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Dutch Disease Symptoms in Mongolian Economy and Ways to reduce its Negative Effects

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Abstract

Background/Objectives: Mongolia has plenty of natural resources and comparatively few populations of 3 million, most of them are younger. It means Mongolia has a lot of opportunities to grow its economy quickly and compete with other countries by an economic growth. But, Mongolian economy has been stagnated in last few years since reaching the peak growth at 17.5 percent in 2011. **Methods/Statistical analysis:** We assume that the main reason for an economic stagnation caused by the government bad decisions not basing on the scientific research. The Dutch disease theory explains the relationship between increasing and declining specific sectors, which resulting in the currency appreciation. **Findings:** This paper aims to determine that the reason for economic difficulties and make some suggestion to prevent the worsening situation. **Improvements/Applications:** As of Mongolia, it has been reflected by Dutch disease very badly, so need to find the way to dive into the right paths.

Index Terms

Economic policy, Dutch disease, Mongolian economy, Resource curse, Budget expansion

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I. INTRODUCTION

The rapid economic growth in a specific sector influences on the whole economy in both positive and negative ways[1,2]. The increase in export revenue manipulates public sector investments, creates jobs and implements public projects, which were impossible in previous economic conditions. In reality, the revenue growth becomes the reason to increase government expenses. Consequently, it affects the state budget to expand and influences to increase the consumption quickly. Briefly, it is called as Dutch disease symptoms in an economy[3,4,5].

II. THE DUTCH DISEASE

The first research paper published in the Economist in 1977, which points out that how does the mining of natural gas explored in 1959, influence on country's whole economy. The article used the terminology of Dutch disease for the first time [6]. Emphasizing on a natural gas mining helps Dutch government to increase its budget revenue, on the contrary, it decreased the production and jobs in non-gas sectors.

The government increased public expenditures to eliminate these negative effects by providing social welfares for many unemployed people in non-gas sectors. Eventually, the budget deficit became larger and inflation rate became worse that all causes the number of increase in poverty and crime.

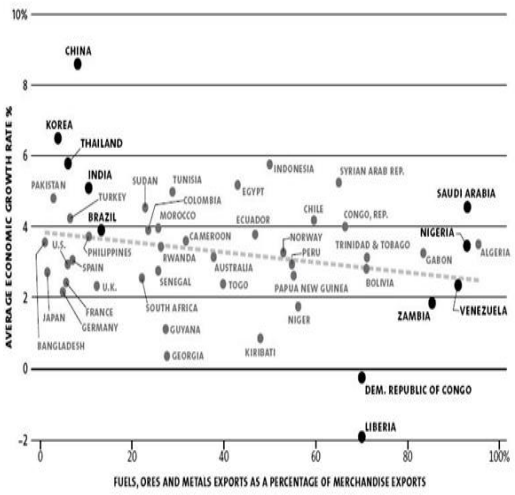


Figure 1. Mineral exports and growth, 1970-2008 (Source: World Development Indicators, World Bank)

At the early stages, the increase in the mining sector of the development attracts the foreign direct investment and creates more jobs. We need to emphasize on the number of jobs have been created by the mining sectors comparing to the other sectors.

It actually creates fewer jobs than others and it does not affect the total employment rate. If government and citizens believe that this situation will continue forever and plan the economy, it leads to a huge risk [7].

As calculation by World Bank as shown on graph 1, if a particular country's export is high dependable to the natural resources, then it will have a low growth rate. It means that the country can use the development of mining sector in early stages, but not forever

III. ECONOMIC BACKGROUND OF MONGOLIA

In 2010-2016, Mongolian real GDP expressed by the price of 2010 increased from 9.8 to 16.0 billion tugriks and by 63.3 percent. Unfortunately, Government of Mongolia is discussing with IMF on launching its Extended Fund Facility program, because of lack of foreign currency reserve to pay previous bond repayments and cover increasing the budget deficit.

There are several studies on Dutch disease in Mongolia. For example, Gan-Ochir noted that "There are hidden and seasonal symptoms of Dutch disease in Mongolian economy and if the prices of gold and copper, main export products of Mongolia continue to increase and new mining of copper and gold are started exploration, then it may influence on tugrik's real exchange rate appreciation and weakness of export production sectors except mining" [8]. On another one study, Avralt-Od and others mentioned that "Some clear symptoms of the Dutch disease are discovered in Mongolian economy from 2010. High growth of mining sector and its supply sectors, an excessive demand for non-tradable goods, and budget expansion became the result of high inflation" [9]. And researchers suggested creating the "Natural Resource Foundation" to diversify additional financial resources of the booming mining sector and to implement budget-tightening policies combining with monetary expansion policies. Ariunaa and Kim attempted to diagnose Dutch disease in Mongolian economy and concluded that the diagnosis of Dutch Disease cannot be confirmed even though Mongolia may be characterized by all these symptoms [10].

There are other several studies about Dutch disease symptoms in Mongolian economy and all of the studies reached controversial results.

One of the main characters to define Dutch disease symptoms on country's economy is real exchange rate and its appreciation. As a report of BoM, between the end of 2000 and 2015, tugrik's REER was appreciated by 83.78 percent when its NEER was depreciated by 41.72 percent.

The second character of Dutch disease is a lower growth rate of manufacturing sector comparing to higher growth of booming mining sector and its supply sectors.

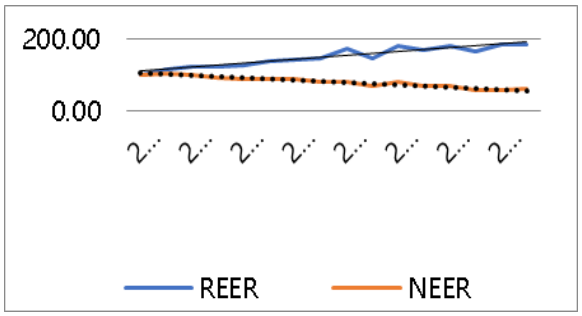


Figure 2. REER and NEER, by percentage (Source: Bank of Mongolia)

Following graph shows that the growth rates of real GDP and mining sector have a growing tendency when the growth rate of manufacturing has a decreasing tendency in 2000-2016 in Mongolia.

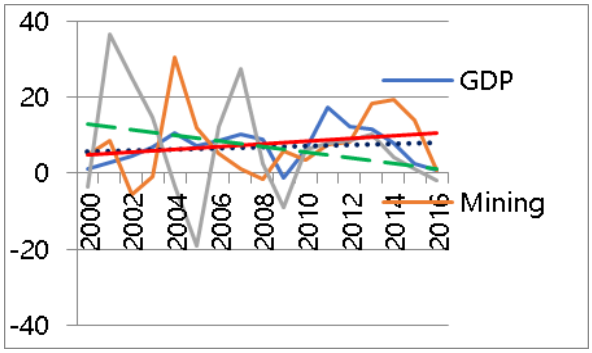


Figure 3. Real growth rate of GDP, mining and manufacturing sectors' production, by percentage (Source: National Statistics Office of Mongolia)

The third indicator of Dutch disease symptom is a growth of average salary depending on more demand of skilled labors in booming sectors. Graph 4 shows that the real average salary has increased 3 times in 2005-2015. At the same time, the real GDP has not grown same times.

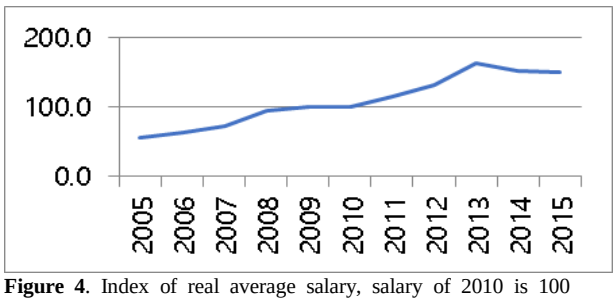


Figure 4. Index of real average salary, salary of 2010 is 100 percent (Source: National Statistics Office of Mongolia)

Quickly considering at above data, it seems Mongolia has some symptoms of Dutch disease. So, here main goals of the paper to testify that does Dutch disease exist practically and define some policies to remedy them appear.

IV. METHODS

W.Max Corden and J. Peter Neary explained Dutch disease by an economic model. They divided the country's economy into 2 main sectors as booming sectors and others. Furthermore, the non-booming sectors are divided into tradable and non-tradable sectors.

The more revenue of booming sector creates 2 kinds of effects on the economy, first, "resource movement effect" from non-booming sector to booming sector and its supply sectors, and second, "spending effect" increasing the money supply as loosening loan policies and expanding social welfares.

These policies influence on the price increase for non-tradable goods sharply, but prices for tradable goods cannot be increased because of international market equilibrium and demand.

After all, REER of domestic currency will be appreciated and the competing capacity of tradable goods in a worldwide market will decrease [11].

$$DD_{manufacturing} = F(RME, SE), \text{ here:}$$

$DD_{manufacturing}$: *Dutch disease in manufacturing sector*
RME : Resource movement effect
SE : Spending effect

There are a lot of studies challenging different empirical models. In our study, we examine real exchange rate, whether copper price and quick growth of GDP cause the Dutch disease in Mongolian economy.

This paper employed macroeconomic quarterly data on the exchange rate, copper price, gross domestic product, and trade balance in 2000-2015. We used data resource as calculation of Bank of Mongolia for tugrik's real exchange rate, data of www.macrotrends.net for copper price, data of National Statistic Office of Mongolia for gross domestic product and trade balance.

The trade balance is calculated by taking the ratio of import and export of Mongolia and then taken into logarithmic form. So regression equation is:

$$ln(\text{REER}_t) = \alpha + \beta_1 ln(\text{CP}_t) + \beta_2 \ln(\text{GDP}_t) + \beta_3 \ln(\text{TB}_t) + \varepsilon_t \quad (1)$$

ln REER : real exchange rate index in logarithm (tugriks per USD)
ln (CP) : Copper price in logarithm (USD per tonn)
ln (GDP) : Real GDP in logarithm (expressed by 2005 MNT)
ln (TB) : Trade balance in logarithm (logEXP-logIMP in USD)
ε : Error term

V. EMPIRICAL FINDINGS AND RESULTS

We used tugrik's real effective exchange rate per USD in logarithm, Ln(REER) as a dependent variable, and copper price in logarithm, Ln(CP), nominal GDP in logarithm, Ln(GDP) and foreign trade balance in logarithm, Ln(TB) as dependent variables.

Sampling data of Bank of Mongolia and National Statistics Office of Mongolia were used and data span covers the period from the 1st quarter, 2000 to 1st quarter, 2016. Total 65 quarterly data are used to evaluate the econometric model.

At first, we checked linear relationships between copper price and GDP, the real exchange rate of tugrik and trade balance of Mongolia.

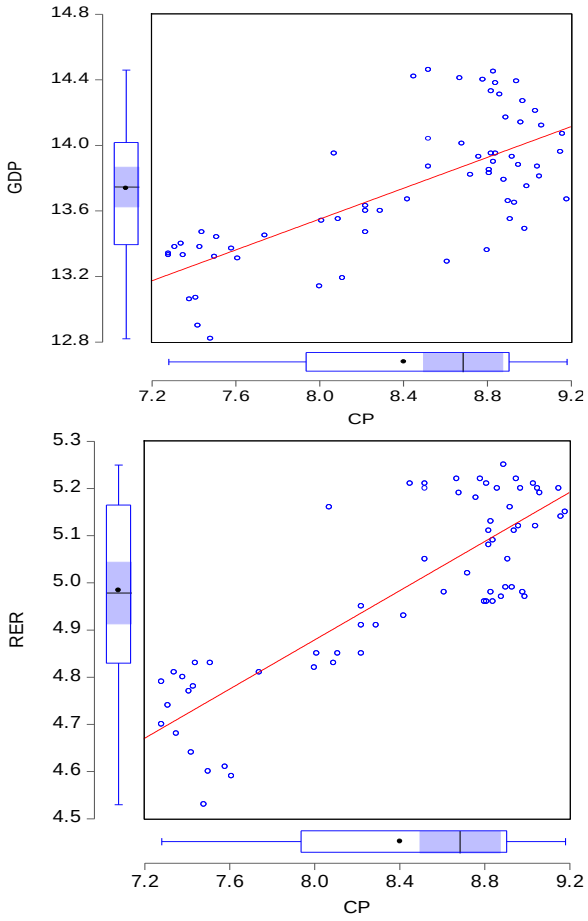


Figure 5. Copper price and GDP, RER scatter diagram

We observe that there is strong, positive linear relationship between copper price and GDP, RER of tugriks and weak, negative linear relationship between copper price and trade balance.

Regression results using OLS method are shown in table 1. For the equation 1, adjusted R-square is high of 0.830792, but trade balance is not statistically significant. So we eliminated the data of trade balance and the result is shown as equation (2) column on table 1.

Table 1. REGRESSION RESULTS USING OLS METHOD

Independent variables	Equation (1) Coefficient	t-Statistic	Equation (2) Coefficient	t-Statistic
Constant	0.454441	1.202189	0.425676	1.152074
Ln(CP)	0.146278***	6.262514	0.146745***	6.331314
Ln(GDP)	0.240473***	6.780240	0.242030***	6.906263
Ln(TB)	-0.021016	-0.426588		
Adjusted R-squared	0.830792		0.824812	
S.E. of regression	0.081955		0.081412	
F-statistic	99.83408***		151.6611***	
Akaike info criterion	-2.105737		-2.133528	
Observations	65		65	

t statistics in parentheses: * p<0.05, ** p<0.01,*** p<0.001

After both regressions, we can see that equation 2 is better described the situation and has higher statistical significance comparing to first equation while the meaning of adjusted R-square was decreased a little bit, but the value of F-statistics increased to 151.6611.

From the regression result, we can conclude that strong, positive linear relationship between RER of tugriks per USD and GDP, copper price exists. And trade balance has a negative, weak effect on RER of tugriks.

Each 1 percent increase in copper price increases RER by 0.146745 percent, each 1 percent increase in nominal GDP increases RER by 0.242030 percent. Copper price has the significant effect on RER and it shows that first hypothesis of Dutch disease are proven.

After that, we used Johansen Cointegration test to check there is the long term relationship between these variables. Attachment 2 shows us there is not a long term relationship.

Second criteria to evaluate Dutch disease symptoms is labor movement between economic sectors depending on mining sector production, copper, and coal export revenues.

For this purpose, we used labor data of economic sectors from National Statistics Office, and data of mining production, copper, and coal export revenue from Mongolian Custom Office.

Table 2. LABOR MOVEMENT BETWEEN ECONOMIC SECTORS AND MINING EXPORT REVENUES

№	Employment by economic sectors	Mining export	Copper export	Coal export
1	Education			
2	Public administration and defense; compulsory social security			
3	Arts, entertainment, and recreation			
4	Professional, scientific and technical activities			
5	Administrative and support service activities			
6	Information and communication			
7	Water supply; sewerage, waste management and remediation activities			
8	Construction			
9	Financial and insurance activities			
10	Transportation and storage			
11	Manufacturing			
12	Mining and quarrying			
13	Accommodation and food service activities			
14	Wholesale and retail trade; repair of motor vehicles and motorcycles			
15	Activity of International organizations and representative offices			
16	Human health and social work activities			
17	Electricity, gas, steam and air conditioning supply			
18	Household activities hiring individuals			
19	Real estate activities			
20	Other service activities			
21	Agriculture, forestry, and fishing			

Explanation:

Positive, strong relationship | Positive, weak relationship | No relationship | Negative, weak relationship | Negative, strong relationship

Table 2 shows that copper, coal, and mining export increase influence on labor movement of sectors in different ways.

We divided economic sectors into 3 segments after evaluating the relationships using a correlation method. In other words, there are some economic sectors, where positive (strong and weak) relationships with mining and main minerals' export increase, some sectors have no relationships, and some economic sectors, where there are negative (strong and weak) relationships with an increase of mining and main minerals' exports.

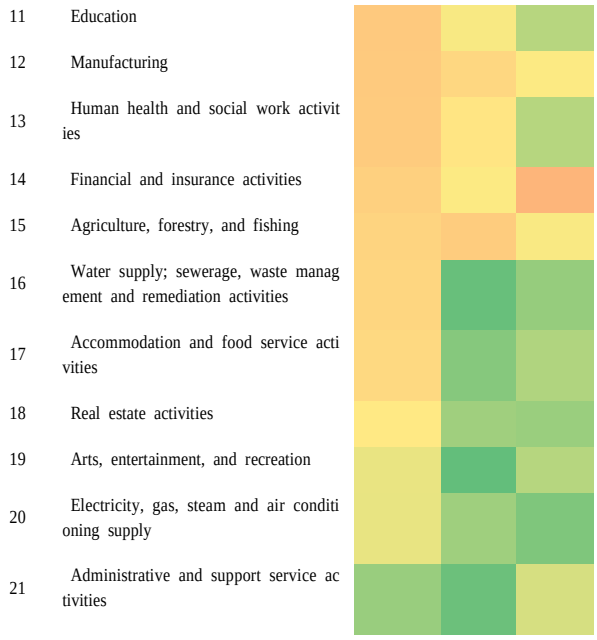
For example, increase of mining, copper and coal export creates more employment in sectors of education, public administration and defense; compulsory social security, arts, entertainment and recreation, professional, scientific and technical activities, administrative and support service activities, information and communication and reduces the employment in sectors of agriculture, forestry and fishing, real estate activities, other service activities depending on strong and negative relationships.

So, we can say that mining export increase creates labor movement between economic sectors. Also, it proves the second hypothesis of Dutch disease symptoms in Mongolian economy.

Additionally, table 3 shows that the relationships between mining exports increase and GDP and production of economic sectors and proves that mining export revenue increase has a strong, positive influence on some non-tradable goods sectors, and has negative effects on most of the tradable goods sectors and symptoms of Dutch disease in Mongolian economy.

Table 3. RELATIONSHIP BETWEEN GDP, PRODUCTION OF MAIN ECONOMIC SECTORS AND MINING EXPORT REVENUES

№	GDP by economic sectors	Mining export	Copper export	Coal export
1	Total			
2	Mining and quarrying			
3	Net taxes on products			
4	Wholesale and retail trade; repair of motor vehicles and motorcycles			
5	Professional, scientific and technical activities			
6	Construction			
7	Public administration and defense; compulsory social security			
8	Transportation and storage			
9	Other service activities			
10	Information and communication			



VI. Conclusion And Future Discussions

The price increase of copper, one of the main sources of Mongolian export revenue has strong and positive relationships with GDP and real exchange rate of tugriks per a USD. It proves that the first hypothesis of Dutch disease symptoms.

Later, we checked how do labor movements between economic sectors depend on an export revenue increase of mining, copper, and coal, and have divided into 3 segments. The result shows that export revenue increase of mining, copper and coal influences on employment increase on education; public administration and defense, compulsory social security; and arts, entertainment, and recreation sectors and on employment decrease on agriculture, forestry and fishing sector, and proves the second hypothesis of Dutch disease symptoms.

Until 2011, the average salary and employment on mining sector have increased, but the sector has not much capacity to employ more people comparing to other sectors like agriculture. Also after 2011, the peak growth of Mongolian economy, the production decrease of the sector created mid-term unemployment.

To reduce Dutch disease symptoms, before all, we need policies to reduce real exchange rate appreciation growth. Meanwhile, promotion policies to support decreasing sectors, which have more capacity to offer more jobs, are required.

Some economic sectors are growing and some are decreasing depending on the rapid growth of mining sector. This situation urges us to implement coherent monetary and fiscal policies. Whole Mongolian economy depends on export revenue of few minerals and world price, not on an exchange rate. In order to reduce these vulnerabilities, economic diversification policies are urgently required.

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ATTACHMENTS

Attachment 1. Ordinary Least Squares regression results

Dependent Variable: REER

Method: Least Squares

Date: 04/13/17 Time: 13:03

Sample: 2000Q1 2016Q1

Included observations: 65

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.454441	0.378011	1.202189	0.2339
CP	0.146278	0.023358	6.262514	0.0000
GDP	0.240473	0.035467	6.780240	0.0000
TB	-0.021016	0.049265	-0.426588	0.6712

R-squared	0.830792	Mean dependent var	4.983846
Adjusted R-squared	0.822470	S.D. dependent var	0.194508
S.E. of regression	0.081955	Akaike info criterion	-2.105737
Sum squared resid	0.409711	Schwarz criterion	-1.971929
Log likelihood	72.43646	Hannan-Quinn criter.	-2.052941
F-statistic	99.83408	Durbin-Watson stat	0.929594
Prob(F-statistic)	0.000000		

Dependent Variable: REER

Method: Least Squares

Date: 04/13/17 Time: 13:19

Sample: 2000Q1 2016Q1

Included observations: 65

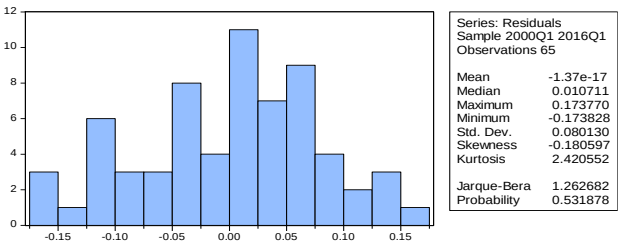
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.425676	0.369487	1.152074	0.2537
CP	0.146745	0.023178	6.331314	0.0000
GDP	0.242030	0.035045	6.906263	0.0000

R-squared	0.830287	Mean dependent var	4.983846
Adjusted R-squared	0.824812	S.D. dependent var	0.194508
S.E. of regression	0.081412	Akaike info criterion	-2.133528
Sum squared resid	0.410933	Schwarz criterion	-2.033171
Log likelihood	72.33965	Hannan-Quinn criter.	-2.093931
F-statistic	151.6611	Durbin-Watson stat	0.946746
Prob(F-statistic)	0.000000		

Attachment 2. Multicollinearity test

	REER	CP	GDP	TB
REER	1			
CP	0.8364967 8495069	1		
GDP	0.8488582 5068873	0.7110511 3557115	1	
TB	-0.1992032 1472616	-0.1679871 79185984	-0.1907709 51729952	1

Attachment 3. Normality test



Attachment 4. Johansen Cointegration test results

Sample (adjusted): 2000Q4 2016Q1

Included observations: 62 after adjustments

Trend assumption: Linear deterministic trend

Series: REER CP GDP TB

Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.384923	42.36265	47.85613	0.1488
At most 1	0.118601	12.23021	29.79707	0.9236
At most 2	0.061202	4.403022	15.49471	0.8684
At most 3	0.007831	0.487434	3.841466	0.4851

Trace test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.384923	30.13244	27.58434	0.0230
At most 1	0.118601	7.827192	21.13162	0.9140
At most 2	0.061202	3.915588	14.26460	0.8681
At most 3	0.007831	0.487434	3.841466	0.4851

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

REER	CP	GDP	TB
-17.63465	1.495250	6.933448	0.086204
2.193216	-1.530446	3.613241	3.168610
0.734287	-2.519033	1.734794	-0.493970
4.201982	-1.170234	0.558525	-5.151328

Unrestricted Adjustment Coefficients (alpha):

D(REER)	0.019673	-0.009747	-0.001450	-0.000934
D(CP)	-0.033759	-0.012855	0.026295	-0.004361
D(GDP)	-0.054286	-0.011826	-0.033836	-0.011278
D(TB)	-0.026279	-0.027332	-0.008375	0.005115

1 Cointegrating Equation(s):	Log likelihood	215.4988	

Normalized cointegrating coefficients (standard error in parentheses)

REER	CP	GDP	TB
1.000000	-0.084790	-0.393172	-0.004888
	(0.02865)	(0.05236)	(0.05965)

Adjustment coefficients (standard error in parentheses)

D(REER)	-0.346918
	(0.09675)
D(CP)	0.595328
	(0.31829)
D(GDP)	0.957308
	(0.49419)
D(TB)	0.463415
	(0.26664)

2 Cointegrating Equation(s):	Log likelihood	219.4124	

Normalized cointegrating coefficients (standard error in parentheses)

REER	CP	GDP	TB
1.000000	0.000000	-0.675425	-0.205394
		(0.08166)	(0.15821)
0.000000	1.000000	-3.328829	-2.364726
		(0.87152)	(1.68845)

Adjustment coefficients (standard error in parentheses)

D(REER)	-0.368296	0.044333
	(0.09449)	(0.01138)
D(CP)	0.567135	-0.030804
	(0.31917)	(0.03843)
D(GDP)	0.931370	-0.063071
	(0.49714)	(0.05986)
D(TB)	0.403471	0.002537
	(0.26012)	(0.03132)

3 Cointegrating Equation(s):	Log likelihood	221.3702	

Normalized cointegrating coefficients (standard error in parentheses)

REER	CP	GDP	TB
1.000000	0.000000	0.000000	0.485975
			(0.46562)
0.000000	1.000000	0.000000	1.042687
			(1.80469)
0.000000	0.000000	1.000000	1.023607
			(0.83726)

Adjustment coefficients (standard error in parentheses)

D(REER)	-0.369361	0.047986	0.098664
	(0.09451)	(0.01756)	(0.04255)
D(CP)	0.586443	-0.097043	-0.234897
	(0.31279)	(0.05813)	(0.14085)
D(GDP)	0.906525	0.022164	-0.477818
	(0.49052)	(0.09115)	(0.22087)
D(TB)	0.397321	0.023633	-0.295486
	(0.25952)	(0.04823)	(0.11686)