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**(2010-1980)**

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(2010-1980)

(PP)

(ADF)

Impulse Response )

(Variance Decomposition)

.(ECM)

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©

**The Impact of Industrial Exports on Economic Growth in Jordan:  
Empirical Study for the Period (1980-2010)**

**Mays Awad Shatnawi**

**Ahmad Ibrahim Malawi**

**Abstract**

This study aims to investigate the impact of Industrial Exports on Economic Growth represented by Real Gross Domestic Product (RGDP) in Jordan during the period (1980-2010). Several diagnostic tests have been utilized such as Augmented Dickey-Fuller and Philips-Perron tests for Stationarity, Cointegration test, and Granger Causality test.

The results show that the variables are not stationary in their levels but their first differences are stationary. Also, the results show that there is a bi-directional causal relation between Industrial Exports and (RGDP). Moreover, the Industrial Exports have a positive effect on the (RGDP). Two major tools were used in the analysis: Variance Decomposition and Impulse Response Function, where these two tools were applied through the Error Correction Model (ECM). The results show that the Industrial Exports are the strongest explanatory variable of the forecasting error of (RGDP), where the explanatory power ends up to be around 28% in the tenth year ahead.

**Keywords:** Economic Growth, Industrial Exports, Error Correction Model, Variance Decomposition, Impulse Response Function.

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Ahmad )

(Erfani & Rod, 1999)

(Al-Sakran,2001)

(& Kwan,1991

(Mishal, 2007)

(Abual-Foul, 2004)



.(2010 -1980)

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(2010-1980)

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.(Shapiro,1995)

.(Solow, 2000)

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.(Todaro,1989)

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.(Solow,2000)

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“Smith”

.(Smith,1976)

“Recardo”

.(2007 )

.(Abou-Stait, 2005)

"Keynes"

Marx, Myrdal)

"Marx"

.(Singer, Nurkse

.(Residuals)

"Myrdal"

"Nurkse"

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(11) (Balassa, 1978)

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(55) (Tyler,1981)

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(Fosu,1990)

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(Greenaway et al.,1999)

(Herzer et al. 2004)

(Abu-Qarn,2002)

(MENA)

(GDP)

(Feder)

(Ibrahim & Macphee, 2003)

(1993 -1974)

30

(Parida & Sahoo,2007)

(2002-1980)

(Kurt &Terzi, 2007)

(Mehdi&Reza, 2011)

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(Ukpolo, 1994)  
(1988-1969)

(Anwar&Samph, 2001)

(1990-1955) (Alam, 2003)  
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(1987-1967)

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(Abual-Foul,2004)  
(1997-1976)

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2002-1976

( Mishal, 2007)

(2004-1964)

(1988-1964)  
(2004-1989)

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(3977.2)

1987 (5791.6) 1985 (5173.7) 1980 (6016.2)

1988 1.4 3.3

1992 (5416.7)

.(1) (1)

(2010-1980)

*	*	*	*	)	)		)	
(%)	(%)	(%)	(%)	(	(	*(%)	(	)
1.19	39.47	-	-	47.41	120.11	-	3977.20	1980
1.95	52.79	88.20	40.73	89.22	169.03	15.27	4584.50	1981
1.75	45.78	-4.78	9.79	84.96	185.58	6.16	4867.00	1982
1.42	44.39	-16.35	-13.74	71.07	160.09	3.09	5017.40	1983
2.56	50.64	86.01	63.07	132.19	261.06	2.73	5154.60	1984
2.19	44.38	-14.27	-2.19	113.33	255.35	0.37	5173.70	1985
1.46	38.05	-24.24	-11.64	85.85	225.62	13.70	5882.30	1986
2.05	49.62	43.77	10.26	123.43	248.77	2.28	6016.20	1987
2.54	45.25	19.07	30.56	146.97	324.79	-3.73	5791.60	1988
5.48	48.78	77.28	64.46	260.55	534.16	-17.84	4758.30	1989
6.80	51.82	21.76	14.62	317.25	612.25	-2.01	4662.60	1990
6.16	47.48	-10.41	-2.23	284.23	598.63	-1.02	4615.00	1991
5.97	51.06	13.84	5.87	323.57	633.76	17.37	5416.70	1992

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*	*	*	*	)	)		)	
(%)	(%)	(%)	(%)	(	(	* (%)	( )	
6.35	51.85	10.77	9.08	358.43	691.28	4.21	5644.50	1993
8.10	62.35	38.11	14.85	495.03	793.92	8.30	6112.90	1994
9.98	64.23	30.34	26.53	645.20	1004.53	5.80	6467.50	1995
9.40	57.13	-7.93	3.51	594.05	1039.80	-2.25	6322.20	1996
9.77	58.78	5.59	2.63	627.25	1067.16	1.55	6420.40	1997
9.01	58.56	-2.32	-1.95	612.71	1046.38	5.91	6799.80	1998
9.46	62.68	7.55	0.48	658.95	1051.35	2.40	6963.30	1999
9.96	66.15	8.50	2.80	714.96	1080.82	3.12	7180.60	2000
12.92	71.48	35.21	25.12	966.68	1352.37	4.19	7481.60	2001
18.03	90.89	46.38	15.11	1415.00	1556.75	4.89	7847.10	2002
18.47	90.62	7.28	7.60	1518.00	1675.08	4.72	8217.70	2003
23.65	91.26	38.67	37.70	2105.00	2306.63	8.30	8899.90	2004
24.12	89.29	9.03	11.43	2295.00	2570.22	6.90	9513.80	2005
24.77	88.96	13.55	13.97	2606.00	2929.31	10.59	10521.00	2006
24.83	87.31	6.66	8.68	2779.60	3183.71	6.41	11195.00	2007
32.99	88.55	41.16	39.18	3923.80	4431.11	6.24	11894.00	2008
25.00	85.66	-21.86	-19.23	3066.00	3579.17	3.10	12263.00	2009
24.00	73.00	19.20	18.00	3120.1	4216.95	2.30	12545.05	2010

(1990-1985)

(-3.1%)

1989

1990

(2010-1980) :

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(1998-1992)

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(%50)

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2000 1999

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(7180.6)

(7481.6)

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(2.30%) 2010

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**:(2010-1980)**

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(47.41)		(1)	
2010		(3120.1)	1980
		2010	(%73)
(24%)			(1.19%)
1985		(1)	
	(132.19)	1984	1986
(85.85)	1985	(113.33)	
(-24.24%)	(-14.27%)	1986	
1986		(1.46%)	
	1991		
	(-10.41%)		
1996		(645.2)	1995
1998	(-9.97%)		(594.05)
		(-2.32%)	
		(1415)	2002
			2000
	2009		
	(-21.9%)	(3066)	

(2010-1980) :

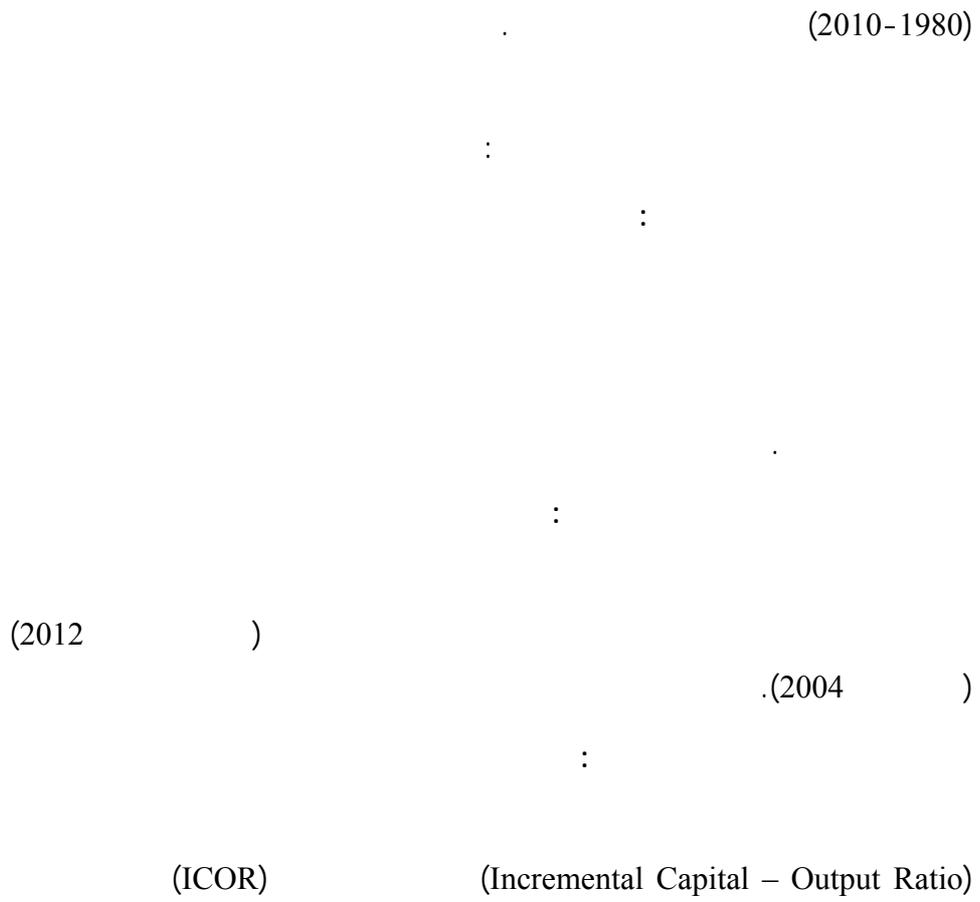
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(3120.1) 2008  
.(19.2%) 2010  
(1)  
2010 %24 1980 %1.2  
1980 %39.5  
%73  
(2)  
(0.83)  
(0.96)  
(0.95)  
(2)

0.961585	K
0.948269	L
0.832999	X

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.(Hammad, 1986)

(2010-1980) :

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( ) (2010-1980)

	*			
417.5	13363	47.41	3977.20	1980
514.4	13685	89.22	4584.50	1981
601.2	13874	84.96	4867.00	1982
655.6	14196	71.07	5017.40	1983
706.6	14343	132.19	5154.60	1984
750.3	14553	113.33	5173.70	1985
801.5	14671	85.85	5882.30	1986
837.1	14732	123.43	6016.20	1987
887.1	14883	146.97	5791.60	1988
929.3	14977	260.55	4758.30	1989
991.9	15176	317.25	4662.60	1990
1072.9	15293	284.23	4615.00	1991
1287.7	15636	323.57	5416.70	1992
1462.6	15669	358.43	5644.50	1993
1598.3	16362	495.03	6112.90	1994
1808.0	16620	645.20	6467.50	1995
1921.8	17363	594.05	6322.20	1996
2036.5	17582	627.25	6420.40	1997
2181.7	18313	612.71	6799.80	1998

	*			
2323.1	18342	658.95	6963.30	1999
2358.5	18885	714.96	7180.60	2000
2425.5	19019	966.68	7481.60	2001
2574.5	19478	1415.00	7847.10	2002
2759.2	19555	1518.00	8217.70	2003
3055.0	20037	2105.00	8899.90	2004
3348.2	20278	2295.00	9513.80	2005
4397.6	21207	2606.00	10521.00	2006
5099.8	22088	2779.60	11195.00	2007
6378.4	22920	3923.80	11894.00	2008
6589.9	24264	3066.00	12263.00	2009
6982.1	24672	3120.1	12545.05	2010

: (\*) :

**.(The Unit Root Test)**

(Nelson & Plosser,1982)

(OLS)

(I(0))

.(R<sup>2</sup>)

(t,F)

(Regression Speriuous)

Test -  
Phillips- Perron (PP)

.(The Unit Root Test)  
Augmented Dickey- Fuller (ADF)

(2010-1980) :

: (ADF) -

:(Gujarati & Porter, 2009) (Y<sub>t</sub>)

$$Y_t = \rho Y_{t-1} + U_t, \quad -1 \leq \rho \leq 1. \dots\dots(1)$$

(ρ -1) (δ)

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + U_t \dots\dots\dots(2)$$

$$\Delta Y_t = \delta Y_{t-1} + U_t \dots\dots\dots(3)$$

(U<sub>t</sub>)

.(White Noise Disturbances)

.(t)

: (H<sub>1</sub>)

(H<sub>0</sub>)

$$H_0: \rho = 1, \text{ or } \delta = 0$$

$$H_1: \rho < 1, \text{ or } \delta < 1$$

(3)

$$\Delta Y_t = \alpha + \delta Y_{t-1} + B t + U_t \dots\dots\dots(4) \dots\dots\dots( )$$

$$\Delta Y_t = \alpha + \delta Y_{t-1} + U_t \dots\dots\dots(5) \dots\dots\dots( )$$

$$\Delta Y_t = \delta Y_{t-1} + U_t \dots\dots\dots(6) \dots\dots\dots( )$$

(Fcal) -

. (Fcri)

$$. H_0 \leftarrow |Fcri| < |Fcal|$$

**:(Phillips- Perron )**

(ADF) - (PP) -  
:  
(Yt)  
$$Y_t = \rho Y_{t-1} + U_t \dots\dots(7)$$

.(PPcri) (PPcal)

$$.H_0 - |PPcri| < |PPcal|$$

.(ADF)

**:(Lag Length Selection)**

(Serial Correlation)  
(HQ) - (SIC) (AIC)  
(FBE)  
(LR)  
( $\chi^2$ )

**:(CUSUM Stability Test)**

(CUSUM)

(Ordinary Least Squares)

(2010-1980) :

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(± 2 S.E)

(%5)

.(Brown et al.,1975)

:(Cointegration Test) :

r

(Johansen,1995)

:

1. Trace Test :

$$\sum_{i=r+1}^n \ln(1 - \lambda_i) \lambda_{\text{trace}} = -T$$

2. Maximal Eigen Value Test :

$$\lambda_{\text{max}} = -T \ln(1 - \lambda_{r+1}).$$

:

:T

:n

:λ

:r

(Eigenvalue)

**:(Granger Causality Test) :**

.(Engle & Granger 1987) ( )  
(Variance Decomposition)  
(Impulse Response Function)

(VAR)  
(Cholesky Decomposition)

.1

(Feder, 1983) Feder

Feder

Feder

Feder

Mckinnon,

(Cob-Douglas) -

:(1973)

$Y_t=f(K_t,L_t)$  ..... (8)

(X)

(1983) Feder

:

(Cobb-Douglas) -

(2010-1980) :

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$$Y_t = f(K_t, L_t, X_t) \dots\dots\dots (9)$$

:

$$LY_t = \alpha_0 + \alpha_1 LK_t + \alpha_2 LL_t + \alpha_3 LX_t + e \dots\dots (10)$$

:

:  $LY_t$

:  $LK_t$

:  $LL_t$

:  $LX_t$

:  $e$

(Hotchkiss et al., 1994)

.(Lloyd et al., 2001)

(Multivariate Time Series Model)

.(Error Correction Model)

: .2

:(PP) (ADF)

-

: (4)

( )			(4)	
% 10	%5			
3.233456-	3.595026-	0.824175-		(Y)
3.261452-	3.644963-	*5.067920-		
3.229230-	3.587527-	1.019746-		(K)
3.261452-	3.644963-	*4.147619-		
3.238054-	3.603202-	3. 059837-		(L)
3.225334-	3.580623-	*5.293100-		
3.221728-	3.574244-	3.049778-		(X)
3.225334-	3.580623-	*6.998793--		

(%10 %5)

\*

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: (5)

(5)

% 10	%5			
3.221728-	3.574244-	1.547936-		(Y)
3.225334-	3.580623-	*6.705195-		
3.221728-	3.574244-	0.483188		(K)
3.225334-	3.580623-	*6.022697-		
3.221728-	3.574244-	2.190025-		(L)
3.225334-	3.580623-	*5.290052-		
3.221728-	3.574244-	2.388635-		(X)
3.225334-	3.580623-	*15.17881--		

(%10 %5)

\*

(2010-1980) :

(ADF)

%10 %5

.%10 %5

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.(ADF)

(Engle&Granger, 1987) .I(1)

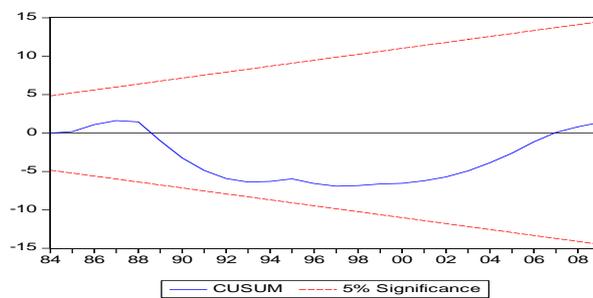
:(CUSUM Stability Test)

(1)

(CUSUM)

(2010 -1980)

(CUSUM Stability Test) (1)



**:(Lag Length Selection)**

(6)

(6)

HQ	SC	AIC	FPE	LR	
-1.274722	-1.145195	-1.333787	3.10e-06	NA	0
6.450086*	-5.802447*	-6.745410*	1.40e-08*	156.3617*	1

\*

:SC . :AIC . :FPE . : LR  
 :HQ .

**:(Co-integration Test)**

: (7)

(7)

**.(Max Eigen value) (Trace test)**

	Eigen value	Trace statistic	Critical value (5%)	Max Eigen value	Critical value (5%)
None*	0.827311	105.6046	63.87610	47.41915	27.58434
At most 1*	0.704810	58.18547	42.91525	32.94367	21.13162

.5%

.\*

(2010-1980) :

(7)

(Max Eigen Value test) (Trace test)

%5

(ECM) Error Correction Model

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I(1)

.2

:(Granger Causality Test)

(8)

(8)

		F		
**	0.0644	2.83230	X	Y
*	0.0075	5.29185	Y	X
	0.5431	0.73546	K	Y
**	0.0714	2.72420	Y	K
	0.6184	0.60668	L	Y
*	0.0367	3.43330	Y	L

.%10

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.% 10 %5

.\*

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(9)

(9)

	$Y \leftrightarrow X$
	$Y \leftarrow K$
	$Y \leftarrow L$

(9)

(Anwar&Samph,1997)

:(Error Correction Model)

(Variance Decomposition)

(Impulse Response Function)

.(Y, K , L , X)

(2010-1980) :

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**:(Variance Decomposition)**

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(10) (

**(10)**

X	L	K	Y	
0.000000	0.000000	0.000000	100.0000	1
2.245834	3.518744	0.803675	93.43175	2
1.632428	2.274867	0.863719	95.22899	3
6.347886	1.848281	3.453863	88.34997	4
12.80896	3.255763	5.935078	78.00020	5
21.04632	5.095114	8.915750	64.94281	6
24.21472	7.114275	10.10876	58.56225	7
26.63316	7.829766	11.53319	54.00388	8
27.48687	8.140959	12.18245	52.18972	9
28.05668	8.141325	12.92389	50.87810	10

Y K L X : Cholesky

:X :L :K :Y

(10)

(%2.25)

(%28)

(11)

(%6.9)

(%24)

(10)

(%0.8)

(%13)

(10)

(%3.5)

(%8.1)

(2010-1980)

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(11)

X	L	K	Y	
66.64624	20.66002	5.865460	6.858424	1
47.81475	34.98624	3.887333	13.32230	2
49.99013	33.12419	3.539943	13.35485	3
46.77402	30.96568	4.466694	17.78849	4
46.99923	29.97761	4.174545	18.83967	5
43.54428	29.85717	6.387170	20.18981	6
43.80969	28.45843	6.727036	20.97857	7
41.30185	27.08168	8.640712	22.93703	8
40.35911	26.44049	9.619623	23.53597	9
38.32203	25.37158	12.14025	24.11200	10

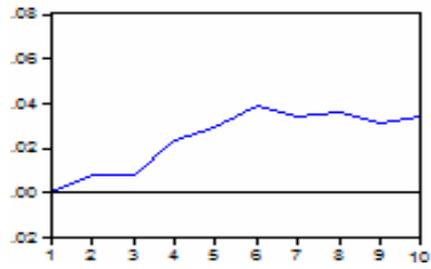
Y K L X : Cholesky

X L K Y

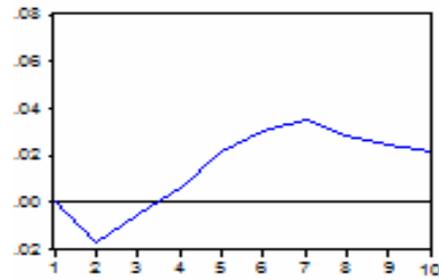
**:Impulse Response Function**

(2)

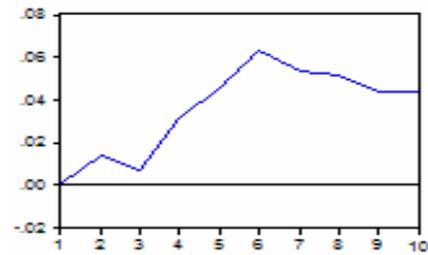
**K Y (Impulse Response Function) (2)**



L Y



X Y



(Fosu, 1990)

(Mehdi & Reza, 2011)

(Kurt & Terzi,2007)

(2010-1980) :

(L, K, Y, X) :

.(12)

(12)

X	Y	K	L	
0.000000	96.84432	0.038830	3.116849	1
2.245834	95.80871	0.767825	1.177635	2
1.632428	96.40631	0.944752	1.016506	3
6.347886	87.99230	3.916683	1.743136	4
12.80896	75.66558	7.024429	4.501031	5
21.04632	61.52404	10.61116	6.818475	6
24.21472	54.33464	12.21013	9.240514	7
26.63316	49.46667	13.88118	10.01898	8
27.48687	47.31133	14.66717	10.53463	9
28.05668	45.76775	15.50510	10.67047	10

L K X Y : Cholesky

(12)

(%0.8)

(%15.5)

(12)

(%1.2)

(%11)

(%3)

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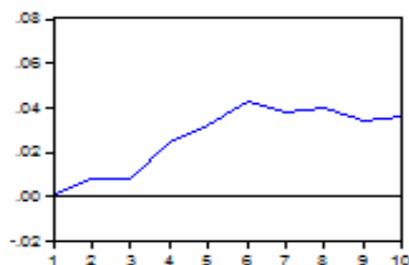
(3)

(3)

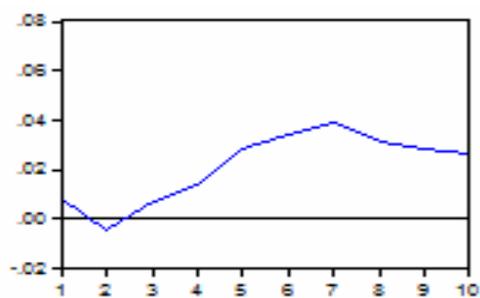
(2010-1980) :

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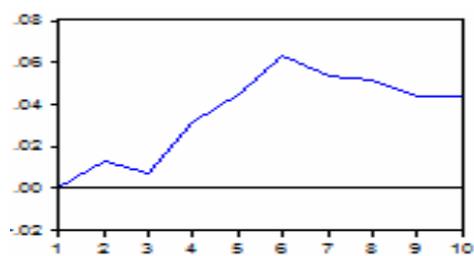
مع الترتيب الجديد استجابة  $K$  ل  $Y$  (Impulse Response Function)



L Y



X Y



(2010-1980)  
(Multivariate Time Series Model)  
(Variance Decomposition)  
(Impulse Response Function)

:  
:  
%5  
-1

(Fosu, 1990)  
(Mehdi & Reza, 2011) (Kurt&Terzi,2007)  
-2  
28%  
-3

(2010-1980) :

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.(2012)

[www.cbj.gov.jo](http://www.cbj.gov.jo)

(2002)

(1) (17) ( ) (2001) (1996-1972) (2012) (2007) .58 (1993) (2006) (2002) .17 -6 (1) (1989) (1) (16) (1987-1967) (2005) (2002-1976) (2009) (6) (1996) 1 4 (2004) (2008) .26 22

.(2010)

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