*Dirasat***,** Administrative Sciences, Volume **34**, No. **2**, 2007

Estimating an Import Function for Jordan: A Cointegration Analysis

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ABSTRACT

This paper investigates the Jordanian aggregate imports during the period 1972-2004. The cointegration and error correction modeling methods have been used. Having determined the order of integration of variables by applying Augmented Dickey-Fuller (ADF) test, we applied the Johansen-Juselius method of cointegration in the estimated model. The empirical findings were one cointegration equation explaining the long-run relationship amongst variables within a given model. The empirical results suggest that the aggregate import volume is found to be both price and income inelastic. Moreover, import liberalisation under the Structural Adjustment Programs (SAPs) is found to have no impact on import demand for Jordan.

Keywords: Import function, Cointegration Analysis, Jordan.

1. INTRODUCTION

Applied economists have been aware of certain difficulties that arise when unit roots are present in the data series. However, ignoring this fact and proceeding to estimate a regression model containing non-stationary variables, as pointed out by Harris and Sollis (2003: 1) at best ignores important information about the underlying statistical processes generating the data, and at worst leads to what Granger and Newbold (1973) call "spurious regression."

One consequence of such discoveries, is that it has now become a common practice to test for non-stationarity of economic time series data prior to any econometric estimation. Therefore, in the light of recent advances in time-series econometrics, the objectives of this paper are to investigate: (i) the existence of a long-run relationship between Jordan's import volume and its main determinants. (ii) the effect of import liberalization policy on Jordan's demand for imports. To do so, this paper starts the estimation process by testing the time series properties of the data. Concepts and definitions of the methodological procedure for testing for unit roots and cointegration are outlined. The Augmented Dickey-Fuller (ADF) test and Johansen technique were used for testing for unit roots and cointegration.

The formation of this paper is laid as follows: section **2** provides a brief overview of import liberalization in Jordan and some of the historical trends in terms of import orientation ratio. The import demand function for Jordan is modeled in section **3**. Section **4** gives some empirical background related to time series properties of the data, and data resources and definitions. In section **5** the application and findings are reported and discussed. Conclusions are drawn in section **6**.

2. BACKGROUND

The Jordanian economy has been undergoing substantial changes since 1992. Reform efforts under SAPs have been conditional and strong. Almost all areas of the economy have been opened to both domestic and foreign private investment, import-licensing restrictions on intermediates, and capital goods have been mostly eliminated, quantitative restrictions on imports have been replaced by tariffs, and tariffs have been also reduced in stages. The maximum tariff rate, in some products, was reduced from 318 percent in 1989 to a maximum of 30 percent in 2000.

In the light of the developments above, Jordan's imports remain about twice the size of the country's exports earnings. To appreciate the prospects and problems arising out of import liberalization in Jordan, it may be useful to look into some of the historical trends in

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terms of import orientation ratio, measured as the average ratio of aggregate imports to GDP and imports growth rate. The data relates to five years before the SAPs and trade liberalization (1984-1988) and five years after (1992-1996). As can be shown in Table (1), we find a higher import orientation ratio during the 1992-1996 period (61.5 %) and the 1992-2004 period (56.52 %) than that in the 1984-1988 period (46.5%). The table also highlights the annual growth of Jordan's imports before and after the SAPs and trade liberalization.

3. THE THEORETICAL MODEL

Assuming that the world supply of imports to Jordan is perfectly elastic, we consider a traditional formulation of the import demand function (see, e.g., Koshal *et al.*(1993), Asseery and peel (1991), Bahmani-Oskooee (1986), Melo and Voget (1984), Boylan *et al.* (1980), Khan and Ross (1977) and Khan (1974)). In this model, import price and income (GDP) variables are crucial, because the effectiveness of import trade policy is highly dependent upon the size of their elasticities.

However, the level of foreign exchange reserve is also relevant for designing import policy in developing countries like Jordan. Usually, there are several major sources of foreign exchange reserve, such as: export earnings, foreign aid, and more importantly In Jordan's case is remittances of Jordanian working abroad. Where the liberalization policy, under the SAP was first adopted by the Jordanian government in 1992, a dummy variable will be added to the suggested model to capture the effect of the trade liberalization policy.

In the era of international trade, the most commonly encountered functional forms for import and export demand relations are either linear or log-linear formulations, (see Houthakker and Magee (1969), Khan (1974)). However, studies by Khan and Ross (1977) and Salas (1982) suggest that in modeling an aggregate import demand function, the log-linear specification is preferable to the linear formulation. Accordingly, the long-run import demand function for Jordan is specified as follows:

$$LIMP_t = \lambda_0 + \lambda_1 LPM_t + \lambda_2 LY_t + \lambda_3 LWR_t + \lambda_4 D_t + e_t \dots (1)$$

Where, IMP_t is the real value of imports, Y_t is the real level of income and PM_t is the relative price. Thus, the parameters λ represent the elasticities relating factors to imports, D_t a dummy variable with values of 0 for 1972-1991 and 1 for 1992-2004; e_t is a random disturbance term with its usual classical properties, and L is natural logarithm. It is expected that $\lambda_1 < 0$; and $(\lambda_2, \lambda_3) > 0$.

If the time series variables of $LIMP_t$, LPM_t, LY_t have unit roots, then we need to take the first difference of the variables in order to obtain a stationary series:

$$\Delta LIMP_t = \lambda_0 + \lambda_1 \Delta LY_t + \lambda_2 \Delta LPM_t + \lambda_3 \Delta LWR_t + \lambda_4 D_t + e_t \quad \dots \quad (2)$$

Equation (2) ignores any reference to the long-run aspects and decision-making. That is, this procedure of differencing results in a loss of valuabe long-run information in the data (Maddala: 1992). The theory of cointegration addresses this issue by introducing an error-correction (ecm) term. The ecm term integrates short-run dynamics in the long-run import demand function. This leads us to the specification of a general error correction model (ecm):

$$\Delta LIMP_t = \lambda_0 + \lambda_1 \Delta LY_t + \lambda_2 \Delta LPM_t + \lambda_3 \Delta LWR_t + \lambda_4 D_t + \lambda_5 ecm_{t-1} + e_t \quad (3)$$

Where ecm_{t-1} = error correction term lagged one period.

4. SOME EMPIRICAL ISSUE

4.1. Test for Stationarity

As our empirical research involving time-series, the distinction between stationary and non-stationary becomes very important, because assuming time-series are stationary when, in fact, they are not, can produce very misleading results. Particularly, the assumptions of the classical linear regression model necessitate that the series of all the variables entering the standard regression model are stationary, and that the errors have a zero mean and finite variance. In the presence of non-stationary variables, there might be what Granger and Newbold (1973) call a "spurious regression", in which regression coefficients appear statistically significant and have a high R^2 even when the variables are, in fact, unrelated.

A time series is said to be stationary if it means that variance and auto-covariance remain the same no matter at what point we measure them, that is, they are time invariant. Such a series may be said to be integrated of order zero, I (0). If, however, a time series is non-stationary and needs to be differenced once to induce stationarity, the series is said to be integrated of order 1, I (1). Similarly, if a time series is I (d), we obtain an I (0) series, after differencing it to (d) times. In this regard

Engle and Granger (1987) pointed out that although first differencing may induce stationarity, first differenced regressions could also filter out long run information when the variables in the levels are cointegrated.

The investigation of stationarity or (non-stationarity) in time series is closely related to the test for unit roots. Existence of unit roots in a series denotes non-stationarity. This preliminary step is important in any test for the existence of a long-run co-integrating relationship. In practice, although the order of integration of a variable is often obvious from a visual inspection of the time plots of the series; however, appropriate statistical tests are needed because what might appear to be stationary to one researcher may not necessarily be of the same view to another.

Indeed, the literature on time series suggests a number of alternative tests for testing whether a series is stationary. One of the most widely used methodologies (because of its simplicity and general nature) to establish the order of integration of the variables is the Augmented Dickey-Fuller (ADF) test [Dickey and Fuller, 1979, 1981]. The (ADF) test for unit roots indicates whether an individual series, say (Y_t) is stationary by running regression. The simplest from of the Dickey-Fuller test amounts to estimating the following auto-regressive model:

$$\Delta Y_t = \alpha Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + U_t \quad . \qquad \text{... (4)}$$

Where (ΔY_t) is the first differences of the series, (k) is the number of lags and (t) donates to the time period. Note that equation (1) does not contain any intercept. An ADF test, however, can be extended to allow the possibility that the underlying data generating process (d.g.p) of (ΔY) contains a stochastic trend with drift. This would require extending (1) to give:

$$\Delta Y_t = \mu + \rho Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + U_t \quad .... \qquad (5)$$

Similarly, equation (4) could be further augmented to allow the underlying (d.g.p) of (Y_t) to contain deterministic components (i.e. a constant and time trend). In general, the models are needed to test for the null hypothesis that a series does contain a unit roots (i.e. it is non-stationary) against the alternative of stationarity. Thus, the ADF tests for the model that contains a stochastic trend, and constants can be formed as follows:

$$\Delta Y_t = \mu + \lambda_t + \rho Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + U_t \quad .... \ (6)$$

Rejection of the null hypothesis ($\rho = 0$) in favour of the alternative ($\rho<0$), implies that (Y_t) is stationary and hence, integrated of order zero, I (0). If the null hypothesis is not rejected, then (Y_t) has a unit root and is integrated of order 1, {i.e. $Y_t \sim$ I (1)}. The lag length (k) could be chosen either by some arbitrary criteria or more usefully, at the length necessary to whiten the residuals [Price, 1998: 163]. According to Charemza and Deadman (1992: 135) the practical rule for establishing the value of (k) is that it should be relatively small in order to save degrees of freedom, but large enough not to allow for the existence of autocorrelation in U_t. However, in this study the lag order was determined using the minimum value of Akaike's Final Production Error (FPE) and information criterion(AIC).

4.2. Cointegration Test

The cointegration concept, first introduced by Granger (1981), is relevant to the problem of the determination of long-run relationships "equilibrium" in economics. Statistically, cointegration is the implication of the existence of a long-run relationship between variables [Thomas, 1993]. According to Linda and Dimitri, (1993) a long-run relationship means that the variables move together over time, so that short-run disturbances from the long-run trend will be corrected. However, the economic interpretation of cointegration is that if two or more series are linked to form an equilibrium (move closer together) in the long-run, even though the series themselves are trended (i.e., are non-stationary), they will nevertheless, move closer together over time and the difference between them is constant (i.e., stationary).

Thus, it is possible to make sense of regressions involving non-stationary variables, if there is cointegration, and then regression analysis imparts meaningful information about long-run relationship [Harris and Sollis, 2003]. A lack of cointegration suggests that such variables can wander arbitrarily far away from each other, which implies they have no long-run relationship [Dickey, *et. al.,* 1991].

There are a number of different ways that can be used to test for the existence of cointegration. In the following we utilised the Johansen (1988) and Johansen and Juselius (1990) method for the empirical analysis. The Johansen-Juselius technique, tests and estimates for the existence of cointegration relationships within a multivariate Vector Auto-Regression (VAR) framework, involving (k) lags of (X_t) [Harris and Sollis, 2003: 110-115].

$$X_t = A_1 X_{t-1} + ... + A_k X_{t-k} + u_t \quad ... \qquad (7)$$

Where X_t is an (n x 1) column vector of observations on the system.

A_I is an (n x n) matrix of parameters.

u_t is an (n x 1) column vector of error terms.

The system is a reduced form with each variables in (X_t), regressed on only lagged values of both itself and all the other variables in the system. Using Δ = 1- L, where L is the lag operator. The statistical model in equation (7) can be rewritten as a Vector Error Correction Model (VECM), of the following form:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + ... + \Gamma_{k-1} \Delta X_{t-k+1} + \Pi X_{t-k} + u_t \quad (8)$$

Where Γ_I = - ($I - A_I$ - ... $-A_i$) (i =1... k - 1) and,

Π = - ($I - A_1$- ... $-A_k$) is the matrix of long-run coefficients.

This way of specifying the system contains information on both the short-run and long-run adjustment to changes in (ΔX_t). In other words, the key insight of the Johansen-Juselius cointegration technique is that if there is a genuine long-run relationship, according to Price (1998: 166) this test can be simplified by assuming that we have a set of variables (Y, X, Z) ~ I (1); that is, each variable is non-stationary, and needs differencing once to obtain stationarity. Thus, for long-run relationships to exist among these variables, we require that a vector ($\beta_1, \beta_2, \beta_3$) exists such that:

$$\beta_1 Y_t + \beta_2 X_t + \beta_2 Z_t = u_t \sim I(0) \qquad (9)$$

Basically, there is a linear combination of (Y_t, X_t, Z_t), which is stationary. In these cases, (Y_t, X_t, Z_t) is referred to a cointegration set, with an associated cointegrating vector (β_1, β_2, β_3). However, in the absence of any cointegration amongst the variables, one may have the advantage of adopting the Vector Auto-Regression model (VAR), dynamic time series simultaneous system. This is because (VAR) is a system of simultaneous auto-regression equations allowing for non-linear relationships amongst variables in a multivariate setting. Nevertheless, applied economists tend to consider (VAR), as a last resort for modeling purpose since its theoretical property is less appealing [Taghavi, 2000].

4.3. The Error Correction Model

In the literature, the notions of cointegration and the Error-Correction Mechanism (ECM) are closely linked. Originally the ECM according to Clarke, *et. al*., (1998) was developed in an engineering control environment and first used in economics by Phillips (1954, 1957). Subsequently, it was used by Sargan (1964) in his paper on wage and price determination, and then popularised by Davidson, *et. al*. (1978) in a widely cited paper [Price, 1998: 167]. In fact, if cointegration relationships among variables exist, according to Engle and Granger (1987) there must be an error-correction specification that can be applied to the data. This result is known as the Granger Representation Theorem[1]- so that it is possible to analyse non-stationary series, which are cointegrated using an Error-Correction Model (ECM) specification. Indeed, in simple terms, if we estimate an ECM for a set of I (1) variables then they must be cointegrated, for this to be a valid regression, or, in the other words, if they are cointegrated, then the lagged equilibrium error (e_{t-1}) is stationary and regression is valid. Obviously, if one concludes that the series are non-stationary and cointegrated, it is appropriate to model them in error-correction form. As illustrated by Clarke, *et. al*. (1998: 145) assuming that we have two series (Y_t) and (X_t) hypothesising that the (Y_t) is a function of the (X_t), then the ECM will take the form:

$$\Delta Y_t = \beta_0 + \beta_1 \Delta X_t + \beta_2 ECM_{t-1} + u_t \qquad (10)$$

Where:

Δ = difference operator (i.e. $x_t - x_{t-1}$)

β_0 = constant

β_1, β_2 = regression coefficients

ECM = error-correction mechanism, derived from the cointegration regression.

U_t = error term.

The main feature of the ECM is that all terms in the model are stationary, so standard regression techniques are valid. In addition, it provides a useful and meaningful link between the long-run and short-run approach to economic

1 The Granger Representation theorem states: "If two variables y and x are cointegrated, then the relationship between the two can be expressed as (ECM)" see, Gujarati (2003:825).

modeling[2], on the other hand, the error correction model can be estimated to determine the dynamic behaviour of import demand. From what has been discussed so far, the modeling strategy to be adopted in dealing with time-series suspected of being non-stationary, suggests a straightforward approach as has been illustrated in literature [Clarke*, et. al.,* : 144] as follows:

(i) Test the series to determine if they are non-stationary, by employing Augmented Dickey-Fuller (ADF) tests, where the null hypothesis is that a series has a unit-root. If all of the series are stationary then model them in level form. However, if two or more series are non-stationary then move to point two.

(ii) Test to determine if the non-stationary series are cointegrated by applying the Johansen-Juselius maximum likelihood method of cointegration. If they are not found to be so, then model them in differenced form. However, if the non-stationary series are cointegrated then move to point three.

(iii) As the non-stationary series cointegrated then they may be modeled in error-correction form and estimated using standard OLS methods.

In the following section, having discussed modeling of an import demand function for Jordan, we will apply the above modeling strategy in dealing with Jordanian time series for the period (1972-2004) for the purpose of estimating Jordan's import function.

4.4. The Data: Resources Definitions

Data of the variables included in our model are obtained from the International Monetary Fund, International Financial Statistics **(IFS)** for the period of the study (1972-2004).

Y: Real GDP, nominal GDP is deflated by the domestic price level CPI (1995 = 100) to obtain real GDP.

WR: Jordanian workers' remittances, nominal WR is deflated by the domestic price level CPI (1995=100) to obtain real WR.

IMP: Imports volume, nominal imports are deflated by import price index (1995 = 100) to obtain real imports.

PM: Refers to the import relative price (The ratio of the import price index (1995 =100) to the domestic price index (1995 =100).

2 For more details regarding to the advantages of using the ECM, see: (i) Harris and Sollies (2003:25-39) (ii) Clarke, Norpoth and Whiteley (1998: 127-155).

5. APPLICATION AND FINDINGS

5.1. Test for Stationarity

The empirical investigations begin by examining the basic time series properties of the data. Using annual data for the period 1972-2004, first we employed the ADF test to determine the degree of integration of each variable. The lag order was determined using the minimum value of Akaike's Final Production Error (FPE) and information criterion(AIC). Both statistics lead to the same results. On the other hand, the tests are performed in natural logarithms, constant and linear time trend terms are included in each test as a visual inspection, reveals that the series may exhibit a trend.

The results of the ADF test applied to level and first difference are reported in Table (2). The values given in this table are the equivalent of calculated student t-test in the level (L), first difference (Δ). According to the test if a variable is found to exhibit a calculated ADF value larger than the critical value of Dickey-Fuller at say 5 percent significance, the variable is said to be stationary. The results of these tests are presented in Table (2) with critical t-statistics for the ADF test at the 1, 5 and 10 percent significance levels, as computed by Mackinnon (1991). The tests failed to reject the null hypothesis of non-stationary for all of the series in their levels (confirming the existence of unit roots), at the 1 percent and 5 percent significance levels.

The next step, is to determine whether they are stationary after taking first differences. In other words, this amounts to test whether the variables are I (1). The results of the ADF test in the first differences (Δ) are shown in Table (2). The results indicate the rejection of the null hypothesis of non-stationarity. Therefore, confirming stationarity for all of the variables at 1 percent and 5 percent significance levels. Thus, the conclusion is that the null hypothesis of non-stationarity is consistently rejected for all variables expressed at first differences.

5.2. Test for Cointegration

We are now in a position to apply Johansen and Juselius technique to test the existence of cointegration in the underlying series. Their method applies the maximum likelihood procedure to determine the presence of cointegration vectors in non-stationary time series. The Johanson and Juselius provide more robust results when there are more than two variables [Gonzalo, 1994]. The test based on maximum likelihood estimation procedures, amounts to calculating two test statistics known as λ-Max and Trace, which are used to determine the number of cointegrating vectors. The Johanson test of cointegration here attempts to compare the size of the estimated λ-Max and Trace against its critical values at 5 percent and 1 percent significance levels. Cointegrating hypotheses are rejected if the former estimates exceed their critical values.

The results of the λ-Max and Trace are reported in Tables (3). Among the variables of the import demand model, there was only one cointegrating vector according to Trace test at the 5 percent significance level. However, turning to the λ-Max test, the test fails to reject the null hypotheses of (r = 1) at any of the significance levels.

Our conclusion is that by relying on at least the Trace test, the null hypothesis of no cointegration can be rejected for all our variables included in the models at the 5 percent level of significance, and this suggests that there is a cointegrating vector. Therefore, our annual data from 1972-2004 appears to support the proposition that in Jordan exists a stable long-run relationship between the variables in our model.

5.3. Estimation of an Error-Correction Model

Following Hendry's (1979) general to specific modeling approach, we first include 3 lags of the explanatory variables, and then gradually eliminate the insignificant variables. After experimenting with the general form of the ECM, the model found to fit the data best in Table (4).

The results in the imports model, Table (4), are statistically significant at the 1 and 5 percent significance levels, with the exception of the coefficient of the dummy variable which appears to be insignificant. The signs of the coefficients are as expected and the estimated model explains about 60 percent of the variations in imports demand, the results also, show that the model does not reveal any problem of serial correlation.

The aggregate import demand is found to be price-inelastic, the price elasticity estimate equals -0.32. The real income elasticity is 0.75 suggesting that the demand for imports is also inelastic with respect to real income. The estimated coefficient of the error correction term -0.53 is statistically significant at the 1 percent level with a negative sign. This suggests the validity of the long-run equilibrium relationship among the variables in the Jordan's imports model, since it is derived from the long-run cointegrating relationship.

With regard to the remittances of Jordan nationals working abroad, as expected, the results show they are significant as important sources to cover the country's needs for imports. Finally, the coefficient estimate of the dummy variable capturing the effect of import liberalisation on imports volume is low 0.12 however, is statistically insignificant.

From the above estimated model the aggregate import volume is found to be both price and income inelastic. Therefore, one can argue that the value of the short-run elasiticities implies that imports are regarded as necessary goods in Jordan. In fact, looking at the Jordanian imports distribution, according to economic function, reveals that raw materials and intermediate goods account for more than 50 percent of total Jordan's imports [Central Bank of Jordan, 2000].

6. CONCLUSION

This paper has estimated the import demand function for Jordan on the basis of cointegration analysis and error correction model. To improve the degree of precision in our economic estimation of the models, we considered examining the time series properties of our variables using the unit root test and cointegration methods. Having determined the order of integration of variables by applying Augmented Dickey-Fuller (ADF) test, we applied the Johansen-Juselius method of cointegration in all our models. The empirical findings were one cointegration equation explaining the long-run relationship amongst variables within a given model.

Finally, the paper specified an Error Correction Model and estimated it, using standard methods. In general, most of our models exhibited meaningful statistical significance.

In the import demand function, aggregate import volume is found to be cointegrated with relative import price and real GDP. In the estimated ECM, real import prices, real GDP (legged one year) have emerged as important determinants of the import demand function for Jordan. However, the dummy variable, introduced to capture the effect liberalization trade polices under the SAP on import demand, appeared as insignificant determinant of the import demand for Jordan.

As far as the size of the estimated elasticities are concerned, the income elasticity was found inelastic, thus, it seems that economic growth will not have a strong effect on the Jordanian balance of payments difficulties. On the other hand, the demand for imports appears to be less sensitive to import price changes, which implies the noncompetitive nature of Jordan's imports.

Finally, the low coefficient estimate of the dummy variable shows insignificant effect of import liberalization under the SAP. Therefore, imports are treated as necessary goods in Jordan. In general, these are a reasonable findings given the structure of the Jordanian economy.

Table 1.* Import Orientation Ratio for Jordan, (1984-2004).

Year	***Total Imports***	***Imports as percent of GDP***	***Imports growth rates (%)***
1984	1071.3	54.0	-3.0
1985	1074.4	53.1	0.3
1986	850.2	39.2	-20.9
1987	915.5	41.3	7.6
1988	1022.5	45.1	11.8
1992	2291.0	63.4	29.4
1993	2449.9	64.4	6.9
1994	2357.6	56.4	-3.7
1995	2588.2	56.1	9.6
1996	3041.6	64.6	17.5
1997	2906.9	56.6	-4.5
1998	2712.4	48.4	-6.7
1999	2622.5	45.7	-2.9
2000	3203.9	54.4	23.7
2001	3434.5	54.9	7.2
2002	3585.5	54.3	4.5
2003	4072.5	55.2	13.5
2004	4799.2	56.3	17.8

Source: CBJ "Annual Reports" "Researcher calculations"
** The table excludes the years where the SAP has been suspended.*

Table 2. ADF Unit-Roots Test for Stationarity.

Variables	**Level (L)**	**First Difference (Δ)**	**Conclusion**
Y	-2.258	-3.764	I(1)**
WR	-3.709	-3.659	I(1)**
IMP	-2.294	-4.642	I(1)**
PM	-3.931	-4.591	I(1)***

Note: Unit root tests were performed using Eviews (version .4)
*** Significance at 1 %
** Significance at 5 %
* Significance at 10 %

Table 3. Johansen Cointegration Test for (IMP).

TRACE TEST					MAXIMAL EINGENVALUE TEST				
Null (Ho)	Altern (H1)	Statistic	Critical Value (95 %)	Critical Value (1%)	Null (Ho)	Altern. (H1)	Statistic	Critical Value (95 %)	Critical Value (1%)
r = 0	r ≥1	54.03	45.21	54.46	r = 0	r = 0	26.03	28.07	32.24
r ≤ 1	r ≥ 2	29.00	30.68	35.65	r ≤ 1	r = 1	12.02	20.97	25.52
r ≤ 2	r ≥ 2	15.98	15.41	20.04	r ≤ 2	r = 2	9.27	14.07	18.63
r ≤ 3	r ≥ 3	6.71	3.76	6.65	r ≤ 3	r = 3	6.71	3.76	6.65

Note: (1) The test was performed using Eviews (version .4).
(2) **r** stands for the number of cointegrating vectors

Table 4. Estimated Imports Model.

$$\Delta LIMP_t = \lambda_0 + \lambda_1 \Delta LY_{t-1} + \lambda_2 \Delta LPM_t + \lambda_3 \Delta LWR_t + \lambda_4 D_t + \lambda_5 ecm_{t-1} + e_t$$

Parameters	λ0	λ1**	λ2**	λ3***	λ4	λ5***
	0.00	0.75	-0.32	0.23	0.12	-0.53
T-value	(0. 19)	(2. 74)	(-1. 95)	(3.67)	(0.25)	(-3. 25)

R^2-adj = 0.59
F-stat = 25.50
D.W = 1.89

*** 1% Significance
** 5% Significance
* 10% Significance

Note: (i) The estimation was performed using Eviews (version .4)
(ii) The correlation matrix (not reported here) reveals that the explanatory variables constitute near-orthogonal regressions and therefore, Multicollinearity is not a problem.

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تقدير دالة الاستيراد للأردن: طريقة جوهانسن للتكامل المشترك

فؤاد كريشان*

ملخـص

يهتم هذا البحث بتقدير دالة الاستيراد للفترة ما بين (1972-2004)، بالإضافة الى تحديد أثر تحرير التجارة على المستوردات الأردنية كأحد سياسات برنامج التصحيح الاقتصادي؛ وذلك باستخدام طريقة جوهانسن للتكامل المشترك. بعد اجراء اختبار ديكي- فولار الموسع وبناء على نتائج الاختبار تم مواصلة التحليل باستخدام طريقة جوهانسن للتكامل المشترك؛ حيث دلت النتائج على أن المتغيرات المقترحة في النموذج تتحرك معا في الفترة الزمنية طويلة الأجل. وقد كشفت الدراسة عن ضعف مرونة الطلب السعرية والدخلية للمستوردات الأردنية، كما توصلت الورقة، أيضا، الى عدم تأثير سياسة تحرير التجارة على المستوردات الأردنية.

الكلمات الدالة: دالة الاستيراد، التكامل المشترك، الأردن.

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