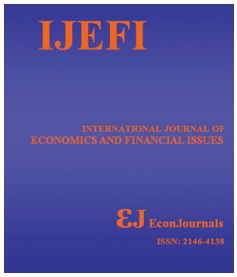

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2019, 9(2), 273-276.

Are Exports, Imports, and Exchange Rates Cointegrated? Empirical Evidence from Nepal

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Received: 21 January 2018 **Accepted:** 07 March 2019 **DOI:** https://doi.org/10.32479/ijefi.7588

ABSTRACT

This paper attempts to empirically investigate the presence of a cointegrating relationship between the exports, imports, and the USD exchange rate in Nepal using the yearly time series data from 1965 to 2017. Time series properties of the data are diagnosed using the Augmented Dickey-Fuller unit root test and Johansen's multivariate cointegration test. The findings indicate that there exists no cointegrating relationship between exports, imports, and the USD exchange rate in Nepal, and hence, no causal relationships within vector error correction model (VECM) can be estimated for Nepal. The lack of cointegration implies that macroeconomic policies of Nepal have been ineffective in bringing exports and imports in long-run equilibrium, and thus, Nepal is in violation of her international budget constraint. These findings may have important implications for decision-making by national policymakers.

Keywords: Exports, Imports, International Budget Constraint
JEL Classifications: F41, C22, C32

1. INTRODUCTION

The knowledge of a cointegrating relationship between exports and imports is essential for the design and evaluation of current and future macroeconomic policies aimed at achieving trade balance (Arize, 2002). Presence of such a relationship between exports and imports implies that the countries are not in violation of their international budget constraints, because their macroeconomic policies have been effective in driving exports and imports into long-run equilibrium (Herzer and Nowak-Lehman, 2006). In addition, the policy on foreign exchange is an important macroeconomic indicator. The success of the policy is influenced by the impact of foreign exchange rates on imports and exports, in terms of a reduction in the foreign trade deficit (Gondalia and Dave, 2015).

The purpose of this study is to investigate the cointegration and possible long-run equilibrium relationship between the exports, imports, and the USD exchange rate in Nepal using the time series data from 1965 to 2017. We would like to investigate the effectiveness of Nepalese macroeconomic policies in driving exports and imports towards long-run equilibrium by testing if exports and imports measured in current Nepalese rupee are cointegrated. Government agencies, researchers, and stockholders can better predict future trends in these variables by understanding their relationships. Hence, the study of cointegration and causality between the exports, imports, and the USD exchange rate holds significant importance and draw the attention of researchers.

To the best of our knowledge, there does not exist any published literature that has studied the cointegration and possible long-run equilibrium relationship between the exports, imports, and the USD exchange rate in the context of Nepal. The purpose of this paper is to fill this void. Furthermore, this paper uses recent data

in the context of relevant literature in the context of Nepalese research.

The organization of the remainder of this study is as follows: Section 2 presents a review of past empirical studies undertaken on this subject. A brief description of the data and the variables used in the study is presented in section 3. Section 4 contains the econometric methodology used in the study, the empirical results, and their interpretations, while the last section sums up the discussion with concluding remarks and policy implications.

2. LITERATURE REVIEW

There are several empirical studies examining the cointegration and causality between the exports and imports. These studies are conducted for both developed and developing countries. In this section, we provide a brief review of some of the relevant literature across the globe.

In the context of the United States, Husted (1992) investigated the long-run relationship between exports and imports using quarterly data. They found that, despite short-run imbalances, the US exports and imports do converge in the long-run.

In the context of Korea, Bahmani-Oskooee and Rhee (1997) studies a long-run relationship between exports and imports using cointegration test for the quarterly data from 1963Q1 to 1991Q4. Their empirical analysis suggested that there exists a cointegration between exports and imports, and that Korea is not in violation of her international budget constraint.

In the Malaysian context, Choong et al. (2004) investigate the long-run relationship between Malaysian exports and imports. Using both the restricted and unrestricted cointegration techniques, the study found that there exists a long-run relationship between exports and imports. They further document that the Malaysian economy is not in violation of their inter-temporal budget constraint. An empirical illustration by Tang (2005) concludes that the cointegration between Malaysian exports and imports as documented by Choong et al. (2004) requires further investigation before it can be generalized.

In the context of Turkey, Sekmen and Saribas (2007) examined cointegration and causality among exchange rate, export, and import using monthly data from 1998 to 2006. Using a cointegration test, vector error correction model (VECM), variance decomposition and impulse response function, they found the existence of a cointegrating relationship between exports and imports. They further show that there exists a feedback relationship between exports and imports.

In the Indian context, Konya and Singh (2008) investigate empirically the presence of an equilibrium relationship between the logarithms of Indian exports and imports between 1949-1950 and 2004-2005. Using the unit-root and cointegration approach, the study found no evidence of a cointegration between exports and imports, which suggests that India is in violation of her international budget constraint.

In the context of Bangladesh, Uddin (2009) investigates the time series behavior of total export and total import using unit root test, Johansen cointegration test, and error-correction mechanism. The findings reveal that there exists a long-run equilibrium relationship between these two variables. In addition, the study finds that there is a bidirectional long-term causality and a unidirectional short-term causality between import and export of Bangladesh. The study further concludes that Bangladesh is not in violation of her international budget constraints.

In the context of Pakistan, Mukhtar and Rasheed (2010) empirically examines the long-run relationship between exports and imports using quarterly data spanning from 1972 to 2006. Using the Johansen cointegration test, the study finds that there exists a long-run relationship between exports and imports, suggesting that Pakistan is not in violation of her international budget constraint. The results are also confirmed by an empirical analysis using a VECM. In addition, the Granger causality test found a feedback relationship between exports and imports for Pakistan. Another study by Chaudhry et al. (2017) investigated the long-run relationship between exports and imports using annual time series data for the period from 1948-1949 to 2012-2013. Using Autoregressive Distributed Lag (ARDL) cointegration technology, the study revealed that there exists a long-run equilibrium relationship between exports and imports. The study further documented that Pakistan is not in violation of her budget constraint, which is consistent with Mukhtar and Rasheed (2010).

Chaudhary et al. (2016) investigated the relationship of the exchange rate with exports and imports of major South-Asian and Southeast Asian countries. Long and short-run relationships between the variables in sample economies over the period of 1979-2010 were investigated using the ARDL approach to cointegration and also a VECM. The findings show the existence of a long-run relationship between exchange rate and exports in more than half of the sample countries. However, the existence of a long-run relationship between exchange rate and imports was found only in one sample country. In addition, the study found no significant short-run relationship between the variables in the majority of the sample countries.

In the Indonesian context, Adam et al. (2017) investigates the influence of the exchange rate on exports using monthly data from January 2001 to November 2015. Using the different equation models, the authors find that the time series data of both the exchange rate and exports of Indonesia are integrated of order one. Findings from Johansen's cointegration test indicate that exports and exchange rate are not cointegrated. They further find a negative relation between exchange rate and exports, and that the exchange rate affects the exports of Indonesia in both the short and long-term. In the long term, each 1% increase (decrease) in the exchange rate causes the exports of Indonesia in units of USD to decrease (increase) by 0.24%.

3. VARIABLES AND THE DATA

This study is based on yearly time series data for the period between 1965 and 2017 from Nepal. The data are collected from

the databases of the International Monetary Fund and the Nepal Rastra Bank, the Central Bank of Nepal, and consist of yearly time series data with the variables, "Exports," "Imports," and the "USD exchange rate." The current values of exports and imports are in Nepalese rupees and the exchange rate is the number of Nepalese rupees per unit of USD. These time series data are transformed into natural logarithmic scales prior to the empirical analysis. Statistical software packages R and EViews (10) are used for arranging the data and conducting econometric analyses.

4. METHODOLOGY AND EMPIRICAL RESULTS

The first step in investigating the presence of a cointegrating relationship between the variables is to test the stationarity of each of the variables. The econometric methodology adopted for this purpose in this paper is the Augmented Dickey-Fuller unit root test. After this test, we will proceed to employ Johansen's multivariate cointegration test. These are briefly explained below, and any interested readers are referred to the relevant literature in the references.

4.1. Augmented Dickey-Fuller Unit Root Test

Since the time series data are usually non-stationary and thus can lead to spurious regression, first the stationarity of each series is examined by using the Augmented Dickey-Fuller unit root test. The Augmented Dickey-Fuller unit root test has the null hypothesis of non-stationarity of the time series (existence of a unit root) against the alternative hypothesis of the stationarity (no existence of a unit root) of the time series.

The Augmented Dickey-Fuller unit root test was conducted in EViews (10) for each variable in current prices in their logarithmic scales, and the results at levels and their first differences are reported in Table 1. As indicated there, the null hypotheses of no stationarity is not rejected for all the three variables in their levels. However, the null hypotheses of no stationarity is rejected for all the three variables in their first differences. This suggests that all the series are non-stationary in their levels and are stationary in their first differences. In other words, all the time series used in the study are integrated of order 1, or $I(1)$. Thus, we may proceed now to conduct the Johansen's multivariate cointegration test between the exports, imports, and the exchange rate.

4.2. The Johansen's Multivariate Cointegration Test

After establishing the stationarity of each of the time series data, we proceeded to determine the lag length of the vector autoregressive system. The Hannan-Quinn (HQ), the final prediction error (FPE), and the Schwarz information criterion (SIC) identified a leg length of 1. Using this lag length, we employed Johansen's multivariate cointegration test in order to test for the long-run equilibrium relationship between exports, imports, and the exchange rate. We conducted the Johansen's multivariate cointegration test with all the variables in their logarithmic scales and considered both λ-trace and λ-max statistics options in EViews (10).

The results from Johansen's cointegration test for both the λ-trace and λ-max statistics are reported in Table 2. As indicated

Table 1: Augmented Dickey-Fuller unit root test results

Variables	Levels		First differences	
	Test statistics	P-values	Test statistics	P-values
EX	−0.82	0.8045	−6.40	0.0000*
IM	0.35	0.9786	−6.20	0.0000*
ER	−0.99	0.7519	−5.21	0.0001*

(*) denotes statistical significance at 0.01 level of significance; EX, IM, and ER denote the logarithmic values of current prices of exports, imports, and the USD exchange rate, respectively

Table 2: Johansen cointegration test results (Trace and maximum Eigen value)

Null hypotheses	λ-trace statistic	P-value	λ-Max statistic	P-value
r=0	10.69	0.9681	6.07	0.9815
r≤1	4.63	0.8472	4.63	0.7882
r≤2	0	0.9958	0	0.9958

r=Hypothesized number of cointegrating equations; the cointegration model is based on the vector autoregression model with 1 lag as identified by the the HQ, FPE, and the SIC. The *P* values for λ-trace and λ-max statistics are calculated by EViews (10)

there, the *P*-values for the λ-trace and the λ-max statistics are 0.9681 and 0.9815 respectively. Since these p-values are greater than α=0.05, the null hypothesis, H_0: r=0 (the null hypothesis of no cointegration), could not be rejected for a conventional level of significance. Thus, we find that both the test statistics identified no cointegrating relationship among the exports, imports, and the exchange rate. Hence, based on the data in the study period, one can infer that there exists no cointegrating relationship between exports, imports, and exchange rate, and hence, no causal relationships within the VECM can be estimated for Nepal. It suggests that macroeconomic policies of Nepal have not been effective enough in bringing exports and imports in long-run equilibrium. In other words, the evidence of no cointegration indicates that the balance-of-payments crisis was indeed not sustainable, and thus, Nepal is in violation of her international budget constraint. These findings may have important implications for decision-making by national policymakers.

The finding of no cointegrating relationship between the exports, imports, and the exchange rate is consistent with the finding of Konya and Singh (2008) for India, who found that there was no evidence of a cointegration between exports and imports, and that India was in violation of her international budget constraint. However, our finding is contrary to the finding to Kemal and Qadir (2005) and Mukhtar and Rasheed (2010) for Pakistan.

5. CONCLUSIONS AND DISCUSSIONS

This paper attempted to examine the cointegration and possible long-run equilibrium relationship between the exports, imports, and the exchange rate, in current prices, using Nepalese data for the period from 1965 to 2017. The econometric methodologies adopted include the widely-used Augmented Dickey-Fuller unit root test and the Johansen's multivariate cointegration test. To the best of our knowledge, no previous study has investigated the presence of cointegration and possible long-run equilibrium

relationship between the exports, imports, and the USD exchange rate using the most recent data from Nepal.

The results from the Augmented Dickey-Fuller unit root test suggested that the time series data for exports, imports, and the exchange rate were nonstationary at their levels. However, these series were stationary at their first differences. Then, we proceeded to conduct the Johansen's cointegration test between the exports, imports, and the exchange rate. The Johansen's cointegration test revealed that there was no cointegrating relationship between the exports, imports and the exchange rate in Nepal, and hence, no causal relationships within the VECM can be estimated for Nepal. The lack of cointegration implies that the macroeconomic policies of Nepal have been ineffective in bringing exports and imports in long-run equilibrium. The evidence of no cointegration also indicates that the balance-of-payments crisis was indeed not sustainable, and thus, Nepal is in violation of her international budget constraint. These findings may have important implications for national policymakers to design macroeconomic policies that can lead to establishing long-run equilibrium relationships between exports and imports. As noted by Chaudhry et al. (2017), since taxes on imports are reflected as taxes on exports (evident by relative prices), carefully analyzing any taxation on imports before its implementation is essential to sustaining a long-run equilibrium relationship between exports and imports.

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