1973 2017 Lags: 8			
Null Hypothesis:	Obs	F-Statistic	Probability
CAD does not Granger Cause BD	22	2.74406	0.14059
BD does not Granger Cause CAD		15.0383	0.00421

Here, the first Null Hypothesis is Accepted and second Null Hypothesis is Rejected i.e. Uni-Directional Causality from BD to CAD is found.