Islamic finance and economic growth: the Turkish experiment

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Abstract

Purpose – This study aims to empirically investigate the connection between Islamic finance and economic growth in Turkey using the endogenous growth model.

Design/methodology/approach – It applies quantile regression with the Markov chain marginal bootstrap resampling technique by adopting total Islamic financing as the main exogenous explanatory factor in the endogenous growth model, while the gross domestic product (GDP) is employed as a measure of economic growth. The sample consists of all full-fledged participation (Islamic) banks operating in Turkey spanning from 2013Q4 until 2019Q4. The study uses academic literature, official financial reports from the Participation Banks Association of Turkey, REDmoney Group, Islamic Financial Services Board (IFSB) and the International Monetary Fund (IMF) database.

Findings – The results show that Islamic finance is promoting economic growth in Turkey, which mirrors the success of the New Turkish Economy Program (2019–2021) which aims at boosting economic growth by enhancing the Islamic finance share in the Turkish banking sector and the global market.

Research limitations/implications – Turkey has a dual banking system (conventional and participation (Islamic)) and both can influence the country's real economy. This study is limited to the influence of Islamic banking on Turkish economic growth. The study also restricts its size and coverage from 2013Q4 to 2019Q4, to cover the years over which data for all variables included in the research are available.

Practical implications – This paper suggests the adoption of the Turkish successful experiment as a path to reach economic growth by increasing the Islamic finance share in the banking industry for countries that seek to promote economic growth by Islamic finance, as the findings of this paper support.

Originality/value – This study is the first that examines the influence of Islamic finance on economic growth under a new theoretical framework of the endogenous growth model in Turkey using a robust non-parametric approach.

Keywords Economic growth, Endogenous growth model, Islamic finance, Markov chain marginal bootstrap quantile regression, Non-parametric approach, Participation banks

Paper type Research paper

Introduction

Turkey has lately become a leading country in Islamic banking and finance (Salaam Gateway, 2020). After more than 30 years since its creation, Turkey's Islamic finance industry has registered notable performance and rapid transformation (Yüksel and Canöz, 2017; Hajjar, 2019). Turkey has become an exemplary country for others that need to increase their Islamic banking and finance market share (Salaam Gateway, 2020). Today, Turkey is in the top 15 countries among Islamic finance's top performers, with a Global Islamic Economy Indicator rating of 55.9 (Salaam Gateway, 2021).

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Islamic finance in Turkey is defined as participation banking based on the Islamic finance concept of participation in profit and loss (Hajjar, 2019). At the end of 2020, six participation (Islamic) banks (henceforth called participation banks (PBs)) were involved in the banking industry, which contains a total of 54 banks: 34 savings banks, 14 investment banks and 6 PBs (Participation Banks Association of Turkey, 2021a). Based on the date of creation, these PBs are Albaraka Türk, Kuveyt Türk, Ziraat Katılım, Türkiye Finans, Vakıf Katılım and Emlak Katılım. They operate all types of banking activities in full compliance with Sharī'ah (Islamic law) principles of interest-free banking (Participation Banks Association of Turkey, 2021a).

The interest-free principle is applied using, among others, the *murābaḥah* contract, in which the bank purchases products that the customers want from vendors and sells them to the customers on instalments. Financing is also provided based on partnership and lease contracts (Participation Banks Association of Turkey, 2020). In addition to avoidance of interest, participation finance observes the avoidance of uncertainty in contracts and the prohibition of unnecessary risk and betting (Participation Banks Association of Turkey, 2020).

According to the Islamic Financial Services Board (IFSB) (2020), the share of Turkish PBs in the worldwide Islamic finance market was 2.9% in 2016. Lately, according to the Participation Banks Association of Turkey (2021a), Turkish participation banking has been growing fast, recording an increased net profit of 16%, from TL2.4bn (US$278.06m) in 2019 to TL3.7bn (US$428.68m) in 2020. The fast growth of participation banking in Turkey is translated in the increase of total accumulated assets of TL437.1bn (US$50.64bn) in 2020 as compared to TL284.5bn (US$32.96bn) in 2019. As a result, Turkey ranked 7th among the top countries with the highest Islamic banking assets, with a global share of 2.6% and a domestic banking share of 7.1% as at 2019Q3 (Participation Banks Association of Turkey, 2021a).

While the participation banking penetration ratio in Turkey reached 7.1% in October 2020, the strategy of participation banking in Turkey (2021–2025) is to achieve a market share of 15% by 2025 (Participation Banks Association of Turkey, 2021b). This strategy of growing the Islamic finance share in Turkey is based on the government's New Turkish Economy Program 2019–2021. It is expected that the Islamic finance share in Turkey will be tripled through PBs, from 5% to 15% by 2025, to enhance economic growth in Turkey (McAughtry, 2019; Participation Banks Association of Turkey, 2020). Consequently, this expected growth of Islamic finance assets, which reflects the potential of PBs in the Turkish economy, motivates this study to empirically examine whether Islamic finance in Turkey is contributing to economic growth, as planned under the New Turkish Economy Program 2019–2021.

This paper answers the following question: Does Islamic finance promote economic growth in Turkey? It seeks to answer it by employing the endogenous growth model. The objective is to provide empirical evidence for financial scholars, academicians and decision-makers on the importance of Islamic finance as an engine of economic growth.

The rest of this study is organized as follows: the literature review and the gap of the study are discussed in the following section. Next, the sample and collected data, the proposed empirical model and the method of analysis are presented. The findings are then deliberated. The conclusion and implications of this study are finally provided.

Literature review

Islamic finance in Turkey

The practice of Islamic finance in Turkey started with foreign-owned PBs setting up subsidiaries in the country. It commenced in 1985 with the setting up of Albaraka Türk PB. The second foreign-owned PB is Kuwait Turkish PB (Kuveyt Türk) which commenced operations in 1989 (Hajjar, 2019). In 2020, Kuveyt Türk became the biggest PB in Turkey based on assets volume (Participation Banks Association of Turkey, 2021a).

Eventually, locally owned Turkish banks also entered the field of Islamic finance. The participation banking sector was joined by Türkiye Finans in 2005, Ziraat Katilim in 2015,

Vakif Katilim in 2016 and Emlak Katilim in 2019. Overall, Islamic finance in Turkey continued to grow through the six PBs, witnessing high growth in assets and net profits in 2020 as shown in Table 1.

Islamic finance as a path to economic growth under the New Turkish Economy Program (2019–2021)

Islamic finance in Turkey – as one of the core elements of the Turkish economy – proved to be a significant factor of growth and development as it continued to sustain its position in the financial sector with its strong performance. Total Islamic assets have been rising over the period 2013Q4–2019Q4, synchronizing the growth in GDP, as shown in Figure 1. The New Turkish Economy Program (2019–2021) plans to further promote economic growth through the stimulation of Islamic finance by increasing the share of participation banking from 5% to 15% by 2025 (McAughtry, 2019; Participation Banks Association of Turkey, 2020; Tan, 2020).

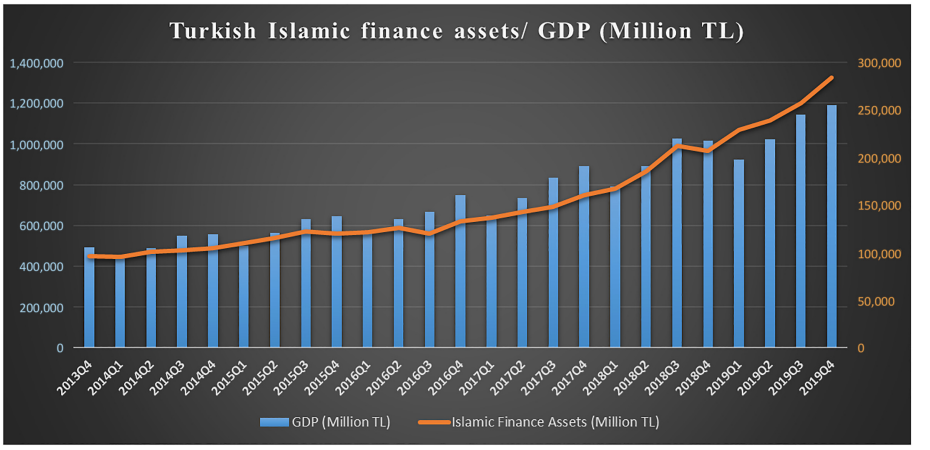
Theoretical background of Islamic finance and economic growth under the endogenous growth model

Romer's endogenous growth theory became well known in the 1980s. The model argues that the permanent rate of growth is well determined by variables under the model, not by the exogenous pace of technological progress as in the neoclassical growth model (Romer, 2011). The endogenous growth model supports technical progression evolving from the investment level and the size of human capital stock (Jhingan, 2011). Moreover, development finance contributes to economic growth as an exogenous factor inside the model of endogenous

Participation bank	Market share	Total assets	Net profits
Albaraka Türk	16%	TL69.3bn (US$8.03bn)	TL63.4m (US$7.35m)
Kuveyt Türk	36%	TL152.3bn (US$17.65bn)	TL1400.3m (US$162.24m)
Türkiye Finans	19%	TL81.4bn (US$9.43bn)	TL675.7m (US$78.29m)
Ziraat Katilim	13%	TL60.2bn (US$6.97bn)	TL254.7m (US$29.51m)
Vakif Katilim	13%	TL53.2bn (US$6.16bn)	TL666.9m (US$77.27m)
Emlak Katilim	4%	TL81.4bn (US$9.43bn)	TL80.6m (US$9.34m)

Source(s): Participation Banks Association of Turkey (2021a, b).

Table 1.
Turkish PBs' market share, total assets and net profits as at end-2020



Source(s): Prepared by authors based on extracted data from IFSB(2020) and International Monetary Fund (2020)

Figure 1.
The growth of Islamic finance assets alongside gross domestic product (GDP) over the period 2013Q4–2019Q4 (Million TL)

growth, as has been confirmed by the notable studies of King and Levine (1993), Rajan and Zingales (1996), Levine and Zervos (1998) and Hassan *et al.* (2011).

According to the endogenous growth theory, when investment in the finance industry increases, it advances economic growth, as confirmed by Petkovski and Kjosevski (2014). Additionally, Bourke (1989) informed that banks with a large profitability remain highly capitalized and have quick access to capital. As a result, the surge in capital stock from banking and finance leads to notable economic growth.

As well, Tabash and Anagreh (2017) stated that Islamic finance has enhanced investment and economic growth. Besides, Kassim (2016), Boukhatem and Moussa (2018), Ledhem (2020), Ledhem and Mekidiche (2020) and Ledhem and Moussaoui (2021) confirmed that economic growth is endorsed by the factor of Islamic finance, which has been used as an exogenous factor within the endogenous growth model.

In summary, endogenous economic growth is defined exogenously by Islamic finance due to its weighty influence on rising capital stock and investment. This connection between Islamic finance and economic growth is in fact a continuation of the supply-leading hypothesis of Schumpeter (1934). It is also in line with the financial repression philosophy of McKinnon (1973) and Shaw (1973), which argues that financial development leads to economic growth. For this reason, this study explores the influence of Islamic finance on economic growth under the endogenous growth model in Turkey.

Based on the philosophy of the endogenous growth theory, which determines that growth in Islamic finance leads to economic growth, this study formulates the following hypothesis:

H1. Economic growth is affected positively by Islamic finance in Turkey.

Prior empirical studies

Numerous studies have been conducted on the connection between Islamic finance and economic growth. Regarding international studies that found a positive effect of Islamic finance on economic growth, a recent study by Gani and Bahari (2021) used autoregressive distributive lags (ARDL) to determine the causal effect of Islamic finance on economic growth from 1998 to 2017 in Malaysia. Their findings revealed that Islamic finance is enhancing Malaysian economic growth.

In another recent study, Ledhem and Moussaoui (2021) explored the nexus between Islamic finance for the entrepreneurial domain and economic growth from 2014 to 2019 in Malaysia. They employed Granger causality and quantile regression using quarterly periods. Their outcomes confirmed that Islamic finance is significantly promoting economic growth in Malaysia by financing entrepreneurial activities.

In the same vein, Anwar *et al.* (2020) explored whether Islamic finance is promoting Indonesian economic growth from 2009Q1 to 2019Q4. They employed vector error correction model (VECM), functions of the impulse response and the ARDL approach to investigate the connection between Islamic finance and economic growth. They found a weighty link between Islamic finance and Indonesian economic growth.

In general, there are a number of past studies which examined the influence of Islamic finance on economic growth in different countries, some of which are highlighted below:

(1) Furqani and Mulyany (2009) assessed Islamic finance's interactions with Malaysian economic growth by applying the cointegration approach and VECM;

(2) Abduh and Omar (2012) studied the Islamic finance effect on Indonesian economic growth by applying the ARDL cointegration methodology;

(3) Mohd. Yusof and Bahlous (2013) assessed Islamic finance's influence on economic growth in the region of the Gulf Cooperation Council (GCC), Indonesia and Malaysia using variance decompositions (VDCs) panel cointegration analysis;

(4) Farahani and Dastan (2013) investigated the Islamic finance effect on economic growth using international evidence;

(5) Kassim (2016) studied the case of Malaysia by employing the ARDL approach over the sample period 1998–2013;

(6) Lebdaoui and Wild (2016) investigated the connection between economic growth and Islamic banks in Southeast Asia using panel ARDL and panel two-stage least squares method on quarterly data from 2000 to 2012;

(7) Imam and Kpodar (2016) explored whether Islamic finance's progress is boosting economic growth, using a system generalized method of moments estimation and fixed-effect regression on 52 countries spanning from 1990 to 2010; and

(8) Boukhatem and Moussa (2018) presented strong evidence that Islamic finance boosted economic development in 13 countries of the Middle East and North Africa (MENA) by using fully modified ordinary-least-squares regression and panel cointegration over the period 2000–2014.

However, to the best of the authors' knowledge, studies on the connection between Islamic finance and economic growth in Turkey are limited. Moreover, no study has yet investigated the connection under the new theoretical framework of the endogenous growth model.

Regarding notable studies that determined a positive influence of Islamic finance on Turkish economic growth, Atici (2018) explored the causality between Islamic finance and economic growth over the period 2008Q1–2018Q1 using the VECM approach. Similarly, Kalaysi and Tekin (2016) explored the interactions between Islamic finance's development and economic growth in Turkey. They used the Johansen cointegration method and Granger causality over the period 2002–2014. Both Kalaysi and Tekin (2016) and Atici (2018) found a positive Islamic finance influence on Turkish economic growth; thus, the supply-leading hypothesis of Schumpeter (1934) was validated.

In the same vein, Yüksel and Canöz (2017) examined the influence of Islamic finance on Turkish economic growth by applying Granger causality on quarterly data between 2005 and 2016. They used GDP as a measure of economic growth and financing as the main factor for Islamic finance effectiveness. They investigated the link between Islamic finance and economic growth based on only four PBs that had a low share in the banking sector at the time of the study (4.9% in 2016, according to the Participation Banks Association of Turkey (2017)). Therefore, they found that Islamic finance is not affecting economic growth in Turkey due to the low share of PBs in the banking sector. The authors' finding is consistent with Lucas' (1988) neutrality theory, which claims that the finance-development link is overstressed because it is not a significant factor in the growth cycle.

The conflicting results from the two groups of studies in the context of Turkey have brought about a debate among scholars over the actual contribution of Islamic finance to economic growth in Turkey. For this reason, this study attempts to enrich the literature with a better understanding of whether the growth of Islamic finance in the Turkish banking sector has been a real factor for promoting economic growth in Turkey.

Research methodology

Sample and data collection

This paper employed Islamic finance data from six PBs (Albaraka Türk, Kuveyt Türk, Ziraat Katılım, Türkiye Finans, Vakıf Katilim, and Emlak Katilim) in Turkey. Data were obtained from quarterly statistics in the database of the IFSB (2020) over the period 2013Q4–2019Q4.

Other macroeconomic variables of Turkey like the GDP, gross fixed capital formation (GFCF) and trade openness (TRADE) were obtained from the database of the International Monetary Fund (2020).

Variables

With regard to the economic growth variable, this study followed the studies of Furqani and Mulyany (2009), Abduh and Omar (2012), Farahani and Dastan (2013) and Yüksel and Canöz (2017) in employing the GDP of Turkey as a measure of economic growth. With regard to the Islamic finance variable, this study adopted the same approach as the cited studies and employed total Islamic financing (IFIN) in Turkey as the main independent exogenous variable.

As regards the macroeconomics variables (control variables), it followed Kassim (2016) and used GFCF and TRADE to control the empirical investigation and avoid the problem of biases in the estimated model which arise due to mislaid variables. TRADE, which represents the external sector, was employed as a proxy of trade activities (Furqani and Mulyany, 2009; Farahani and Dastan, 2013; Kassim, 2016). It was measured by the sum of Turkish imports and exports over Turkish GDP. GFCF was employed as a measure of investment, which is one of the main channels used by financial intermediaries that may promote economic growth (Furqani and Mulyany, 2009; Abduh and Omar, 2012; Kassim, 2016).

Estimating model

The essential issue in the estimation model of economic growth is the inclusion of the most appropriate control variables. Brock and Durlauf (2001) addressed this issue of including the control variables in the estimation model as an "open-ended theory" due to the causal connection between any control variable and economic growth. This theory detailed that controlling the connection between economic growth and a further variable is difficult to regulate. Certainly, this theory was confirmed before by Durlauf and Quah (1999) when they presented about 90 possible variables for controlling economic growth.

However, the key goal in this paper is not to mention all theories of economic growth related to Islamic finance but rather to explore whether and how Islamic finance influences economic growth in the context of the endogenous growth model. Consequently, this study determined the minimal model for the estimation of Islamic finance's influence on economic growth. Thus, following previous empirical studies associated with the topic, it employed the probable macro-economic factors as control variables to prevent the bias problem in the estimation model. Hence, the general model for the empirical investigation is provided in equation (1):

$$\mathrm{GDP} = \mathrm{IFIN} + \mathrm{GFCF} + \mathrm{TRADE} \tag{1}$$

where GDP is a dependent variable, IFIN is an independent variable and GFCF and TRADE are control variables.

Econometric methodology

According to Ullah (1989) and Jureckova *et al.* (2012), the non-parametric approaches are efficient for empirical investigation because these approaches do not require parametric distributions for the produced errors from the estimation models. As well, the non-parametric approaches provide a profound and accurate mathematical explanation, which is better than the parametric approaches that can generate misleading estimated results because of the assumption that the generated errors in the estimation model follow parametric distributions. According to Machado *et al.* (2019), one of the robust non-parametric approaches is quantile

regression. Thus, following the studies which adopt the non-parametric approach of quantile regression regarding the nexus of finance and economic growth, Abdel-Razzaq (2018) used this approach to examine the determinants of Islamic banking profitability with macro-economic variables like GDP. Also, using the non-parametric approach of quantile regression in the domain of banking, Jiang *et al.* (2019) estimated the connection between the capital cushion and risk-holding in the banking sector. This experimental study applied quantile regression with the bootstrap technique over 1,000 simulations for a robust estimation.

The quantile regression procedure was presented by Koenker and Bassett (1978). Machado and Silva (2013) and Machado *et al.* (2019) indicated that quantile regression was adopted in many practical applications. It leads to robust estimation without the heteroskedasticity problem when the dependent variable has varied properties on the conditional distribution over the independent variable.

Following Koenker and Bassett (1978), the τ quantile conditional distribution of the variable Y_i given X_i is provided in equation (2):

$$Q_\tau(Y_i|X_i) = X_i' \ \beta_\tau \tag{2}$$

The τ quantile's restriction vector among the conditional distribution is valued via:

$$\widehat{\beta}_\tau = \text{argmin} \sum_{i=01}^{N} \rho_\tau\left(Y_i - X_i'\beta\right) \tag{3}$$

where ρ_τ (.) is the quantile loss function and is defined as:

$$\rho_\tau(u) = (\tau - 1)u \ \text{ for } \ u < 0$$
$$\rho_\tau(u) = \tau u \ \text{ for } \ u \geq 0 \tag{4}$$

Equation (3) shows that the method of quantile regression allows for restraint heterogeneity with various τ values in the interval (0,1) ($\tau \in [0, 1]$), in which these values are the minimum weighted deviations sum, which allows getting more detailed analysis of the link between an exogenous variable (X_i) and endogenous variable (Y_i) in the interval (0,1) (Koenker and Machado, 1999; Jiang *et al.*, 2019; Machado *et al.*, 2019).

Besides, the quantile regression is robustly precise with regard to outliers since it can adjust the weight over the loss function (ρ_τ). Unlike the ordinary least squares approach, the quantile process is not limited to the standard error (SE) term (Koenker and Machado, 1999; Jiang *et al.*, 2019; Machado *et al.*, 2019).

As stated by Hahn (1995), Feng *et al.* (2011) and Nikitina *et al.* (2019), when the sample in the empirical model that uses the quantile regression is small, it is better to employ bootstrapping as an efficient technique for robust resampling to get healthy estimated results. Kocherginsky *et al.* (2005) also recommended the Markov chain marginal bootstrap (MCMB-A) resampling technique for the quantile regression that has a finite and small sample. Thus, since the research sample is small with 25 observations, this research applied the quantile regression with MCMB-A resampling technique. This technique was developed by Kocherginsky and He (2007) after it was previously used by He and Hu (2002) and Kocherginsky *et al.* (2005). Besides, according to Kocherginsky *et al.* (2005), the MCMB-A is robust and accurate against heteroskedasticity.

According to Kocherginsky and He (2007), the MCMB-A resampling technique is created by resampling with separate replacement from the residuals $u_i(\tau)$ and from X_i. By letting u^* be a resample residual m-vector and letting X^* be an exogenous (independent) resample matrix of $m \times p$ ($m \neq n$ where n is the sample size), the endogenous (dependent) variable Y^* (using the resampled residuals, resampled data and estimated coefficients) is as follows:

$$Y^* = X^* \widehat{\beta}(\tau) + u^*. \tag{5}$$

Then, using X^* and Y^*, the bootstrap estimation of $\beta(\tau)$ is constructed under the repeated process for M (chain length) bootstrap simulations, and the estimated form for the asymptotic covariance-matrix $V(\widehat{\beta})$ is as follows:

$$V\left(\widehat{\beta}\right) = n\left(\frac{m}{n}\right)\frac{1}{B}\sum_{j=1}^{B}\left(Bj(\tau) - \overline{B(\tau)}\right)\left(Bj(\tau) - \overline{B(\tau)}\right)' \tag{6}$$

where $\overline{B(\tau)}$ is the bootstrap elements mean and the bootstrap covariance-matrix $V(\widehat{\beta})$ is purely an estimation of the sample's variance of the bootstrap estimations $\widehat{\beta}(\tau)$ (Kocherginsky and He, 2007). The estimated model using the quantile regression in this study is as follows:

$$\text{GDP}_t = \alpha_\tau + \alpha_{\tau 1}\text{IFIN}_t + \alpha_{\tau 2}\text{GFCF}_t + \alpha_{\tau 3}\text{TRADE}_t, \tau \in (0,1) \tag{7}$$

where α_τ is the constant (C) term; $\alpha_{\tau 1}$, $\alpha_{\tau 2}$ and $\alpha_{\tau 3}$ are coefficients; t is the quarter; GDP is the dependent variable; IFIN is the independent variable; and GFCF and TRADE are control variables.

This study applied the quantile regression quantiles with the MCMB-A resampling technique over 1,000 simulations to determine the influence of IFIN as the main exogenous variable on GDP as the endogenous variable.

Results and discussion

According to Koenker and Bassett (1978), quantile regression is an extension of linear least squares regression that estimates the response variable's conditional mean across values and the independent variables. Thus, it is important to test the linearity of the structure and stationarity of the variables which confirm that the estimated model is fit to the autoregressive (AR) process.

To check the linearity, this paper performed the test of Keenan (1985) and Tsay (1986) and the likelihood ratio linearity test of Chan and Tong (1986) (Table 2). It also performed the augmented Dickey-Fuller (ADF) test to check the variables' stationarity to avoid the issue of spurious regression (Granger *et al.*, 1974; Leong and Huang, 2010) (Table 3).

Table 2 shows that the null hypothesis cannot be rejected at the 5% significance level in the tests of Keenan (1985) and Tsay (1986) and the likelihood ratio linearity test of Chan and Tong (1986). This confirms that all the variables in this research are proven to be of linear characteristics. Thus, GDP, IFIN, TRADE and GFCF follow the linear AR process.

Based on the ADF test, Table 3 shows that the AR(1) coefficient of GDP, IFIN, TRADE and GFCF series are statistically significant at the 1% level, which indicates that GDP, IFIN,

Null hypothesis: The model is an autoregressive (AR) process (linear structure)

Linearity test	Keenan (1985) one-degree test		Tsay (1986) test		Likelihood ratio linearity test	
Variables	*t*-stat	Prob.	*t*-stat	Prob.	*t*-stat	Prob.
GDP	0.1403664	0.7116738	0.003549	0.9531	6.160	0.328
IFIN	0.07369802	0.7886775	2.088	0.1632	10.791	0.195
TRADE	2.175466	0.1550628	0.6671	0.4232	4.568	0.324
GFCF	0.8390086	0.3700798	0.04532	0.8335	8.642	0.293

Source(s): Authors' own

Table 2.
Linearity test outputs

Variables	Stationarity levels	*P*-value: No trend, no intercept	*P*-value: Including intercept	*P*-value: Including trend and intercept
GDP	Level	0.9964	0.8879	0.8356
	1st difference	0.0000**	0.0000**	0.0000**
IFIN	Level	0.9967	0.8962	0.9367
	1st difference	0.0041**	0.0008**	0.0035**
TRADE	Level	0.9458	0.4467	0.6660
	1st difference	0.0000**	0.0000**	0.0000**
GFCF	Level	0.8998	0.3260	0.0647
	1st difference	0.0000**	0.0000**	0.0001**

Table 3.
Stationarity tests using the ADF test

Note(s): **1% significance level
Source(s): ADF test executed by authors based on the Akaike information criterion (AIC) for choosing the optimal lag length

Number of observations = 25
R-squared = 0.856641
SE of regression = 41589.67
Quasi-LR statistic = 154.1845

Estimated equation tau (τ) = 0.5
Adjusted *R*-squared = 0.836162
Sparsity = 99883.84
Prob (Quasi-LR stat) = 0.000

Variables	Coefficient	Stand. Err.	*t*-stat	Prob.
IFIN	4.977824	1.279755	3.889670	0.0008**
TRADE	−497400.9	241112.6	−2.062940	0.0517
GFCF	1.711026	0.523311	3.269615	0.0037**
C	145063.7	103246.6	1.405022	0.1746

Table 4.
MCMB-A quantile regression outputs

Note(s): MCMB-A quantile regression with 1,000 simulations; number of observations = 25; **1% significance level
Source(s): Quantile regression outputs computed by the authors

TRADE and GFCF do not contain a unit root in the first difference. Therefore, all the variables in this study are stationary and follow the linear AR(1) process, which indicates that the problem of spurious regression does not exist (Granger *et al.*, 1974; Leong and Huang, 2010).

To obtain robust estimated results, this paper performed the quantile regression with the MCMB-A (Table 4).

Table 4 reports that Islamic finance in Turkey has a positive influence on economic growth at the 1% significance level (p-value: 0.0008 < 0.01). If there is an increase of 1% in Islamic finance median value, then GDP will increase by 4.97% in the median value. Thus, this outcome validates the hypothesis that Islamic finance is positively affecting economic growth in Turkey.

For trade openness (TRADE), it has no significant effect on GDP in Turkey at the 5% significance level (p-value: 0.0517 > 0.05). On the other hand, GFCF is positively influencing economic growth (GDP) in Turkey at the 1% significance level (p-value: 0.0037 < 0.01). If there is an increase of 1% in GFCF median value, then GDP will increase by 1.71% in the median value. For the constant (C), it is not significant to economic growth since the p-value is superior to 0.05, which confirms the high explanatory power of the independent variables in the estimated model ($R^2 = 0.8566$).

Concerning the quantile regression goodness-of-fit tests as defined by Koenker and Machado (1999), Table 4 shows that the *R*-squared is 85.66% and the adjusted *R*-squared is 83.61%. So, 83.61% variation in the conditional median in GDP is due to IFIN, TRADE and

GFCF. The quasi-LR statistic value is 154.1845 and the *p*-value (0.000) is less than 0.05, which indicates that the estimated model is stable.

To determine the quantile process estimates, Table 5 provides estimates across 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9 quantiles. Lower quantiles (from quantile = 0.10 to quantile = 0.30) represent low Islamic finance (IFIN) on a low economic growth (economic recession), the medium quantiles (from quantile = 0.30 to quantile = 0.70) reflect medium Islamic finance (IFIN) on medium economic growth and the upper quantiles (from quantile = 0.70 to quantile = 0.90) represent high Islamic finance (IFIN) on high economic growth.

Table 5 reports that GDP is increased by IFIN from 4.48% in the 40th quantile (0.4 quantiles) to 8.84% in the 90th quantile (0.9 quantiles), which indicates that IFIN is increasing GDP in medium and high quantiles. Therefore, these increases in Islamic finance are causing a significant increase in the Turkish economic growth. This outcome is in accordance with the findings of Imam and Kpodar (2016) which state that when Islamic finance is increased in a

Variables	Quantile	Coefficient	Stand. Err.	*t*-stat	Prob.
IFIN	0.1	2.922687	1.675404	1.744467	0.0957
	0.2	2.961143	1.962144	1.509136	0.1462
	0.3	3.138609	1.538276	2.040342	0.0541
	0.4	4.485209	1.557342	2.880040	0.0090**
	0.5	4.977824	1.266206	3.931292	0.0008**
	0.6	5.086412	2.660126	1.912094	0.0696
	0.7	5.342965	0.868275	6.153538	0.0000**
	0.8	5.070640	1.198040	4.232448	0.0004**
	0.9	8.844035	0.030780	287.3287	0.0000**
TRADE	0.1	−403711.7	374090.5	−1.079182	0.2927
	0.2	−38895.40	420364.7	−0.092528	0.9272
	0.3	−151071.2	340439.0	−0.443754	0.6618
	0.4	−531977.6	325410.9	−1.634787	0.1170
	0.5	−497400.9	239479.8	−2.077005	0.0503
	0.6	−500723.2	279847.9	−1.789269	0.0880
	0.7	−445406.0	157957.7	−2.819781	0.0103*
	0.8	−402915.7	203050.4	−1.984314	0.0604
	0.9	−842152.4	7709.936	−109.2295	0.0000**
GFCF	0.1	1.861790	0.563808	3.302170	0.0034**
	0.2	2.066955	0.718605	2.876343	0.0090**
	0.3	2.085699	0.586728	3.554800	0.0019**
	0.4	1.905347	0.621343	3.066498	0.0059**
	0.5	1.711026	0.515568	3.318720	0.0033**
	0.6	1.609310	1.211872	1.327955	0.1984
	0.7	1.496799	0.342440	4.370976	0.0003**
	0.8	1.613730	0.433668	3.721121	0.0013**
	0.9	0.286724	0.012793	22.41241	0.0000**
C	0.1	212276.8	133152.6	1.594237	0.1258
	0.2	−6076.873	151230.9	−0.040183	0.9683
	0.3	34754.33	136189.7	0.255191	0.8011
	0.4	166119.1	135113.1	1.229482	0.2325
	0.5	145063.7	102333.4	1.417560	0.1710
	0.6	161970.0	125698.3	1.288562	0.2116
	0.7	137645.2	68811.09	2.000335	0.0586
	0.8	119727.0	86123.51	1.390178	0.1790
	0.9	283469.1	3577.046	79.24671	0.0000**

Note(s): MCMB-A quantile regression with 1,000 simulations; number of observations = 25; *5% significance level; ** 1% significance level

Source(s): Quantile regression outputs computed by the authors

Table 5. Markov chain marginal bootstrap (MCMB-A) quantile process estimates

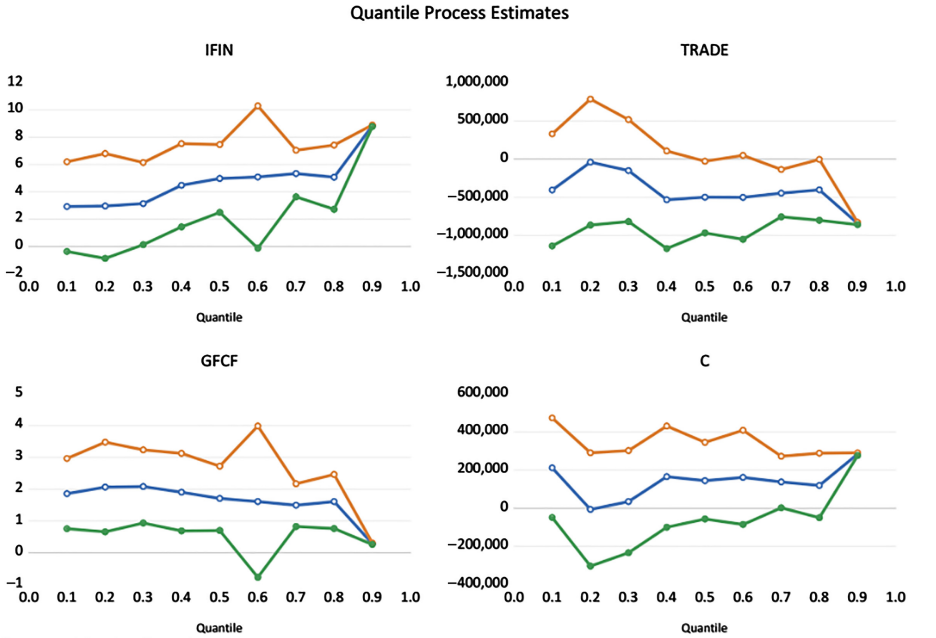
country, it experiences quicker economic growth (Figure 2). Consequently, the hypothesis that Islamic finance is positively affecting economic growth in Turkey is validated.

Moreover, the success of IFIN in enhancing GDP refers to the Islamic finance growth in Turkey which synchronized a high level of economic growth because of PBs. It is noted that PBs increased their total assets by 21.9% from December 2018 to August 2019 based on the prospects of the New Turkish Economy Program (2019–2021), which forecasted an increase in the Islamic finance share through PBs from 5% to 15% by 2025 (McAughtry, 2019; Participation Banks Association of Turkey, 2020; Tan, 2020). Thus, the New Turkish Economy Program (2019–2021), which aims at stimulating Islamic finance to achieve significant economic growth, can be said to be successful. However, IFIN in Turkey has no significant influence on economic growth across low quantiles of (0.1, 0.2, and 0.3 quantiles), consistent with the findings of Yüksel and Canöz (2017) (Figure 2).

Concerning other control variables, TRADE has no significant effect on economic growth in Turkey across lower quantiles (0.1, 0.2 and 0.3 quantiles), medium quantiles (0.4, 0.5 and 0.6 quantiles) and upper quantiles (0.8 quantiles) (Figure 2). Regarding GFCF, Table 5 reports that GFCF is contributing to GDP all over the lower quantiles (0.1, 0.2 and 0.3 quantiles), medium quantiles (0.4, 0.5 and 0.7 quantiles) and upper quantiles (0.8 and 0.9 quantiles) (Figure 2). For the constant (C), it has no significant effect on Turkish economic growth across lower quantiles (0.1, 0.2 and 0.3 quantiles), medium quantiles (0.4, 0.5, and 0.6 quantiles) and upper quantiles (0.7, and 0.8 quantiles).

Regarding diagnostics of the estimation model based on Koenker and Machado (1999), quantile regression requires that the following tests be performed: Koenker and Bassett's slope equality examination (1982), Ramsey's reset stability test (1969) and Newey and Powell's symmetric quantile assessment (1987) (Table 6).

Table 6 reports that the chi^2-statistic value is 47.00640 which is statistically significant under the slope equality examination (probability of χ^2: 0.0033 < 0.05 which indicates that



Source(s): Authors' own

Figure 2.
Markov chain marginal bootstrap (MCMB-A) quantile process estimates graphs

Slope equality examination *Null hypothesis: Slope equality is identical* Test summary	χ^2 stat	χ^2 D.F.	Prob.
Wald test	47.00640	24	0.0033

Ramsey's reset stability test *Null hypothesis: No misspecification in the model* Test summary	Value	D.F.	Prob.
QLR L-statistic	2.508520	1	0.1132

Symmetric quantile assessment *Null hypothesis*: *No asymmetry in quantiles* Test summary	χ^2 statistic	χ^2 D.F.	Prob.
Wald test	12.95808	16	0.6758

Restriction details over quantiles

Quantiles	Variable	Restricted value	χ^2 statistic	Prob.
0.1, 0.9	IFIN	1.811074	2.755659	0.5110
	TRADE	−251062.4	528887.5	0.6350
	GFCF	−1.273538	1.071008	0.2344
	C	205618.4	212921.9	0.3342
0.2, 0.8	IFIN	−1.923864	2.583085	0.4564
	TRADE	552990.7	514250.1	0.2822
	GFCF	0.258632	0.988665	0.7936
	C	−176477.4	201283.3	0.3806
0.3, 0.7	IFIN	−1.474074	2.065111	0.4754
	TRADE	398324.5	390078.9	0.3072
	GFCF	0.160445	0.813010	0.8436
	C	−117727.9	159040.2	0.4592
0.4, 0.6	IFIN	−0.384027	2.554144	0.8805
	TRADE	−37899.06	356957.0	0.9154
	GFCF	0.092605	1.123850	0.9343
	C	37961.63	153014.4	0.8041

Source(s): Authors' own

Table 6.
Markov chain marginal bootstrap (MCMB-A) quantile regression diagnostics

slope equality is rejected at the significance level of 5% based on the Wald test). Thus, the slope equality is different across quantiles; therefore, the conditional quantile is not identical.

Table 6 also reports that the null hypothesis of stability cannot be rejected at the significance level of 5% in Ramsey's reset stability test (1969) (p-value: 0.1132 > 0.05). Consequently, all of the coefficients on all powers are equally insignificant; therefore, the estimation model is truthful and stable against misspecifications of heteroskedasticity and autocorrelation.

Table 6 further reports that the chi^2-statistic value is 12.95808 under the symmetric quantile assessment (probability of χ^2: 0.6758 > 0.05). This indicates no existence of asymmetry across all the quantiles (0.1 and 0.9, 0.2 and 0.8, 0.3 and 0.7, 0.4 and 0.6). This is what the insignificant values confirm based on the individual coefficient restriction details across quantiles.

By executing the diagnostic examinations of Koenker and Bassett's slope equality (1982), Newey and Powell's symmetric quantile assessment (1987) and the Ramsey's Reset stability test (1969) in the MCMB-A quantile regression, this paper demonstrated that the estimated

outcomes are robustly precise and truthful. This answers the research question whether Islamic finance is promoting economic growth in Turkey.

Conclusion

By applying the MCMB-A quantile regression process, this paper determined that Islamic finance's influence on economic growth is statistically significant and positive in Turkey across the 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8 and 0.9 quantiles, which confirms that the increase of Islamic finance in Turkey is promoting economic growth.

Thus, this experimental study has achieved robust evidence that Islamic finance in Turkey is a real contribution to economic growth under the endogenous growth model of Romer (2011). The result also confirms the supply-leading hypothesis of Schumpeter (1934) and is well-matched with the financial repression philosophy of McKinnon (1973) and Shaw (1973). Additionally, the estimated outcomes validated the hypothesis that Islamic finance is positively affecting Turkish economic growth.

Therefore, this empirical research agrees with the studies of Kalaysi and Tekin (2016) and Atici (2018) that found a positive influence of Islamic finance on Turkey's economic growth. This significant contribution refers to the success of the New Turkish Economy Program (2019–2021), which aims to triple the Islamic finance share in the banking sector through PBs by 2025. It also aligns with the 11th Development Plan prepared by the Turkish Presidency's Strategy and Budget for 2019–2023, which aims to increase the share of PBs in the worldwide market (Tan, 2020). Additionally, the success of Islamic finance in promoting Turkish economic growth is because of the capabilities of the Islamic finance industry in Turkey, which is widely accepted by a noteworthy Muslim population who prefer Islamic finance to conventional banking (Hajjar, 2019).

In conclusion, this study shows the successful experiment of Islamic finance in Turkey, which can be beneficial to many countries that are still at the beginning of adopting Islamic finance as an engine of economic growth.

This paper has an implication for practice and research. It suggests the adoption of the Turkish successful experiment as an exemplary experiment in achieving economic growth through Islamic finance. To simulate this successful experiment, there must be cooperation between both decision-makers who are in the government and monetary policy adapters to make the flow of Islamic finance easy and quick through the finance channels that promote economic growth.

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