

# Comparison of Macroeconomic Performance of Selected Asian Countries. An Econometric Analysis of China Economic Growth and Policy Implications

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***Abstract.** This paper compares the key macroeconomics indicators for the selected countries: China, Malaysia, Indonesia, Korea, Rep. and India and also makes an econometric analysis for China for the period 1961-2007. These countries are chosen on the basis of comparability of data and time without measurement errors. This study also investigates six hypotheses considering the impact of several key macroeconomic variables such as domestic saving rate, domestic investment rate, and volatility of savings, volatility of inflation, growth rate of exports and growth rate of real GNP. By using suitable statistical and econometric tests, this paper finds that prevailing performance of China depends on its superior rates of domestic saving and exports. Policies are also suggested from the differentials between the economic performances of China and other chosen Asian countries.*

**Keywords:** China; Asian Countries; macroeconomic indicators.

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**JEL Codes:** E01, E21, E22.

**REL Codes:** 3I, 8E, 8M.

## Introduction

It is known that rapid economic growth and macroeconomic stability are the main objectives of development policy. Poor developing countries require more growth when compared with the developed ones in order to reach the development of the social and physical infrastructure.

Six important factors were suggested by World Bank inquiry made in 1993 to explain fast growth rate achieved by Asian countries. These factors are: 1. High domestic saving rate, 2. High domestic investment rate, 3. Provision of competitive market, 4. High export share in GNP and growth policies encouraging exports, 5. Canalizing investments to high yielding sectors and adapting new technologies in domestic industries, and 6. High investment on education and training.

The factors above are the major characteristics of Asian countries (China, Malaysia, Indonesia, Korea, Rep. and India) that achieved high growth rates in the former recent years.

Since domestic investment rate is determined by domestic savings, a country's investment level definitely depends on saving rate (Warman, Thirlwall, 1994). Therefore these two factors move in the same direction and affect economic growth positively. While encouraging the firms which produce exportable goods is an advantage in the sense of giving them chance to serve a market of unlimited consumers, however it introduces a strong competition of multinational firms and forces domestic firms to be cost efficient and to increase overall efficiency. There is

a huge amount of theoretical and empirical literature argued that there is a positive correlation between economic growth and exports (Feder, 1983, Jeffrey, Warner, 1995, Mankiw et al. 1992, Levine et al., 1992).

The most effective way to increase labor efficiency and the efficiency in overall is to follow and adapt the new technologies developed all over the world and to canalize investments to high yielding sectors. In this context, making high investment on education and training is vital to catch up and practice new technologies on production, transportation and on all other branches of economy. Also provision of competitive market in which price and quality are determined by market forces is a key factor to obtain an outstanding economic development and growth rate.

In this study, six hypotheses will be examined below for Chinese economy regarding the annual data for the period 1961-2007.

H1-Higher domestic saving rate affects growth rate of real GNP, H2-Higher domestic investment rate affects growth rate of real GNP, H3-Higher growth rate of exports affects growth rate of real GNP, H4-Higher volatility of export growth affects growth rate of real GNP, H5-Higher volatility of saving affects growth rate of real GNP, and H6-Higher volatility of inflation rate affects growth rate of real GNP.

The next divisions of the study are devoted to the comparison of key macroeconomic indicators for China and selected Asian countries, methodological structuration, results, conclusions and policy issues.

## Comparison of key macroeconomic indicators for China and selected Asian countries

We will analyze the growth performance of China compared to some other Asian developing countries' performance regarding the data of some important economic indicators between 1961 and 2007.

### Growth performance of China and chosen Asian countries

Table 1

	1961-1967	1968-1975	1976-1982	1983-1989	1990-1996	1997-2003	2004-2007
China	7.52	9.42	6.85	10.85	10.71	8.57	12.96
Malaysia	5.74	6.71	8.00	5.42	9.57	3.57	4.21
Indonesia	6.21	7.71	7.00	6.28	8.00	1.57	2.62
South Korea	7.12	8.42	7.00	9.42	6.85	4.14	5.23
India	3.60	5.62	6.71	5.52	7.02	6.41	7.23

**Source:** World Development Indicators Database 2008.

From Table 1, we can see that China has a prevailing growth performance compared with Malaysia, Indonesia, South Korea and India between 1961-2007. The interval between 1976-1982 is the only period in which China has a lower performance relative to other selected countries except India.

### Inflation Rate

(Average annual percentage change in consumer price index)

Table 2

	1961-1967	1968-1975	1976-1982	1983-1989	1990-1996	1997-2003	2004-2007
China	-	-	-	14.66	11.71	0.14	1.20
Malaysia	6.21	5.57	5.48	2.14	3.71	2.42	3.21
Indonesia	19.32	18.57	13.42	8.00	8.71	17.00	18.25
South Korea	16.42	15.14	16.28	3.71	6.28	3.71	4.21
India	7.85	6.25	6.12	5.76	6.70	5.40	5.77

**Source:** World Development Indicators Database 2008.

Since we don't have the data between 1961-1982, we may have a limited but still reliable analyze. China has the lowest inflation rate between 1997-2007 among chosen five countries.

### The share of exports in GNP (Average annual percentage change)

Table 3

	1961-1967	1968-1975	1976-1982	1983-1989	1990-1996	1997-2003	2004-2007
China	1.85	2.57	8.85	13.42	22	20.14	35
Malaysia	39.76	40.57	51.14	58.85	83.28	114	123
Indonesia	17.23	18.42	27.42	27	26.42	36.85	42
South Korea	19.45	20.57	30.57	34.14	28	38.42	46
India	1.92	2.75	9.68	14.02	23.01	22.25	38

**Source:** World Development Indicators Database 2008.

Table 3 indicates that China has a lower export share in GNP in overall compared to the other given countries.

### Investment share of GNP (In percentage terms)

Table 4

	1961-1967	1968-1975	1976-1982	1983-1989	1990-1996	1997-2003	2004-2007
China	23.21	24.37	25.77	22.67	26.58	28.91	35
Malaysia	12.36	15.69	20.36	20.36	28.04	21.02	24.36
Indonesia	7.56	9.83	12.61	19.05	18.73	12.74	25.23
South Korea	17.56	20.44	29.43	32.39	41.72	34.23	36.21
India	8.26	9.15	10.25	11.56	10.23	8.56	18.98

**Source:** World Development Indicators Database 2008.

Although the investment share of GNP changes in each time period, China still has a consistent trend on the investment share of GNP since the share of investment in GNP varies between 24% and 35% in the given 45 years time period. Although it is not put in a table, the saving rate of China is also consistent and higher than the concerned countries.

### Methodological structuration

Since the annual data of China covering the period of 1961-2007 are used, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests are employed in order to test the integration level and the possible co-integration among the variables (Dickey, Fuller, 1981, Phillips, Perron, 1988). The PP is an alternative test to ADF unit root test and it calculates a residual variance that is robust to autocorrelation. The researcher should always ask himself a question while analyzing whether it is most appropriate to include constant term and trend factor in the unit root process (Enders, 1995). It might be more reasonable to test the existence of a unit root in the series with the most general model. The Akaike Information Criteria (AIC) is used to choose the number of lags in the dependent variable in order to ensure that the errors are white noise. The power of the test and the degrees of freedom might be reduced with the presence of additional estimated parameters. If the researcher fails to reject the null hypothesis of a unit root because of misspecification concerning the deterministic part of the regression, Doldado et al. (1990) advises to use the most general model to test for a unit root when he is faced with the form of unknown data generating process. It is known that the power of the test even goes to zero if the intercept or time trend is inappropriately omitted (Campbell, Perron, 1991). Enders (1995) points out that reduced power can misguide the researcher leading to wrong decision. If the variables are stationary, a linear combination of

integrated variables can be accepted as co-integrated variables (Enders, 1995). In order to find any long run relationship between the variables, cointegration between the variables should be tested after the decision of the order of integration. In this paper Johansen trace test is used as the co-integration test. Cheung and Lai (1993) points out that the trace test for co-integration is more robust than the maximum eigen value test. It is known that Johansen trace test decides the number of co-integrating vectors among variables. At least one co-integrating vector should be present for a possible co-integration. Empirical studies have indicated that the presence of non-stationarity in the time series can cause spurious regression results and the conclusions obtained from Granger causality can be invalidated. Toda and Phillips (1993) have mentioned about the necessary methods to deal with Granger causality for the systems of integrated of one. The presence of a co-integrating relation creates the basis of the vector error correction specification. Standard Granger or Sims tests may show invalid casual information with the omission of error correction terms from the tests (Doyle, 2001).

### Results

Table 5 presents ADF and PP test results for unit root. It shows that all the variables are integrated of order one and the first differences of  $\ln\text{GNP}$ ,  $\ln\text{DomesticSaving}$ ,  $\ln\text{DomesticInvestment}$ ,  $\ln\text{Export}$  and  $\ln\text{Inflation}$  are stationary for this sample in China.

### ADF and PP Test for Unit Roots<sup>(1)</sup>

Table 5

Statistics	lnGNP	Lag	lnDomesticSaving	Lag	lnDomesticInvestment	Lag	lnExports	Lag	lnInflation	Lag
<b>Levels</b>										
$\tau_T$ (ADF)	-1.46	(0)	-2.53	(1)	-2.04	(3)	-1.35	(0)	-1.56	(0)
$\tau_\mu$ (ADF)	1.91	(0)	-0.53	(1)	-1.09	(1)	0.47	(0)	1.02	(0)
$\tau$ (ADF)	10.40	(0)	2.41	(1)	1.75	(1)	6.06	(0)	3.82	(0)
$\tau_T$ (PP)	-1.16	(4)	-2.06	(2)	-1.26	(3)	-1.48	(7)	-0.56	(21)
$\tau_\mu$ (PP)	4.07	(7)	0.21	(0)	-1.02	(3)	1.64	(37)	4.96	(34)
$\tau$ (PP)	11.12	(1)	4.62	(0)	1.96	(4)	12.75	(38)	4.97	(24)
<b>First Difference</b>										
$\tau_T$ (ADF)	-5.31*	(3)	-4.28*	(1)	-4.18*	(0)	-7.96*	(0)	-6.31*	(0)
$\tau_\mu$ (ADF)	-6.88*	(0)	-4.41*	(1)	-4.16*	(0)	-7.51*	(0)	-5.61*	(0)
$\tau$ (ADF)	-2.48*	(1)	-2.89*	(0)	-2.54**	(1)	-2.35*	(3)	-2.61*	(1)
$\tau_T$ (PP)	-8.82*	(6)	-3.70**	(4)	-4.12**	(2)	-8.81*	(12)	-7.74*	(12)
$\tau_\mu$ (PP)	-6.85*	(0)	-3.74**	(4)	-4.12*	(2)	-7.33	(5)	-5.61*	(5)
$\tau$ (PP)	-2.04*	(3)	-2.81*	(1)	-3.72*	(3)	-4.65*	(2)	-4.48*	(1)

**Notes:**

$\tau_T$ : most general model consisting of drift and trend

$\tau_\mu$ : model consisting of only drift

$\tau$ : model without a drift and trend

\*, \*\* and \*\*\* show rejection of null hypothesis at the levels of 1%, 5% and 10%.

Eviews 5.1 is used for the tests

<sup>(1)</sup> Ordinary least squares regression results have been analyzed as well in order to decide if there is a positive or negative relationship between the variables concerned.

### Cointegration tests with the Johansen (1988) and Johansen & Juselius (1990) approach

Table 6

Variables	Trace statistic	Critical value (5 percent)
(1)lnDomesticSaving and ln GNP		
$H_0:r=0$	15.05**	15.43
$H_0:r \leq 1$	0.76	3.74
(2)lnDomesticInvestment and lnGNP		
$H_0:r=0$	23.64*	15.36
$H_0:r \leq 1$	1.82	3.74
(3)lnExports and lnGNP		
$H_0:r=0$	29.46*	15.40
$H_0:r \leq 1$	6.71	3.73
(4)lnVolatilityExport and lnGNP		
$H_0:r=0$	17.22**	15.43
$H_0:r \leq 1$	3.04	3.74
(5)lnVolatilitySaving and lnGNP		
$H_0:r=0$	22.56*	15.44
$H_0:r \leq 1$	4.27**	3.74
(6)lnVolatilityInflation and lnGNP		
$H_0:r=0$	10.25	15.43
$H_0:r \leq 1$	4.12**	3.75

**Notes:**

r shows the number of co-integrating vectors.

Akaike Information Criterion (AIC) and Schwartz Criteria (SC) were used for the selection of the lags. Volatility of the variables has also been investigated according to the stationarity purposes.

After obtaining the stationarity of data, Johansen (1988) and Johansen and Juselius (1190) approach has been used with the choice of lag length (Chang, 2002) to find out the possible long-run relationship among the considered variables.

From Table 6, it is concluded that each pair of variables are co-integrated with each other indicating that there is a long-run

equilibrium relationship between these variables.

An Error Correction Model should be used to determine the direction of causality since there is a co-integration relationship between the variables. If the variables are co-integrated, Granger (1988) indicates that there is at least one direction of causality among the variables.

### Granger Causality Tests

Table 7

Null Hypothesis	Lag 1		Lag 2		Lag 3		Conclusions
	F	t-on ECMt-1	F	t-on ECMt-1	F	t-on ECMt-1	
(1)lnDomesticSaving and ln GNP Domestic Saving does not Granger cause GNP GNP does not Granger cause Domestic Saving	1.25	1.31	0.68	1.51	0.48	1.56	Domestic Saving → GNP
(2)lnDomesticInvestment and lnGNP Domestic Investment does not Granger cause GNP GNP does not Granger cause Domestic Investment	2.71**	-2.31**	1.71	-2.44**	1.82***	-2.41**	
(3)lnExports and lnGNP Exports does not Granger cause GNP GNP does not Granger cause Exports	0.18	0.35	0.36	1.06	0.82	2.15	Domestic Investment → GNP
(4)lnVolatilityExport and lnGNP Volatility Export does not Granger cause GNP GNP does not Granger cause Volatility Export	7.55*	-4.42*	3.25**	-3.35*	1.75***	-2.13**	
(5)lnVolatilitySaving and lnGNP Volatility Saving does not Granger cause GNP GNP does not Granger cause Volatility Saving	7.42*	-3.05*	3.15**	-2.21**	3.18*	-2.95	Exports → GNP
(6)lnVolatilityInflation and lnGNP Volatility Inflation does not Granger cause GNP GNP does not Granger cause Volatility Inflation	0.41	0.93	0.93	1.56	1.96	2.71	
(7)lnVolatilityExport and lnGNP Volatility Export does not Granger cause GNP GNP does not Granger cause Volatility Export	2.92**	-0.80	2.05***	-1.62***	2.40**	0.08	Volatility of Export → GNP
(8)lnVolatilitySaving and lnGNP Volatility Saving does not Granger cause GNP GNP does not Granger cause Volatility Saving	1.78	-2.31**	1.62	-1.75**	1.72	-2.21**	
(9)lnVolatilityInflation and lnGNP Volatility Inflation does not Granger cause GNP GNP does not Granger cause Volatility Inflation	1.85	-1.07	2.52**	-2.21**	2.58**	-2.05**	Volatility of Saving → GNP
(10)lnVolatilityInflation and lnGNP Volatility Inflation does not Granger cause GNP GNP does not Granger cause Volatility Inflation	1.30	1.87	0.87	-1.20	2.21**	-1.08	
(11)lnVolatilityInflation and lnGNP Volatility Inflation does not Granger cause GNP GNP does not Granger cause Volatility Inflation	0.53	0.92	0.63	-0.74	1.27	1.47	Volatility of Inflation → GNP
(12)lnVolatilityInflation and lnGNP Volatility Inflation does not Granger cause GNP GNP does not Granger cause Volatility Inflation	6.51*	4.38*	2.71**	-3.09*	2.21**	-2.69**	

**Notes:**

\*, \*\* and \*\*\* indicate the rejection of the null hypothesis at the levels of 1%, 5% and 10% respectively.

## Conclusions and policy issues

This study has investigated the six hypotheses and has concluded that higher domestic saving rate, higher domestic investment rate, higher growth rate of exports, higher volatility of export growth and higher volatility of saving affects the growth rate of real GNP.

It is also important to think in which way the real GNP is affected. According to the cointegration and OLS results there are positive relationships between domestic saving and growth rate of real GNP; domestic investment rate and growth rate of real GNP; growth rate of exports and growth rate of real GNP. On the other hand, higher volatility of export, higher volatility of saving and higher volatility of inflation rate affect growth rate in negative ways.

Also, from the tables, it is advisable to

have a good saving and investment rate to develop more and to catch the necessary growth rate with low inflation. Most of the developed countries (not China) have the policies of growing with export. Growing with exports can lead to negative effects on the economy such as uncertainty and risk when thinking the usage of capital investment. It can also be said that the investment can move from traded goods to non-traded ones (Gehrels, 1991).

If there's no consistency in the economy such as the consistency in the saving rate, inflation and the export that are already been analyzed, an uncertainty can occur in the economy by decreasing the motivation of the policies applied. So it is recommended that China and the other developing countries should apply policies that lower the macroeconomic volatility specially for the variables that are considered.

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