

## Financial development and domestic savings in emerging Asian countries

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**Abstract.** *Saving is one of the important determinants of economic growth. Therefore determinants of saving are indirectly important for a sustainable economic growth. Financial sector has come into prominence as a possible determinant of saving in the globalized financial markets. This study examines the relationship between gross domestic savings and financial development in the emerging Asian countries during the period 1992-2011 by using panel regression. We found that financial development, economic growth and real interest rate had positive impact on gross domestic saving, while aged dependency ratio had negative impact on gross domestic saving.*

**Keywords:** financial development, gross domestic savings, panel regression.

**JEL Classification:** C23, E21, 016.

**REL Classification:** 11B.

## 1. Introduction

Saving rate is one of the important components of economic growth with regard to both exogenous and endogenous growth theories (see Solow (1956), Romer (1986), Lucas (1988)). Therefore it is crucial to understand the determinants of domestic saving rate for policy makers to keep a sustainable economic growth. The studies empirical studies have found a large number of determinants of savings such as economic growth, real GDP per capita, macroeconomic stability, budget deficit, real interest rate, financial development, foreign saving, demographic variables including fertility rate, life expectancy, aged/youth dependency.

We will examine the relationship between domestic saving rate and financial development in this study. The theoretical relationship between savings and financial development traced to the McKinnon (1973) and Shaw (1973). McKinnon (1973) and Shaw (1973) stated that a developed financial sector is expected to increase the savings by raising the efficiency of financial intermediation. On the other hand a more developed financial system has potential to provide alternative saving instruments which are more suited for individual preferences (Schmidt-Hebbel and Serven, 2002).

Saving rate has been relatively higher in highly growing emerging Asian countries. Their financial sector also has developed since 1990s in parallel with increasing saving rates. This study investigates the role of development of financial sector on domestic savings in emerging Asian economies (China, India, Indonesia, Korea, Malaysia, Philippines, Thailand) during the period 1992-2007 by panel regression. The rest of the paper is organized as follows. Section 2 reviews the previous literature, Section 3 deals with data and present econometric application and main findings and Section 4 concludes the study.

## 2. Literature review

Financial sectors of many countries have developed significantly together with the globalization of financial markets especially as of 1990s. So many studies have conducted to determine the possible effects of financial sector development on major macroeconomic indicators. The studies generally have focused the relationship between financial development and economic growth, and relatively few studies have examined the effects of financial development on domestic savings rate in the literature. The studies investigating relationship between saving rate and financial development have generally used the variables of M2, M1, domestic credit to private sector representing financial development and also employed economic growth, real interest rate, aged/youth dependency ratio as

control variables. Most of the studies in the literature such as Edwards (1996), Dayal-Gulati and Thimann (1997), Kelly and Mavrotas (2001), Kelly and Mavrotas (2003), Kelly and Mavrotas (2008), Touny (2008), Park and Shin (2009), Horioka and Yin (2010) and Sahoo and Dash (2013) found that financial development had positive effect on domestic savings.

Edwards (1996) examined the possible determinants of saving rates in 36 countries but focused Latin America during the period 1970-1992 by using panel regression. He found that growth rate of GDP per capita and financial development (proxied by M1 and M2) had positive effect on private savings rate, while real interest rate had no statistically significant effect on private savings rate. Dayal-Gulati and Thimann (1997) examined the determinants of private saving in 14 Southeast Asia (Indonesia, Malaysia, Philippines, Singapore and Thailand) and Latin America countries (Argentina, Brazil, Chile, Colombia, Mexico, Paraguay, Peru, Uruguay and Venezuela) during the period 1975-1995 by using panel regression. They found that financial development (proxied by M2 as a percent of GDP) had a positive effect on private saving in Southeast Asia and Latin America.

Loayza et al. (2000) examined the determinants of private saving in 150 countries during the period 1965-1994 by panel regression and they found that economic growth had a positive impact on private saving rate, while real interest rate and age dependency ratio had a negative impact on private saving rate. On the other hand they reached the finding that M2/GNP had a insignificant relationship with private saving rate, while private domestic credit had a negative impact on private saving rate. Kelly and Mavrotas (2001) investigated the relationship between private savings and financial development during the period 1972-1997 and found that financial development had a positive impact on private savings. In another study Kelly and Mavrotas (2003) examined the effects of financial sector development (proxied by financial sector development index) on private saving in Sri Lanka during the period 1970-1997 by using co-integration test. They found that financial sector development had a positive effect of on private savings.

Kelly and Mavrotas (2008) examined the effects of financial sector development (proxied by private credit) on private saving in 17 African countries during the period 1972-1994 by using Pedroni co-integration test and they found that there was a positive relationship between financial sector development and private savings. Yong et al. (2008) examined the determinants of saving rate in Malaysia during the period 1974-2004 by using ARDL model. They found that GDP and GDP growth had a positive impact on saving rate, while foreign saving and dependency ratio had a negative impact on saving rate. On the other hand interest rate had no significant impact on saving rate.

Touny (2008) examined the determinants of domestic saving rates in Egypt during the period 1975 – 2006 by using and he found that economic growth, financial development (proxied by M2/GNP ratio) and real interest rate had a positive impact on domestic savings. Park and Shin (2009) examined the possible determinants of savings and investment rate in 137 countries during the period 1965-2004 by using panel regression. Their empirical findings demonstrated that financial development (proxied by M2 as a percent of GDP) and economic growth had positive impact on saving rate. Horioka and Yin (2010) examined the determinants of the household savings rates in OECD countries by using panel regression and they found that financial development (proxied by ratio of private credit by deposit money banks and other financial institutions to GDP) and age dependency ratio had negative impact on household saving rate.

Wang et al. (2012) examined the relationship between domestic saving rate and financial development (proxied by domestic credit to private sector and M2), economic growth, real interest rate, aged dependency ratio in 31 OECD countries and 12 East Asian countries during the period 1960-2008 by panel regression and found that there was a hump-shaped relationship between financial development and domestic savings, in other words total saving rate rose initially with financial development, but then decreased with further financial development. On the other hand economic growth had a positive impact on domestic savings, while aged dependency ratio and real interest rate had a negative impact on domestic savings.

Sahoo and Dash (2013) examined the effects of financial sector development (proxied by financial development index M2Y, bank credit to domestic sector and access to banking), real interest rate, economic growth and age dependency ratio on the savings in South Asian countries (Bangladesh, India, Pakistan, Sri Lanka and Nepal) during the period 1975-2010 by panel co-integration and causality tests. They found that development of financial sector, real interest rate (post-liberalization period) and GDP growth had positive effect on the savings rate and there was unidirectional causality from financial sector development to savings. On the other hand Sharma and Kumar (2013) examined the effects of financial development on savings and capital formation in India during the period 1950-2011 and found that financial development had a positive effect on savings. Shahbaz et al. (2013) investigated the relationship among financial development, domestic savings and poverty in Pakistan during the period by using ARDL bound test and Granger causality test and they found that there was causal relationship between financial development and domestic savings.

### 3. Data, empirical application and findings

#### 3.1. Data

We examined the possible effects of financial development, economic growth, real interest rate and age dependency ratio on gross domestic savings in emerging Asian countries by using panel regression. Our data cover 7 emerging Asian countries during the period 1992-2011 and was obtained from the Financial Development and Structure Database and the World Development Indicators (World Bank 2013a, 2013b). The variables, their symbols and their sources were presented in Table 1. Eviews 7.1 and Stata 10.0 statistical packages were used in the econometric analysis.

**Table 1.** *Variables used in the econometric analysis and their symbols*

Variable	Symbol	Data Source
Gross Domestic Savings	GDS	World Development Indicators
Deposit money bank assets to (Deposit money + central) bank assets (%)	BAC	Financial Development and Structure Dataset
Liquid liabilities to GDP (%)	LLG	Financial Development and Structure Dataset
Private credit by deposit money banks and other financial institutions to GDP (%)	PCR	Financial Development and Structure Dataset
Stock market capitalization to GDP (%)	STM	Financial Development and Structure Dataset
Real GDP Growth Rate	GDP	World Development Indicators
Real Interest Rate	RIR	World Development Indicators
Age Dependency Ratio	ADR	World Development Indicators

#### 3.2. Empirical application and findings

##### 3.2.1. Panel Unit Root Tests

The variables used in the panel data analysis should be stationary to avoid causing possible spurious relationships among the variables. Therefore we tested common unit root process by Levin, Lin and Chu (2002) test and tested unit root process for every unit (country) by Im, Pesaran ve Shin (2003). We tested stationarity of the time series by Augmented Dickey Fuller (ADF) (1979) test. The results of panel unit root tests were presented in Table 2. We found that all the variables were not stationary at the level, but became stationary after first differencing.

**Table 2.** Results of panel unit root test

Variables	Levin, Lin & Chu Test Results		Im, Pesaran & Shin Test Results		ADF-Fisher Chi-square	
	Level	First Difference	Level	First Difference	Level	First Difference
	Trend and Constant	Constant	Trend and Constant	Constant	Trend and Constant	Constant
GDS	0.1182	0.0001*	0.1166	0.0197*	0.1268	0.0009*
BAC	0.1488	0.0000*	0.1924	0.0102*	0.1253	0.0014*
LLG	0.0830	0.0000*	0.1062	0.0003*	0.1077	0.0000*
PCR	0.1376	0.0027*	0.1264	0.0000*	0.0932	0.0000*
STM	0.0722	0.0144*	0.0921	0.0026*	0.0834	0.0026*
GDP	0.1035	0.0000*	0.1172	0.0000*	0.1124	0.0000*
RIR	0.0881	0.0268*	0.0935	0.0163*	0.0933	0.0032*
ADR	0.1374	0.0000*	0.1562	0.0000*	0.1371	0.0026*

The series were deseasonalized by Hodrick-Prescott filter during the stationarity analyses and periods of crisis and policy change were considered with regard to the statistical significance. In the model selection, trend and constant components were included in the model as long as they were they were significant.

\* Significant at the 0.05 and 0.01 level, lags for ADF test were selected automatically by based on Schwarz information criterion, Bandwidths for Phillips-Perron test were selected automatically by based on Newey-West Bandwidth.

Cusum path lies within the confidence interval bounds at %5, structural breakpoint was not observed.

The panel unit root tests in Table 2 are called as first generation panel unit root tests. First generation panel unit root tests is based on the assumption which cross-sectional units of the panel are independent and all the cross-sectional units are affected equally from the any shock which one of the panel units is exposed to. Whereas it is more realistic that the other units are affected from the shock which any one of the panel units is exposed to in different levels. The second generation panel unit root tests were developed to eliminate this shortcoming and they test the stationarity by considering the dependency among the cross-sectional units (Göçer, 2013, p. 5094).

It is required to test the cross-sectional dependency in panel data set for determining the existence of unit root. If the cross-sectional dependency in panel data set is rejected, first generation panel unit root test can be used. However if there is cross-sectional dependency in the panel data, use of second generation panel unit root tests yield a more consistent, efficient and powerful estimation (Güloğlu and İspir, 2011, pp. 209-210).

We can determine the existence of cross-sectional dependency by Breusch-Pagan (1980)  $CD_{LM1}$  test in case of time dimension (T) > cross-sectional dimension (N), Pesaran (2004)  $CD_{LM2}$  test in case of T=N, by Pesaran (2004)  $CD_{LM}$  test in case of T<N. We used Breusch Pagan (1980)  $CD_{LM1}$  to test the cross-sectional dependency because there are 7 countries (N=7) and 20 years (T=20). The hypotheses of the test are as follows:

$H_0$ : There is no cross-sectional dependency

$H_1$ : There is cross-sectional dependency

If the p value is smaller than 0.05,  $H_0$  is rejected at 5% significance level and it is decided there is cross-sectional dependency among the panel units (Pesaran, 2004). The results of  $CD_{LM1}$  test were presented in Table 3. The results demonstrated that there was cross-sectional dependency in the series and equation because p value is smaller than 0.05. In this case there is cross-sectional dependency among the countries which formed the panel and all the other countries affected from the shock which any country was exposed to.

**Table 3.** Results of  $CD_{LM1}$  Test

GDS	BAC	LLG	PCR	STM	GDP	RIR	ADR
4.911*	4.765*	5.315*	5.763*	5.172*	7.620*	6.438*	7.552*

\* Significant at the 0.05 level.

Since we found that there was cross-sectional dependency among the countries which formed the panel, we tested the stationarity of the series by cross-sectionally augmented Im-Pesaran-Shin (2003) (CIPS) based CADF (Cross-Sectionally Augmented Dickey-Fuller) which is one of the second generation unit root tests. The hypotheses of the test are as follows:

$H_0$ : There is unit root and

$H_1$ : There is no unit root.

CIPS statistics is calculated by taking arithmetic averages of the all CADF statistics to determine whether there is unit root in the overall panel. The calculated CIPS statistics is compared with the table value in Pesaran (2006) and if the calculated CIPS value is smaller than the table critical value,  $H_0$  is rejected. In this case there is no unit root in relevant data of the countries and the shocks are temporary (Göçer, 2013:5094-5095).

CIPS statistics were calculated and the results were presented in Table 5. Since calculated CIPS statistics is higher than the critical value in the table,  $H_0$  is accepted and it was decided there was unit roots in the series which formed the panel. In this case the series were not stationary at the levels. So we made the regression analysis with first differences of the variables, because the series were not stationary at the level.

**Table 4.** Results of CIPS test

GDS	BAC	LLG	PCR	STM	GDP	RIR	ADR
4.335*	5.887*	7.303*	8.320*	6.409*	10.821*	7.463*	9.003*

\* Significant at the 0.05 level.

### 3.2.2. Panel Regression

Panel data analysis is implemented by fixed and random effects as specified in Baltagi (2004). We applied some statistical tests to determine which estimation method we use in the analysis. The main issue is whether the data will be pooled among the countries and the periods because all the variables in the model may be varied among the countries and the periods. We used Chow test to determine common significance of country specific effects and time specific effects. Here effective estimator under null hypothesis is pooled ordinary least squares, while effective estimator under alternative hypothesis is fixed effect model (Berke, 2009, p. 41). We used Chow and Breush-Pagan tests to determine which panel regression model would be used and the results of the tests were presented in Table 5. Null and alternative hypotheses for BP tests respectively pooled regression and random effects model, while null and alternative hypotheses for Chow test respectively are pooled regression and fixed effects model.

**Table 5.** Results of panel regression estimation method

Test	p value	Decision
Chow(F test)	0.025	Accept $H_1$
BP( $\chi^2$ test)	0.001	Accept $H_1$

We then used Hausman test to decide whether we use random effects model and fixed effects model. In this test null hypothesis is that there are random effects, while alternative hypothesis is that there are not random effects. The results of Hausman test were presented in Table 6. Hausman test results demonstrated that alternative hypothesis was accepted. So we used random effects model in the analysis.

**Table 6.** Hausman test results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	113.678	3	0.131
Period random	211.772	3	0.250
Cross-section and period random	419.553	3	0.217

We used different algorithms for the analysis and the estimation results of the model obtained by panel-corrected standard errors (PCSE) algorithm which had minimum value of total squared error and the results of panel regression were presented in Table 7. We found that all the variables except ADR had statistically significant positive effect on domestic saving, while ADR had statistically significant negative effect on domestic saving. Moreover our explanatory variables explained 87% of variation in dependent variable (gross domestic saving). Our findings are consistent with the general trend in the literature.



Increases in financial sector development, economic growth and real interest rate raised the domestic savings, while increases in aged dependency ratio decreased the domestic savings in emerging Asian countries. 1% increase in the variables of STR, LLG, PCR, BAC, RIR and GDP respectively caused 23.21%, 7.96%, 8.71%, 9.35%, 9.09% and 69.06% increase in the domestic savings, while 1% increase in the variable of ADR led a 10.48% decrease in the domestic savings.

**Table 7.** Results of panel regression estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DSTR	0.232111	0.079005	2.937944	0.0039
DLLG	0.079680	0.020203	3.943923	0.0001
DPCR	0.087128	0.022345	3.899249	0.0002
DADR	-0.104880	0.030716	-3.414548	0.0008
DBAC	0.093594	0.044418	2.107120	0.0370
DRIR	0.090901	0.028998	3.134738	0.0021
DGDP	0.690670	0.213719	3.231673	0.0015
C	40.42585	5.281320	7.654498	0.0000
Effects Specification				
			S.D.	Rho
Cross-section random			6.408972	0.8683
Period random			0.000000	0.0000
Idiosyncratic random			2.496169	0.1317
Weighted Statistics				
R-squared	0.872999	Mean dependent var		2.811506
Adjusted R-squared	0.845873	S.D. dependent var		3.352307
S.E. of regression	2.911161	Sum squared resid		1135.631
F-statistic	40.06379	Durbin-Watson stat		2.733130
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.858114	Mean dependent var		32.40479
Sum squared resid	6877.303	Durbin-Watson stat		2.121060

Autocorrelation is an important problem in the panel data analyses as in all the time series. One of the main assumptions of the regression analysis is that there should be not the relationship (correlation) among the same error terms for the different observations. If the error terms are interrelated, this is called as

autocorrelation or serial correlation (Greene, 2011). We tested the autocorrelation in the data set by Woolridge (2002) autocorrelation test. The test result was presented in Table 8 and the null hypothesis, which states that there is no autocorrelation, was rejected according to the test results. In other words there was no autocorrelation among the error terms.

**Table 8.** *Results of Woolridge autocorrelation test*

F value	Probability
431.047	0.165

On the other hand heteroscedasticity was tested by Greene heteroscedastic test and the test result was presented in Table 9.  $H_0$  hypothesis, which states that there is no heteroscedasticity, was accepted according to the test results.

**Table 9.** *Results of Greene heteroscedastic test*

chi2 (2) = 412.980
Prob>chi2 = 0.242

#### 4. Conclusions

Saving rate is one of the important macroeconomic variables underlying the economic growth for an economy. Therefore it is crucial to understand the determinants of the domestic savings for the policy makers to sustain economic growth. This study examined the effects of financial development including major financial sector indicators, economic growth, real interest rate and age dependency ratio on gross domestic savings in emerging Asian countries by panel regression.

The empirical findings demonstrated that financial development, economic growth and real interest rate had positive effect on domestic saving, while age dependency ration had negative effect on domestic saving. This finding is consistent with the studies such as Edwards (1996), Dayal-Gulati and Thimann (1997), Kelly and Mavrotas (2001), Kelly and Mavrotas (2003), Kelly and Mavrotas (2008), Touny (2008), Park and Shin (2009), Horioka and Yin (2010) and Sahoo and Dash (2013) which found that financial development had positive effect on domestic savings. Therefore policy makers should consider the financial sector which is one of the key determinants of domestic savings and they are required to develop financial sector to increase the saving rate in their countries as emerging Asian economies did.

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