Assess The Relation Between Agricultural Exports And Agriculture GDP In Egypt

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Abstract

This article aims to examine the short run relationship between agricultural exports and agriculture GDP. Assess the relation between variables considered by co-integration analysis by using Johansen co-integration technique. Results indicate a positive link in the short between agricultural exports and agriculture GDP. The co-integration between the pairs of series has been also; increases in agricultural exports have followed by increases in agriculture GDP. The elasticity's of the agriculture exports and agriculture GDP are found to be 0.62.

Key Words: **Agricultural exports, agricultural economic growth, co-integration analysis, Johansen co-integration.**

Introduction:

Since the global crisis 2007/2008, the Egyptian economy has been extremely affected by increasing of food prices, especially in grains, that needs to intervention of the Egyptian government to provide immediate assistance and to apply new programs on agriculture policy and reform. Before 2011, The Egyptian economy is evolving and this evolution only appeared on the rich and did not reach the poor, who suffer from poverty and lack of food availability, the poverty increased by 50% according to State Information System (2012), leading to socioeconomic and political instability. All of that led to the explosion of a popular revolution on January 25, 2011.

After two revolutions in 25th of January, 2011 and 30th of June, 2013, Egypt harming from very bad economic situation and affected by high food and energy prices, and decline in economic growth rate in most relevant sectors. These events showed the fragility of the Egyptian economy, where the Egyptian GDP growth rate decreases from 5.1% in 2010 to 2.2% in 2014, also the inflation increases from 7.1% in 2012 to 10.1% in 2014 (World bank, 2014). Egyptian food prices increased by 17.7% from the 1st week of January 2011 till the 1st week of December 2013 (Egyptian Food Observatory, 2013).

The Egyptian economy depends basically on agriculture, Suez Canal revenues, tourism, taxation, cultural and media production, petroleum exports and remittances of more than three million Egyptians abroad, mostly in the Gulf States, the United States, Europe and Australia. Agriculture played a vital role in Egyptian economy, working in the agricultural sector about 30% of the total labor force, contributing about 14.8% of GDP, and agricultural exports contribute about 20% of total good exports, making the agricultural sector a significant national income resource(State Information System, 2012). Agriculture can salvage the prevailing economic situation under instability (Raza et al., 2012; Shirazi and Manap, 2004; Jatuporn et al., 2011; Haleem et al., 2005).

Recently, assess the effects of agricultural export on economics have started to gain interest among economists interested. Many of studies found evidence that agricultural export variable has significant effects on economic growth, where it's one of the most important sources of foreign exchange income that ease the pressure on the balance of payments and create employment opportunities, thus agricultural export is considered as a very important one among economic growth contributors. Some economists seem to generally have agreed that exports can have high added value on economic growth, while others did not find much support to the export led economic growth hypothesis.

In this paper we investigate the relationship between agricultural exports and agricultural economic growth in Egypt. For this purpose we have used Johansen (1988) co-integration technique based on error correction model.

This paper is organized as follows. In the next section, a literature review of the effect of the exports and international trade on economic growth using time-series econometric techniques is presented. In section 2, the methodological approach is described. The fourth section is devoted to the empirical implementation to assess relationship between agricultural exports and agriculture GDP. The last section in this article offers the concluding remarks and policy implication.

Literature review:

During the last two decades, the role of exports in economic growth has a wide range of literature. Some of these studies haveused simple correlation coefficient technique in order to analyze the relationship between economic growth and exportse.g. (Chenery and Strout, 1966); Michaely (1977); Balassa(1978); Heller and Porter (1978); Tyler (1981); and Kormendi and Mequire (1985).They found evidence that the correlation between the growth of exports and economic growth rate were highly positive correlated.

The second part of these studies have used regression techniques to examine the relationship e.g. Voivades(1973); Feder (1983); Balassa (1985); Ram(1987); Sprout and Weaver; 1993); and Ukpolo(1994). They found a positive and highly significant effect of the product export on the GDP.

Several studies have addressed the links between exports and the national GDP by using Granger causality testwhich can examined the causality relationship between growth of export and economic growth e.g. Jung and Marshall(1985); Chow(1987); Serletis(1992); Dodaro(1993); and Jin and Yu(1995).Thesebulk of studies concluded that there existed some evidence of causality relationship between exports and economic growth.

Heiko (2008) examined the links between export diversification and economic growth. Provide robust empirical evidence of a positive effect of export diversification on per capita income growth. The study estimated a simple augmented Solow growth model and investigated the relationship between export diversification and income per capita growth. The findings of this paper was that the effects of export diversification on economic growth is potentially nonlinear with developing countries benefiting from diversifying their exports in contrast to the most advanced countries that perform better with export specialization. The evidence is strong that

export concentration has been detrimental to the economic growth performance of developing countries in the past decades.

Ramphul (2013) investigated the causality between agricultural exports and agriculture GDP in India by using the Granger causality test. The study has found a unidirectional causal link running from farm exports to gross domestic product of agriculture. It indicated that, agricultural products export Granger caused the growth in GDP of agriculture, which supports the exportled growth hypothesis.

The studies by Noula, Sama, and Gwah (2013) have assessed the contribution of agricultural exports to economic growth in Cameroon. They employed an extended generalized Cobb Douglas production function model. All variables were non stationary and of an order I, and the Cointegration test was conducted for long run equilibrium. All the variables confirmed cointegration and as such the conventional vector error correction model was estimated using the Engle and Granger (1987) procedure. The findings of the study show that the agricultural exports have mixed effect on economic growth in Cameroon.

Muhammad (2012)explored and quantified the contribution of agricultural exports to economic growth in Pakistan. He hasestimated the relationship between Gross domestic product GDP and agricultural and non-agricultural exports for Pakistan by using Johansen co-integration technique for the period 1972–2008. The finding of this study is that the agricultural exports have negative and significant effect on economic growth while agricultural exports elasticity was 0.58. Moreover there was bidirectional causality in agricultural exports and real GDP. The same results have been found by Faridi (2012) who has studied the contribution of agricultural exports to economic growth in Pakistan. The results showed that the agricultural exports had negative and significant effect on economic growth while agricultural exports elasticity was 0.58. And there was bidirectional causality in agricultural exports and real GDP.

Lopez and Dawson (2010) quantified the contribution of agricultural exports to economic growth in developing countries. And they estimated the relationship between GDP and exports of agricultural and non-agricultural sector for 42 countries using panel cointegration methods. The Results showed that a long-run relationship existed; the agricultural export elasticity of agricultureGDP was 0.07 whereas that of non-agricultural exports was 0.13.Haleem (2005) estimated of exportsfunction for citrus fruit in Pakistan. The study result in importance of exports in the development of an economy cannot be denied.This is particularly true in case of a developing economy.

Methodology:

Most of previous studiesasses the relation between agricultural exports and agriculture GDP but they ignored study how the changes in agricultural exports could be passed to the agriculture GDP. These studies have found evidence that the presence of a unit root in the time series data and, when related, to share a tendency to co-move in the long-run (Myers, 1994).

This analysis uses error correction model by estimating johansen cointegration techniques. Co integration and error correction models (ECM) have been introduced

in the literature (Engle and Granger, 1987) to characterize nonstationary and cointegrated data and inform both on their short and long-run dynamics. Tthe use of Johansen cointegration (1988, 1991, and 1995) methods is well known at the financial economics literature.

Johansen's methodology based on the vector autoregression (VAR) that can be expressed as:

$$y_t = \sum_{i=1}^{k} A_i y_{t-i} + \varepsilon_t \tag{1}$$

Where y_t is an $n \times 1$ vectors of integrated variables of order one for $k > 1$, and ε_i are $n \times 1$ error terms. The equation (1) can be re-written as

$$\Delta y_t = \prod y_{t-1} + \sum_{i=1}^{k-1} \prod_i \Delta y_{t-i} + \varepsilon_t \tag{2}$$

Where

$$\prod = \sum_{i=1}^{k} A_i - I \ and \ \Gamma_i = -\sum_{j=i+1}^{k} A_j . \tag{3}$$

The coefficient matrix can be written as

$$\prod = \alpha \beta' \tag{4}$$

Where α are the adjustment parameters in the vector error correction model or speed of adjustment towards equilibrium and each column of β is considering as cointegrating vector.

Where $\prod$ is equal to zero that means the variables tested are not cointegrated, and the variables regard to be cointegrated where the rank of $\prod \neq 0$, where r is the number of cointegrating relationships, and If the rank of $\prod$ is reduced to be $r > n$ but is not equal to zero, then its determinant is zero. To overcome of this problem we can consider eigenvalues to be the estimators of the cointegrating vectors [1] (Sørensen B. E., 2005).

Johansen tests divided into two likelihood ratio tests to assess the null hypothesis of no cointegration against the alternative of presence the cointegration of the canonical correlations; these two tests are: the trace test and the maximum eigenvalue test, represented in the equations (5) and (6), respectively. First, the trace test examines whether the null hypothesis of the rank $\prod = r$ coinegrating vectors relative to the alternative hypothesis of $r < \prod \leq n$ conatigrating vectors. Second, the maximum eigenvalue test assess the null hypothesis of $r = 0$ relative to the alternative that $r + 1 = 0$ (Hjalmarsson E. and Österholm P., 2007)

$$J_{trac} = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \tag{5}$$

$$J_{max} = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{6}$$

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[1]**Johansen tests (1998, 1991) are based on the eigenvalues of the transformation of the variables and can assess relationships among variables which have canonical or maximum correlation that shows the maximum likelihood estimator of the cointegrating vector leads to find higher r canonical correlation of Δy_t by transforming the variable to lagged differences and deterministic variables (for more details follow Johansen, 1995 or Hjalmarsson E. and Österholm P., 2007).**

The Augmented Dickey and Fuller (1979), Perron (1997) and KPSS (1992) tests used to test for unit roots are run on our data. Results support the presence of a unit root in both agricultural export and agricultural GDP. The two variables considered are also found to maintain equilibrium parity by implementing the Johansen (1988) cointegration test.

Empirical analysis:

The analysis based on the dataset includes annual Egyptian agricultureGDP and agriculture exports for the period from 1970 to 2013, yielding 44 observations. AgricultureGDP and agriculture exports are expressed in constant 2005 dollars (figures 1 and 2) data were obtained from the United Nations statistical database (UN database, 2016). Logarithmic transformations of agriculture GDP and agriculture exports series are used in the empirical analysis. The Augmented Dickey and Fuller (1979), Perron (1997) and KPSS (1992) unit root tests have been conducted and shown that none of the series is stationary and presence of the unit root (table 1). Thus we take the logged agriculture GDP and agriculture exports series in first differences. Table 1 presents summary statistics for first differenced logged series used in the analysis.

We have applied the Johansen's (1988) cointegration to assess the existence of an equilibrium relationship between the pairs of series studied and to drive the error correction term in order to estimate ECM-GARCH bivariate model and evaluate the short run relationship between the agricultural exports and agriculture GDP.

Results indicate that there is a long-run relationship between agriculture exports and agricultureGDP (see table 2). Existence of co-integration suggests the existence of thatagriculture exports affected theagriculture GDP. Since series used in the analysis are expressed in logarithms, co-integration parameters can be interpreted as agricultural exports and agriculture GDP elasticity's. Agriculture exports and agricultureGDP elasticities are being 0.62. It is not surprising to find high correlation between agriculture exports and its GDP. A chi-square test of weak exogeneity for long-run parameters within the Johansen's framework indicates that agriculture exports variable isendogenous for long-run parameters, agricultureGDP is exogenous. This implies that the agriculture GDP for maintaining such equilibrium by responding to the fluctuations that can occur by agriculture exports (see Table 2). As expected, the parameters representing long-run series used links suggest that an increase in agricultural exports will causes an increase in agriculture GDP as well, which may result in higher acceptance and compatible with Mulagi (2015), and Lopez and Dawson (2010). This is not surprising since the agricultural economy in Egypt depends on agricultural exports, especially to the European market. Given that rice represents almost 40% of total Egypt's exports,the well-known Egyptian cotton have imported to India, Pakistan and China. The European market is the major absorbs of potatoes and oranges; its represents 42% of the country's exports.

Concluding remarks and Policy Implications:

While Egypt is one of the more African countries exporting agricultural products, but the current direction of the Egyptian government is that to pay more attention to industrial exports. This paper studies the contribution of the agricultural

exports to agriculture GDP by using the Johansen (1988) cointegration technique to examine the relation between agricultural exports and agriculture GDP. The ECM-GARCH bivariate model has been also conducted for the purpose to assess the short term relationship between agricultural exports and agriculture GDP, and also allows for evaluate the time-varying and clustering volatility.

The analysis is based on the time series data, annual Egyptian agriculture's share on GDP and agriculture exports for the period 1970-2013, the results indicate that there is long-run equilibrium relationship between agricultural exports and agriculture GDP. The agricultural export elasticity of agriculture GDP was 0.62. The agricultural exports and agriculture GDP have been influenced negatively by the speed of adjustment which indicates that in the long term the agriculture's share on GDP and agricultural exports have adjusted yearly by 4%. Results also indicate that increases in agricultural exports will followed by increases in agriculture GDP.

Currently, Egypt is experiencing high price of the dollar against the local currency, which requires increasing exports to provide a strong foreign reserves. According to our findings above increases in agricultural exports lead to increases in agriculture GDP, and thus increases in the growth rate of the economy as a whole .

Therefore the application of some of the policies through the intervention of the Egyptian government or by the relevant bodies to increase agricultural crops exports could lead to the strengthening of the Egyptian economic performance. That is suffering since the outbreak of the revolution of January 25th 2011, as well as the strengthening of the Egyptian local currency against the dollar. To implement some of the policies that could be used to increase the export of agricultural products, it is relevant that the problems faced by the farmers to export their products should be solved.The most important of these problems was the lack of commitment exporters' of the forward contracts; thus such these contracts need to be controlled by the government and the application of fines for breach of the contracts.

Also one the problems that facing exporters and farmers together is that the production of agricultural products need to be high quality and thus lacked the ability to compete in the global market especially in European market. To overcome this problem, the farmers needed to intensive and specialized training courses to develop their abilities to produce high-quality products and thus becomes a product with a feature of comparative and competitive. As well as the Egyptian government must provide suitable place for the storage of their products, additionally the use of suitable and high-quality methods of sorting and packaging. The implication of such polices could create more exports opportunities. Beside that there is some roles could be followed to increase the potentiality of the exports. For this purposes the government could provide for farmer's kind of export tariff subsidies and better access to the international marketespecially the European market due to its proximity to Egypt and easy transport of agricultural products. Support and encourage exports as well as facilitate the entry exporters procedures to the agricultural market and through it can increase the numbers of agricultural exporters and increase agricultural exports.

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Table 1 Summary statistic for first log-differences series.

Unit root testing on logged Agriculture GDP and Agriculture Exports series		
	Agriculture GDP	**Agriculture Exports**
Perron	1.326	0.718
Critical values	-3.584 (1%)	-2.928 (5%)
Augmented Dickey-Fuller	2.902	3.179
Critical values	7.06 (1%)	4.86 (5%)
KPSS	1.201**	0.586*
Critical values	0.739 (1%)	0.463 (5%)

Summary statistic for first log-differences Agriculture GDP and Agriculture Exports series		
	Agriculture GDP	**Agriculture Exports**
Mean	0.001	0.054
Standard Deviation	0.002	0.035
T-statistic	14.687	1.479
Skewness	-2.086	0.669
Kutosis (excess)	8.731**	0.461
Jarque-Bera statistic	167.803**	3.598
ARCH LM statistic	14.085**	11.632**
Number of observations		43

Note: *(**)indicates rejection of the null hypothesis at the 1% (5%) significance level. The skewness and kurtosis and their significance tests are from Kendall and Stuart (1958). The Jarque-Bera is the well known test for normality. The ARCH LM test of Engel (1982) is conducted using 5 lags.

Table 2 Johansen λ_{trace} test for cointegration and cointegration relationship

Agriculture GDP - Agriculture Export			
H_0	Ha	λ_{trace}	$P-value$
$r=0$	$r>0$	35.276	0.000
$r\leq 1$	$r>1$	2.865	0.614
	Agriculture GDP	**Agriculture Exports**	
Chi-Square(r) **(P-values)**	29.416 (0.000)	0.688 (0.407)	
Cointegration: Agriculture GDP -Agriculture Export			

$$GDP_{Agr} - \underset{(-1.569)}{0.627**} Exp_{Agr} - \underset{(-3.954)}{7.376**} = v_{GDP_{Agr}Exp_{Agr},t}$$
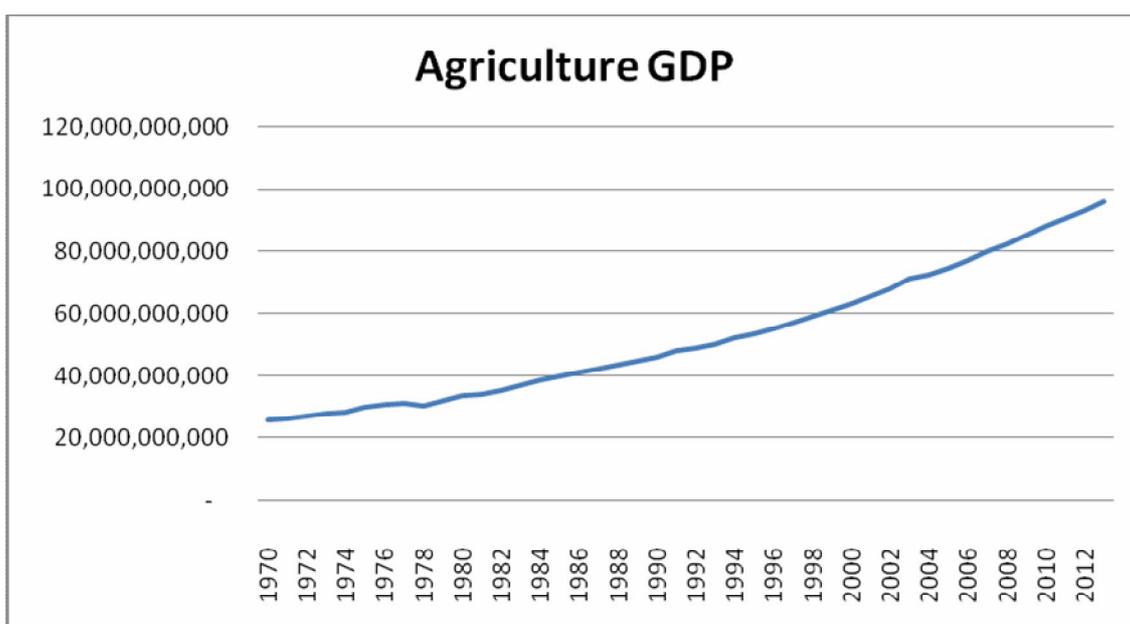
Figure 1. Annual agriculture's share on GDP expressed in dollars and expressed in constant 2005$
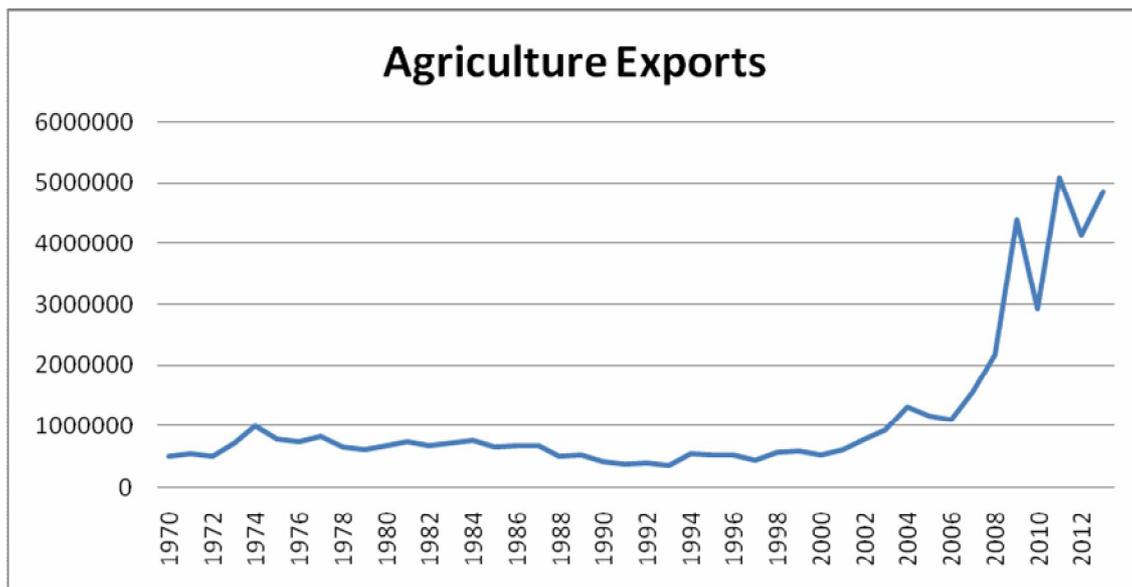
Figure 2.Annual agricultural exports expressed in dollars and expressed in constant 2005$

الملخص

يهدف هذا البحث الي اختبار العلاقة بين الصادرات الزراعية والناتج المحلي الزراعي في كــل مــن المدي القصير والطويل، وتم استخدام أسلوب Johansen Co-Integration Technique وأسلوب -ECM GARCH لاختبار وتقدير تدخل الأسعار الزراعية، وقد اشارت نتائج البحث الي إيجابية العلاقة بين النــاتج الصادرات الزراعية والناتج المحلي الزراعي، وقدرت مرونة تلك العلاقة بنحو ٠,٦٢،، ومن ثم يمكن القــول بأن الصادرات الزراعية تسهم في زيادة نسبة مشاركة قطاع الزراعة في الناتج المحلي الإجمالي، وبناء علي هذه النتيجة يجب علي صانعي السياسة ولاسيما السياسة الزراعية استكمال البرامج التي مــن شــأنها تنميــة الصادرات الزراعية ورفع قدرتها التنافسية في الأسواق العالمية، ولتحقيق هذا الهدف يجب وضع حزمة مــن البرامج التي من شأنها تربية القناعة والوعي الكافي عند مجتمع المنتجين والزراعيين بأهمية الإنتــاج وفقــاً لمتطلبات السوق الدولية ومراعاة شروط ومواصفات الجودة المطلوبة.