

Financial Development and Economic Growth: Time Series Evidence from Turkey

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Abstract: This paper attempts to explore the relationship between financial development and economic growth for Turkey over the period 1968-2007. For this purpose, we used an endogenous break unit root test as suggested by Zivot and Andrews (1992) and the Gregory-Hansen (1996) cointegration technique. The empirical results showed that there is a long-run relationship between financial development and economic growth.

1. Introduction

The relationship between financial development and economic growth has been debated quite extensively by economists and policymakers since the studies of Bagehot (1873), Schumpeter (1911) and, more recently, Mckinnon (1973) and Shaw (1973). The debate has focused on whether financial development causes economic growth or vice versa or whether a two-way relationship exists. Four different views on the theoretical link between financial development and economic growth exist (see Apergis et al. 2007):

- (i) supply-leading view
- (ii) demand-following view
- (iii) mutual impact of finance and growth
- (iv) no relationship between finance and growth

The supply-leading view supports the belief that financial development has a positive impact on economic growth (Schumpeter 1911, Gurley & Shaw 1955). Patrick (1966) explains this view as follows: “to transfer resources from the traditional, low-growth sectors to the modern, high-growth sectors and stimulate an entrepreneurial response in these modern sectors.” The demand-following view states that finance actually responds to changes that happen in the real sector (see Friedman & Schwartz 1963, Jung 1986, Ireland 1994). Economic growth creates a demand for developed financial institutions and services. The third view supports a bidirectional relationship between financial development and economic growth (see Demetriades & Hussein 1996, Greenwood & Smith 1997). Finally, the last view rejects the existence of a finance-growth relationship (see Lucas 1988).

The purpose of this paper is to investigate empirically the existence of a long-run relationship between financial development and economic growth in Turkey by including savings as a third important variable that affects both financial development and economic growth. For this analysis, we took into account structural breaks because Turkey started to liberalize its financial system in 1980, opening a new path in terms of financial liberalization applications and structural adjustment programs. Therefore, on the econometrics front, we applied the Zivot and Andrews (1992) unit root test and the Gregory and Hansen (1996) cointegration test in the presence of potential structural breaks.

The remainder of the paper is organized as follows. Section II describes the data and model specification. Section III outlines the methodology used in this paper and reports on the empirical results. Finally, Section IV gives the conclusion.

2. Data and Model Specification

To investigate the relationship between economic growth, savings, and financial development in Turkey, we used the following model specification:

$$Y_{it} = \beta_{0i} + \beta_{1i}F_{it} + \beta_{2i}S_{it} + u_{it} \quad (1)$$

where Y_{it} is GDP per capita, F_{it} is the measure of financial development, S_{it} is the share of savings in GDP (a third important variable affecting finance-growth relationship), and u_{it} is the error term. We used the liquid liabilities of the financial system (LL), which is the broadest measure of financial development defined as currency plus demand and interest-bearing liabilities of bank and non-bank financial intermediaries divided by GDP (M3/GDP) as a measure of financial development.

The present study was based on annual data covering the period from 1968 through 2007. All the variables used were in natural logarithms. The data on savings were obtained from Undersecretariat of State Planning Organization and the data on other variables have been taken from the World Bank World Development Indicators database.

3. Methodology and Empirical Results

The main objective of this paper is to investigate the long-run relationship between financial development, savings, and economic growth in Turkey. First, we analyzed the time-series properties of the data using Augmented Dickey Fuller ([ADF] 1981) and Philips Perron (1988) procedures. We also implemented the endogenous break unit root test suggested by Zivot and Andrews (1992). Second, the Gregory-Hansen (1996) cointegration technique, allowing for the presence of potential structural breaks in the data, was applied.

3.1. Unit Root Tests with and without Structural Break

The ADF test suggested by Dickey and Fuller (1981) is the most widely used unit root test. Perron's (1989) criticism of the ADF unit root test is related to a concern that the presence of structural change can reduce the power of these tests. Assuming that the time of the breaks is an exogenous phenomenon, Perron (1989) extended the ADF test to allow for a structural break in the time trend, showing that the ADF test is not able to reject a null hypothesis of the presence of a unit root when the true model is trend-stationary and there is structural change. A better test was proposed by Zivot and Andrews (ZA) (1992). This test allows for one structural break and suggests determining the break point "endogenously." To test for a unit root against the alternative of a trend-stationary process with a structural break, we employed three versions of the ZA unit root test. Model A allows for a structural break in the intercept, model B allows for a structural break in the slope of the trend, and model C combines both structural breaks in the intercept and the slope of the trend. These models are expressed as follows:

$$\text{Model A: } y_t = \hat{\mu}^A + \hat{\alpha}^A y_{t-1} + \hat{\beta}^A t + \hat{\theta}^A DU_t(\lambda) + \sum_{j=1}^k \hat{d}_j^A \Delta y_{t-j} + \hat{e}_t \quad (2)$$

$$\text{Model B: } y_t = \hat{\mu}^B + \hat{\alpha}^B y_{t-1} + \hat{\beta}^B t + \hat{\gamma}^B DT_t(\lambda) + \sum_{j=1}^k d_j^B \Delta y_{t-j} + \hat{e}_t \quad (3)$$

$$\text{Model C: } y_t = \hat{\mu}^C + \hat{\alpha}^C y_{t-1} + \hat{\beta}^C t + \hat{\theta}^C DU_t(\lambda) + \hat{\gamma}^C DT_t(\lambda) + \sum_{j=1}^k d_j^C \Delta y_{t-j} + \hat{e}_t \quad (4)$$

where λ is the break fraction calculated as T_B/T , T_B denotes the break date, Δ is the first difference operator, e_t is a white noise disturbance term with variance σ^2 , k is the number of augmented lags, and $t = 1, \dots, T$ is an index of time. The incorporated Δy_{t-j} terms on the right hand side of equations (2), (3) and (4) aim to remove the serial correlation if any. DU_t and DT_t are dummy variables for structural breaks in the intercept and in the trend, respectively, where

$$DU_t(\lambda) = \begin{cases} 1 & \text{if } t > T\lambda \\ 0 & \text{otherwise} \end{cases} \quad \text{and} \quad DT_t(\lambda) = \begin{cases} t - T\lambda & \text{if } t > T\lambda \\ 0 & \text{otherwise.} \end{cases}$$

The break point in the ZA test was selected where the test statistic of the null of a unit root is the most negative for the t-statistic of the coefficient of the autoregressive variable.

We first tested for the presence of unit roots in our variables by using ADF and PP unit root tests. The test results are shown in Table 1.

Table 1: The results of ADF and PP unit root tests

Variable	ADF-test		PP-test	
	Level	First Difference	Level	First Difference
<i>Y</i>	-2.244 (0)	-6.128 (0) ^a	-2.392 (1)	-6.129 (0) ^a
<i>LL</i>	-1.729 (0)	-7.099 (0) ^a	-1.831 (3)	-7.061 (2) ^a
<i>S</i>	-2.788 (1)	-5.249 (0) ^a	-2.188 (6)	-7.536 (3) ^a

The numbers in parentheses indicate the number of lags in the augmented term of the ADF regression and are determined by using AIC information criteria. The number of truncation lags for PP test is chosen based on the Newey-West method. The unit root tests include a constant and time trend. ^a represents the significance at 1% level.

The results suggest that the time series, including *Y*, *LL* and *S* were not stationary in their levels. They were stationary at the 1% level of significance after first differencing. However, since the conventional unit root tests favor the null of unit root when a structural break exists, this study implemented the ZA (1992) unit root test to determine whether any possible break point in the series changes the stationarity results. The results of the ZA unit root test are reported in Table 2.

Table 2: The results of ZA unit root test

Variable	T_B	$t_{\hat{\alpha}}$	θ	γ	k
<i>Y</i>	1981	-4.475 (A)	-0.044 ^c (-1.886)	-	3
<i>LL</i>	1997	-4.382 (C)	0.259 ^b (2.470)	0.038 ^b (2.284)	3
<i>S</i>	1985	-4.236 (A)	0.289 ^a (4.398)	-	1
ΔY	1998	-6.936 (C) ^a	-0.066 ^b (-2.046)	0.013 ^b (2.497)	0
ΔLL	2002	-7.693 (C) ^a	-0.326 ^b (-2.248)	0.087 ^b (2.157)	0
ΔS	1980	-6.084 (A) ^a	0.118 ^b (2.202)	-	1

^a, ^b and ^c represent the significance at 1%, 5% and 10% levels respectively. The critical values for (1%, 5% and 10%) levels are (-5.34, -4.80 and -4.58) for Model A, (-5.57, -5.08 and -4.82) for Model C from Zivot and Andrews (1992). The numbers in parentheses are t-statistics and the letters in parentheses indicate the appropriate model based on the results.

The results show that all the variables examined in this study were not stationary in their levels. Nevertheless, they were stationary at the 1% level of significance after first differencing. The test identified the break points as 1981 for *Y*, 1985 for *S* in years also marked by financial liberalization in Turkey, and 1997 for *LL* in the year when a great financial crisis occurred. In all, the unit root tests indicated one order of integration for the *Y*, *LL* and *S* variables.

Since the series has one order of integration and contains structural breaks, we also used the Gregory and Hansen (1996) test to accommodate a single unknown structural break in the cointegration analysis.

3.2. Cointegration Analysis with a Structural Break

Gregory and Hansen (1996) proposed a cointegration procedure that allows for an endogenously determined break in the cointegrating relationship. They provided three alternative forms of structural break: level shift (model C), level shift with trend (model C/T), and regime shift (model C/S). Their specifications for our application are as follows:

Model C: level shift

$$Y_t = \alpha_0 + \alpha_1 D_t + \beta_1 F_t + \lambda_1 S_t + e_t \quad (5)$$

Model C/T: level shift with trend

$$Y_t = \alpha_0 + \alpha_1 D_t + \gamma t + \beta_1 F_t + \lambda_1 S_t + e_t \quad (6)$$

Model C/S: regime shift

$$Y_t = \alpha_0 + \alpha_1 D_t + \gamma t + \beta_1 F_t + \beta_2 (D_t * F_t) + \lambda_1 S_t + \lambda_2 (D_t * S_t) + e_t \quad (7)$$

where D_t is a dummy variable equal to 0 if $t \leq \theta$ and 1 if $t > \theta$. The unknown parameter θ denotes the timing of the change, α_1 denotes the change in the intercept coefficient at the time of the shift, and t is the time trend. β_2 and λ_2 represent the change in slope of the cointegrating equation. Given that the timing of structural break is unknown a priori, Gregory and Hansen (1996) computed the cointegration test statistic, ADF^* , for each possible break and took the minimum test statistic across all possible break points. We selected a break date where the test statistic is the minimum—in other words, the absolute ADF test statistic is at its maximum. The null hypothesis of no cointegration with structural breaks is tested against the alternative of cointegration. Table 3 reports the results of the Gregory-Hansen cointegration procedure for a level shift, a level shift with trend, and a regime shift.

Table 3: Tests for Gregory Hansen cointegration procedure

<i>LL</i>		
Models	Break Date	ADF*
Model C	1986	-4.942 (0) ^b
Model C/T	1984	-4.432 (3)
Model C/S	1986	-4.947 (0) ^c

The numbers in parentheses show the number of lags in the augmented term.

$$ADF^* = \inf_{\tau \in T} ADF_t(\tau)$$

^b and ^c represent the significance at 5% and 10% levels respectively.

Gregory-Hansen (1996) ADF^* critical values are as follows: Level shift; a (1%) -5.13,

b (5%) -4.61, and c (10%) -4.34, Level shift with trend; a (1%) -5.45, b (5%) -4.99,

and c (10%) -4.72, and Regime shift; a (1%) -5.47, b (5%) -4.95, and c (10%) -4.68.

The results of the Gregory-Hansen cointegration procedure show that the ADF^* statistics for *LL* was statistically significant in models C and C/S, thereby rejecting the null hypothesis of no cointegration with an endogenous break date of 1986. The Gregory-Hansen cointegration tests point to the existence of a long-run relationship between economic growth, savings, and financial development.

Conclusions

In this paper, we examine the long-run relationship between financial development and economic growth in Turkey by including savings as a third important variable affecting both financial development and economic growth. On the econometrics front, the endogenous break unit root test suggested by Zivot and Andrews (1992) and the Gregory-Hansen (1996) cointegration technique, which allows for the presence of

potential structural breaks, are employed. The empirical results show a long-run relationship between financial development, savings, and economic growth.

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