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Study of Causal Relationship among Product Cost, Infield and Price of Cotton in Iran's Agriculture (1996-2012)

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Abstract

Cotton is one of production that its added value is more than hundred percent and itisa strategic and valuable production in all countries. In recent years, cultivating of cotton has decreased very much and its price doesn't have a considerable growth. Hence, this paper has studied causal relationship among the price, infield and product cost of cotton in Iran's agriculture through 1996-2012. For causal relationship have been used Granger, Toda and Yamamoto tests. Similarity of the two tests is that based on every two tests causality is confirmed from prices over production cost and unfiled. But in Granger test, causality is from cost over the price. While in causal Toda-Yamamoto test the causality is from infield over production cost and the price.

Keywords: Causal Granger test, causal Toda and Yamamoto test, cotton, Iran

Introduction

Cotton because of different usage in our world today has a high economic and commercial importance. Because of the economic importance of this crop it is called white gold.(faryadras& et.al., 2002)

Cotton is among productions that its employment rate due to its application in textile, military and oil plumbing industries is high. Total population in the country that is living by activity in cotton production and related industries to cotton is estimated approximately two million people.(ferdowsi&yazdani, 1996).

So this crop is as a valuable crop in all countries in the world. China, India and America are as three major manufacturer of cotton in the world. These three countries have allocated overall 70 percent of total volume of world cotton production. The main cotton manufacturer in world have influenced on the world prices of this crop by implementation of specific policies such as offering subsidy to the producers. From long time ago, cotton cultivation was common in Iran and historical records show that cotton garments have been popular in the past. Unfortunately, during recent years cotton cultivation has decreased significantly and its rate has declined from 272 acres in 1996 to 100 hectare in 2012.

Cotton is one of the Non-oil commodities and main productions in agriculture of Iran which in two recent decades has lost its former place despite the emphasis on self-sufficiency policy of agricultural Products and non-oil export.(zad& et.al., 2002). In the main crops, cotton is one of crops that policies governing its trading and pricing have been instable in production and infield in two recent decades.(karbasi& et.al, 2004).

Unfortunately Iran suffersweakness in policies governing cotton production such as lack of mechanization in agriculture, absence of cotton collecting machines, weakness in research and… that they cause to rising the total cost of production and reducing competitive power of domestic cotton with imported cotton to possible minimum point. Also historical evidences indicateincreasing of cotton price will give prosperity to the area under cultivation of this crop. So the man goal of this paper is studying of causal relationship among variables of price, infield and production cost of cotton in Iran's agriculture according to data obtained from 1374-1391. For achieving to this goal is answered to below questions:

1- Whether cotton price iscausality of cotton cultivation or rate of cotton cultivation iscausality of cotton price or there is a causal relationship between them?

2- Whether cotton price is causalityof cultivation cost of cotton or cultivation cost of cotton in per hectareis causality of its pricing, or there is a mutual causal relationship between them?

3- Whether production cost of cotton in per hectare is causality of cotton cultivation rate or rate of infield is causality of production cost or there is a mutual causal relationship between them?

Materials and Methodology

In this paper is used two library methodology for investigation. The statistical data which is used in this paper are cotton price in RIALS; infield of cotton based on hectare and cost production of per hectare cotton in RIALS. These data have been obtained from time series data of central bank of the Islamic Republic of Iran and statistical center of Iran from 1996 to 2012.for studying causal relationship have been used from Granger, Toda and Yamamoto tests.

Causal Granger relationship

It is hypothesized that we have two variable of x and ythat effect together by distributed lags.Now the question is that can say changes in y cause changes in x or vice versa, changes in x cause changes in y, for thispurpose we use from causal test. One of the most popular tests in this field is causal Granger test (1980). Actually this test match the VARmodelofx and y equations and it is as follow:

$$y_t = \alpha_{10} + \sum_{i=1}^{n} \alpha_{1i} x_{t-i} + \sum_{j=1}^{n} \beta_{1i} y_{t-j} + u_{1t}$$

$$x_t = \alpha_{20} + \sum_{i=1}^{n} \alpha_{2i} x_{t-i} + \sum_{j=1}^{n} \beta_{2i} y_{t-j} + u_{2t}$$

It is assumed that that^{u} 1t and ^{u} 2tare non-correlated.

In this case, the following 4 conditions can be expressed:

1-If estimatedcoefficients with lagx statistically be in contrary to zero $(\sum \alpha_1 i \neq 0)$and sum of the estimated coefficients with the lagy statistically be zero $(\sum \beta 2j \quad = 0)$Thecausalityis one sided, fromx to y.

2- If sum of coefficients with the interval x statistically be in contrary to zero $(\sum \alpha_1 i = 0)$and sum of the estimated coefficients with the lagy statistically be in contrary to zero $(\sum \beta 2j \neq \quad 0)$the causalityis one sided, fromy to x.

3- If sum of the coefficients of x and y statistically be in contrary to zero the causality is mutual. $(\sum \alpha_1 i \neq 0)$ And$(\sum \beta 2j \neq \quad 0)$

4- If sum of the coefficients of x and y statistically aren't significant two variables will be independent. $(\sum \alpha_1 i = 0)$ And $(\sum \beta 2j \quad = 0)$

For testing of hypothesis related to statistical significance or lack of statistical significance of coefficients in VAR model we use Wald statistics:

$$F = \frac{(SSR_r - SSR_u)/k}{SSR_u/(n-2k-1)}$$

SSR_u : Residual sum of squares of the unrestricted model

SSR_r :sum of Residual squares constrained model

K: number of parameters

n: Number of observations

If critical F be greater than calculation F$\sum \alpha^1 i = 0$ andx is not Granger cause of y.

If calculation F be greater than critical F$\sum \beta 1j = \quad 0$and y is Granger cause of x (Gujarati, 2010, Souri, 2011).

Causal Toda-Yamamoto test

Toda-Yamamoto cause (1995) has been developed based on model of vector autoregressive(VAR). The advantage of this method is that there is no need to existence of condition for the co-integration of vector auto-regression system and it is from this point similar to Bounds test. Assuming that the model under study has three variable of x 1, x 2, x 3, causal test in the model framework of VAR is written as a linear combination of intervals of variablesin the model plus intercept from origin and the error. The general form of the model is as follows. Considering that the aim of causality is among the mentioned variables, the seemingly unrelated regression (SUR) method is used.

$$\begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} \sim_1 \\ \sim_2 \\ \sim_3 \end{bmatrix} + \begin{bmatrix} {}_{11}(L) & {}_{12}(L) & {}_{13}(L) \\ {}_{21}(L) & {}_{22}(L) & {}_{23}(L) \\ {}_{31}(L) & {}_{32}(L) & {}_{33}(L) \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} \pounds_1 \\ \pounds_2 \\ \pounds_3 \end{bmatrix}$$

^{b} ij: in the matrix, coefficients express how of the variables relate each other and all variables have been estimated endogenous. Also the error sentences are white noises. In the Toda-Yamamoto is used from the generalized Wald test statistic that is used for test of linear restriction on the coefficients in the VAR model.(Samadi, 2009)

Results

table1. result of Granger causality test (1996-2012)

Null Hypothesis:	Obs	F-Statistic	Prob.
PRICE does not Granger Cause CULTIVATION	203	2.54405	0.0811
CULTIVATION does not Granger Cause PRICE		1.52100	0.2210
COST does not Granger Cause CULTIVATION	203	2.26281	0.1067
CULTIVATION does not Granger Cause COST		1.23557	0.2929
COST does not Granger Cause PRICE	203	4.15866	0.0170
PRICE does not Granger Cause COST		3.49397	0.0323

Table2. result of Toda and Yamamoto causality test

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.005774	0.004072	246.9960	0.0000
C(2)	14.40868	82.46540	0.174724	0.8614
C(3)	7.925006	9.741032	0.813569	0.4162
C(4)	10278.76	21780.64	0.471922	0.6372
C(5)	-7.58E-07	2.96E-07	-2.565528	0.0105
C(6)	1.005067	0.005983	167.9959	0.0000
C(7)	0.001937	0.000709	2.730584	0.0065
C(8)	-2.679192	1.582346	-1.693177	0.0909
C(9)	-1.08E-06	2.19E-06	-0.489897	0.6244
C(10)	0.139215	0.044535	3.125973	0.0019
C(11)	1.017934	0.005199	195.8073	0.0000
C(12)	-35.23915	11.71078	-3.009120	0.0027

Determinant residual covariance 2.15E+12

Equation: COST = C(1)*COST(-1) + C(2)*CULTIVATION(-1) + C(3)*PRICE(-1) + C(4)
Observations: 204

R-squared	0.999948	Mean dependent var	7473964.
Adjusted R-squared	0.999947	S.D. dependent var	4860087.
S.E. of regression	35350.89	Sum squared resid	2.50E+11
Durbin-Watson stat	0.193934		

Equation: CULTIVATION = C(5)*COST(-1) + C(6)*CULTIVATION(-1) + C(7)*PRICE(-1) + C(8)
Observations: 204

R-squared	0.998302	Mean dependent var	172.5088
Adjusted R-squared	0.998276	S.D. dependent var	61.44337
S.E. of regression	2.550882	Sum squared resid	1301.400
Durbin-Watson stat	0.210039		

Equation: PRICE = C(9)*COST(-1) + C(10)*CULTIVATION(-1) + C(11)*PRICE(-1) + C(12)
Observations: 205

R-squared	0.999924	Mean dependent var	3453.015
Adjusted R-squared	0.999923	S.D. dependent var	2212.436
S.E. of regression	19.40708	Sum squared resid	75703.55
Durbin-Watson stat	0.194630		

Table3. result of Wald test

Test Statistic	Value	df	Probability
Chi-square	0.694430	2	0.7067

Null Hypothesis: C(2)=C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	14.40868	82.46540
C(3)	7.925006	9.741032

Test Statistic	Value	df	Probability
Chi-square	7.599994	2	0.0224

Null Hypothesis: C(5)=C(7)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(5)	-7.58E-07	2.96E-07
C(7)	0.001937	0.000709

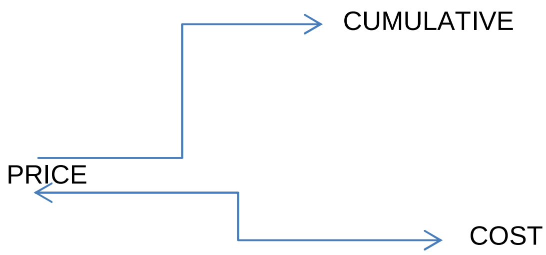
Test Statistic	Value	df	Probability
Chi-square	9.787494	2	0.0075

Null Hypothesis: C(9)=C(10)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(9)	-1.08E-06	2.19E-06
C(10)	0.139215	0.044535

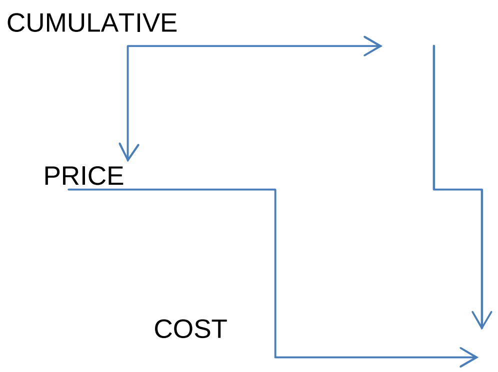
Discussion

Results of causal Granger test expresses there is a mutual causality between cotton price and cultivation cost of cotton in every hectare. Also, there is one-sided causality from cotton price to cotton infield. While, there is not any causality from cotton infield over cotton price. And also there is not any causality between production cost of cotton in per hectare and rate of cotton infield based on results in causal Granger test. The results of this test have been shown in the following figure.



Based on results of causal Toda-Yamamoto test, there is not any causality from cotton production cost over cotton price in Iran. While, there is a one-sided causality from cotton price over cotton production cost.

And also, there is a mutual causality between cotton infield and cotton price. While, there is not any causality from infield cotton infield over cotton cost. The results of causal Toda-Yamamoto test have been shown in the following figure.



Compression of two tests

Based on two tests, thesimilarities between two tests are that causality is confirmed from price over production cost and infield. And also in two tests there is not any causality from production cost over infield.

The distinctions in two tests are that in causal Granger test, causality if from cost over price. But based on causal Toda-Yamamoto test, causality is from infield over production cost and price. According to in both causal tests, the causal relationship is from price over production cost and infield, it is noted that price is the most important determinant factor of cotton cultivation in Iran's economy and in predicting and planning for cotton cultivation in Iran's agriculture the price should be considered as the most important factor in the cultivation of this crop.

Conclusion

Cotton is one of production that its added value is more than 100% and itisa strategic and valuable production in all countries. In recent years, cultivating of cotton has decreased very much and its price doesn't have a considerable growth. So, in this research is used from causal tests to study relationship among the price, infield and product cost of cotton in Iran's agriculture through 1996-2012. For studying causal relationship have been used Granger, Toda and Yamamoto tests. According to results in both tests, there is causality from cotton price over production cost and infield. And also based on both tests, there is not any causality from cost over infield. As a result, cotton price is as the most important factor for cultivating of cotton and policymakers should seriously consider the variable of price in the cultivation planning of this crop.

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