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Capital market and economic growth nexus: Evidence from Turkey☆

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ABSTRACT

This study explores the relations between the development level of capital market sub-components, involving mutual/pension funds, corporate bond, stock and government bond markets, and economic growth over the period of 2006:M1 and 2016:M6 in Turkey. We find that there is a long-run cointegrating relationship between capital market development and economic growth and also a unidirectional causality running from capital market development to economic growth. Using ARDL, Markov Switching Regression and Kalman Filter models, we also find that capital market development has asymmetric effects on economic growth where government bond market development is negatively but the aggregated index of other sub-components is positively associated with economic growth.

1. Introduction

'No man ever steps in the same river twice, for it's not the same river and he's not the same man.'
Heraclitus

Heraclitus is certainly right from philosophical and methodological aspects of stepping in the same river; however, it is confusing to see how some trends show little change in time and result déjà vu perception. For example, there passed more than three decades the words of Stiglitz (1985) suggesting "Keynes, in the *General Theory,* expressed a concern that investors in the stock market were merely concerned with short-term gains, not the long-term returns. Today, increasingly, similar allegations are brought against the managers of many of America's largest enterprises." After experiencing several stock market crashes with global financial crisis, we possibly still agree with Keynes/Stiglitz. Therefore, expecting strong positive relationship between stock market and economic growth may naively imply high expectations, specifically in developing countries.

In this paper, we develop a novel modeling approach that predicts the nature of the relationship between the development level of capital market sub-components and economic growth in Turkey. Though previous studies mostly focus only on stock market and growth nexus, we investigate the aggregated effect of mutual funds, pension funds, corporate bonds and stock markets on economic growth over the period between 2006:M1 and 2016:M6. To measure the aggregated effect of the sub-components of capital market, we construct a composite index of capital market development by employing principal component analysis (PCA). This study additionally analyzes the relation between the development level of government bond market and economic growth in Turkey. By doing so, we highlight whether significant sub-components of Turkish capital market, namely Borsa Istanbul (henceforward, BIST),

☆ The views expressed here are of our own and do not necessarily reflect those of our affiliated institutions. All errors are ours.

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Table 1
Overview of selected stock exchanges (2015).

	BIST	NYSE	Korea	NSE	PSE	SSE	Moscow	Saudi	Tehran	Tel-Aviv
DMC (mn USD)	188,862	17,786,787	1,231,200	1,485,088	238,820	4,549,288	393,238	421,060	87,245	243,904
Listed Companies	393	2424	1961	1794	265	1081	254	171	318	461
NCL (unit)	2	55	159	25	4	89	4	n/a	5	2
VST (mn USD)	374,449	17,477,291	1,929,558	676,620	39,683	21,342,843	140,904	436,893	8838	56,443
VBT (mn USD)	194,058	n/a	1,582,409	85,178	n/a	336,904	138,842	121	1073	241,569
IFS (mn USD)	26,1	18,047	3842	5099	111	17,695	508	1108	1	39
IFB (mn USD)	55,055	n/a	539,799	248,889	n/a	n/a	42,520	n/a	n/a	23,094
SIO (NT)	936	n/a	83.317.700	7.370.780	n/a	n/a	32.398	n/a	n/a	n/a
SIF (NT)	166,313	n/a	7,965,730	727,670	n/a	n/a	327,901	n/a	n/a	n/a
IFTT	278	54,480	309	36	19	11,006	2697	n/a	362	n/a
ETFTT	238	232,661	30,556	2229	n/a	22,770	n/a	4	16	n/a

Note: **Names of the Stock Exchange/Country**: BIST; Borsa Istanbul (Turkey), NYSE; New York Stock Exchange (the US), NSE; National Stock Exchange of India, PSE; Philippine Stock Exchange, SSE; Shanghai Stock Exchange (China), Moscow; Moscow Exchange (Russia), Saudi; Saudi Stock Exchange (Tadawul; Saudi Arabia), Tehran; Tehran Stock Exchange (Iran), Tel-Aviv; Tel-Aviv Stock Exchange (Israel). **Abbreviations**: **DMC**; Domestic market capitalization, **NCL**; New companies listed (year-end value), **VST**; Value of share trading (USD millions; year-end value), **VBT**; Value of bond trading (USD millions, year-end value); **IFS**; Investment flows channeled through IPO (the values of newly and already issued shares); **IFB**; Investment flows raised by bonds issuance (USD millions; year-end value), **SIO**; stock index options (notional turnover), **SIF**; stock index future (notional turnover), **IFTT**; investment funds total turnover (year-end value, USD millions), **ETFTT**; ETFs (total trades, year-end value, in thousands).
Source: World Federation of Exchanges.

provide growth benefit to the Turkish economy. To the best of our knowledge, no previous effort has been made to quantify the aggregated contribution of the capital market sub-components to the economic growth. Therefore, this paper attempts to fill this gap in the empirical literature of finance-growth nexus by asking whether Anglo-Saxon stock market-growth paradigm works in the case of an emerging market, such as Turkey, by also involving capital market sub-sectors other than stock market.

As one of the leading countries in the emerging world, Turkey provides an interesting case study. Because, however the root of the stock market financing went back to the mid-19th century in Turkey, it is perceived like most of the emerging countries that the contribution of the capital markets to economic growth is negligible comparing visible contributions of banks and also non-financial industries. Therefore, we will show in the case of Turkey, whether the benefit of stock market and other capital market sub-components is still negligible from the economic growth perspective despite emerging nature of the analyzed market. As discussed below, the study explores four interconnected research questions by focusing on the link between economic growth and development of the capital market sub-components.

The essential functions of the stock and government bond markets in the Turkish economy are *(i)* providing alternative financing and investment channels to firms and local/foreign investors, and *(ii)* injecting seriously needed short term capital market money to the economy (see Kara, 2015).[1] Because these functions are perceived critical for the short-term growth, regulatory framework provides various supporting mechanisms and more importantly Turkish tax code has long provided tax heaven to free movements of capital market money. However, international comparison suggests in Table 1 that Turkish stock market may not fully reflect the dynamism of Turkish economy. For example, while market capitalization of Moscow Exchange and Saudi Stock Exchange are 393 billion USD and 421 billion USD, respectively, market capitalization of BIST is 189 billion USD as of 2015. More interestingly, the values of investment flows channeled through IPO show while BIST created only 26 million USD investment flow through IPO in 2015, Moscow Exchange, Saudi Stock Exchange, and Tel-Aviv Stock Exchange have created 508 million USD, 1.108 million USD and 39 million USD, respectively. Moreover, financial deepening and liquidity have declined in terms of USD denominated market capitalization and traded values during 2010 and 2015 in BIST (see Table 2). Therefore, as the sub-market level analysis, we first explore whether there is a merit in supportive regulatory framework of Turkish stock market from the economic growth perspective. To this aim, we analyze whether stock market has a significant contribution to the economic growth in Turkey by using market capitalization and stock market total traded value as the measures of stock market development.

The corporate bond market provides an alternative financing channel for firms (specifically banks) in Turkey. As the mostly supply side factor of capital market development, corporate bond market is one of the booming sub-markets in BIST. Analyzing relative changes in the market value of the capital market sub-components suggests that corporate bond market capitalization growth may result relatively higher positive impacts on aggregated market development specifically during 2010:M3 and 2013:M2.[2] Moreover, the comparison between investment flows raised through IPO and bond issuance in BIST suggests that bond financing is the primary financing mechanism of the Turkish private sector. Corporate bond market capitalization has increased from 0.1 billion Turkish Lira (TL) in 2006 to 5.9 billion TL in 2010, and then to 49.4 billion TL in 2015 (Table 2). Therefore secondly, this study aims to investigate whether capital market financing of Turkish corporations through bond market contributes to economic growth by using the size of the market as a measure of the market development criterion.

In addition, institutional investors play critical demand side role in stock markets; however structural problems may generally limit this role in emerging markets. Although their portfolios heavily involve government bonds, mutual and pension fund markets have showed development in Turkey. In this respect, despite declining in terms of USD since 2012, net asset value of the mutual funds in terms of Turkish Lira has increased 69% between 2006 and 2016. Despite this gradual increase, net asset value of pension funds has

[1] Despite they consist only 1% of the number of investors, foreign portfolio investors hold 63% and 31% of the market capitalization and total traded volume in the Turkish equity market respectively as of September 2016 (TUYID and MKK, 2016:14). Foreign investors also hold about 25%, 26%, 26% and 20% of the market value of the government bond market during the years 2012–2015 respectively (TSPB, 2016:51). Therefore, the functionality of the equity and partially bond markets in Turkey may mostly depend on their decision-makings.

[2] The market value increase of the capital market sub-components over the period of 2010:M3 and 2013:M2 are in the following; stock market capitalization (45.9%), stock market total traded value (10.5%), corporate bond market capitalization (3301,2%), market value of mutual fund (2.9%) and market value of pension funds (119.2%). This interesting result implies that newly emerging corporate bond market has probably positive impacts to the economic activities in Turkey.

Table 2
Overview of capital market in Turkey (2006–2015).

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
BIST- 100 Index Value	39,117	55,538	26,864	52,825	66,004	51,266	78,208	67,801	85,721	71,726
Market Cap (mn USD)	162,399	286,572	118,329	233,997	307,052	197,074	315,198	195,746	219,763	188,862
Market Cap/GDP (%)	0.31	0.44	0.16	0.38	0.42	0.25	0.40	0.24	0.28	0.26
Traded Value (mn USD)	n/a	294,295	247,893	305,036	411,469	393,910	357,779	419,362	393,976	374,449
Traded Value/GDP (%)	0.42	0.46	0.34	0.50	0.56	0.51	0.45	0.51	0.49	0.52
Listed Companies	329	332	323	322	344	368	404	424	425	416
Number of Mutual Funds	282	294	304	286	311	337	351	373	395	384
Mutual Fund Net Asset Value (mn USD)[a]	15,463	22,609	15,404	19,426	19,545	14,048	16,478	14,078	15,292	11,428
Mutual Funds Net Asset Value (mn TL)[b]	22,012	26,381	23,979	29,608	33,220	30,219	30,688	30,083	33,314	37,186
Pension Funds Net Asset Value (mn TL)	2821	5558	6042	9105	12,018	14,345	20,358	26,186	37,771	47,918
Corporate Bond Market Value (mn TL)	133	540	690	625	5829	14,624	29,772	38,873	47,743	49,395
Government Bonds Market Value (bn TL)	251.4	255.3	274.8	330.0	352.8	368.8	386.5	403.0	414.6	440.1

[a] European Fund and Asset Management (EFAMA) data provided by Capital Market Board of Turkey (2015).
[b] Provided Monthly Bulletins of Capital Market Board of Turkey. Mutual fund market is mostly dominated by fixed income mutual funds (B Type) and also involves equity mutual funds (A type) during observation period.
Source: Capital Market Board of Turkey (2015).

been booming with an increase of 1599% during the same period (Table 2). More interestingly, private pension system may show even higher growth potential in Turkey thanks to recently implemented automatic/mandatory participation system with significant subsidy contribution of the state. So, thirdly, the study timely asks whether mutual and pension fund markets have contributed to the economic growth in Turkey.

On the other hand, government bond market in BIST has significant secondary market role in financing of government deficits and liquidity management of the Central Bank of the Republic of Turkey (CBRT). According to our constructed data set, market value of total government bonds, which is dominated predominantly by longer term government bonds rather than T-bills, has increased from 251.4 billion TL in 2006 to 440.1 billion TL in 2015 (Table 2). These figures suggest a 75% increase in market capitalization in a decade. Then, fourthly, the paper asks whether government bond market supports economic growth. With this research question, the study also aims to compare the contributions of government bond market and capital market aggregate, involving mutual/pension funds, corporate bond, and stock market, to economic growth.

To that end, we utilize Granger causality approach to examine the dynamics between capital market development and economic growth in Turkey by using monthly data for the period from January 2006 to June 2016. We investigate the long run cointegration relationship between the variables by employing Bounds test approach proposed by Pesaran et al., 2001. Moreover, ARDL model is used in order to analyze the short- and long-term static spillover relationships between capital market development, government bond market development and economic growth. In addition to the static models, we employ both Markov Switching Regression Model and Kalman Filter Model, which allow us to investigate the dynamic spillover relationship between capital market development, government bond market development and economic growth in Turkey. The results suggest that while the effect of government bond market development on economic growth is negative, the aggregated index of capital market development has a positive effect on economic growth.

The remainder of paper is organized as follows: Section 2 outlines the literature review. Section 3 describes variables, data construction, principal component analysis, and the empirical strategy. Section 4 presents the results. The last section is reserved for the conclusion and discussions.

2. Literature review

There is a vast and insightful theoretical and empirical literature on the finance-growth nexus. Instead of re-analyzing this well-documented literature, the study focuses on capital market-growth nexus with particular emphasis on the rare studies analyzing the relation between capital market sub-components and economic growth.

2.1. Stock market-growth nexus

Highlighted by Schumpeter (1912) to emphasize the importance of credit mechanism, the finance is important for growth. Literature also reveals that stock market development may have positive economic impacts. For example, liquid and internationally integrated stock markets may induce productivity growth (Levine, 1991; Devereux and Smith, 1994; Obstfeld, 1994). However, the studies focusing on developed countries mostly support the positive relationship between stock market development and economic growth. Yu et al. (2012) indicate that main conclusions in theoretical/empirical studies based on cross-country analysis are sensitive to the countries, estimation methods, data frequency, and functional form of the relationship and proxy measures chosen in the study.

Atje and Jovanovic (1993) find a large effect of stock markets on subsequent development but a similar effect of bank lending was not observed. Levine and Zervos (1998) show that stock market liquidity and banking development both positively predict growth, capital accumulation, and productivity improvements, even after controlling for economic and political factors. The paper also finds that stock market size, volatility, and international integration are not robustly linked with growth. Beck and Levine (2004) find that stock markets and banks positively influence economic growth for the period 1976–1998 in selected countries. Boubakari and Jin (2010) find a positive link between stock market and economic growth for countries having liquid and highly active stock market. Beck (2011) suggests that under-investment in the financial sector will have long-term negative repercussions for economic growth. However, the causality relationship is rejected for the countries in which stock market is small and less liquid. Examining 146 countries over the period 1991–2011, Seven and Yetkiner (2016) find that relationship between stock market development and economic growth is positive and significant in middle- and high-income countries. As indicated, literature also reveals several counter and weak evidences on the linkage between stock market development and growth. For example, analyzing 49 countries over the period of 1980 and 1991, Harris (1997) finds that stock markets have weak effect on growth in developing countries. Arestis et al. (2001) find that although both banks and stock markets may be able to promote economic growth, the effects of the former are more powerful and further argue the contribution of stock markets

on economic growth may have been exaggerated by studies that utilize cross-country growth regressions. Naceur and Ghazouani (2007) find no significant relationship between banking and stock market development and growth in 11 MENA region countries.

Empirical literature also suggests that the contribution of stock market to economic growth may be related to country and market-level structural factors. In this respect, by analyzing Saudi Arabia, Turkey, and the United Arab Emirates through multivariate Granger-causality tests, Darrat (1999) finds that financial deepening is a necessary causal factor of economic growth. Demirguc-Kunt and Levine, 2001 and Demirguc-Kunt et al., 2012 show that market development in stock markets (and banks) is parallel to economic development of countries. McGowan (2008) suggests that developed economies will have also developed capital markets and Lin et al. (2009) discuss that there is an endogenously determined optimal financial structure for the economy at each stage of development. Cecchetti and Kharroubi (2012) discuss that financial booms are not, in general, growth enhancing and there is a pressing need to reassess the relationship of finance and real growth. Yu et al. (2012) argue that positive finance-growth relationship established by Levine (1997) is the long-run relationship (e.g., over 20 years) and it is possible for underdevelopment countries to experience slower economic growth despite financial and stock market development in the short-run (e.g., less than 10 years) mainly due to ill-enforced legal systems and political instability. Rioja and Valev (2014) find that banks have a sizable positive effect on capital accumulation and stock markets, however, have not contributed to capital accumulation or productivity growth in low-income countries. Using data collected on 101 countries from 1980 to 2009, Francis and Ofori (2015) argue that political regimes matter for stock market development and polity scores have a positive and statistically significant impact on stock market development—this effect is strongest in 1980s and 1990s.

However focusing only on traditional measures of stock market development such as turnover and/or market capitalization, there are also studies analyzing stock market-growth nexus specifically for Turkey. Selectedly, by using turnover rate and total market capitalization to measure stock market development, Çetintaş and Barışık (2003) find that banking and stock market development are statistically meaningful Granger causes of the economic growth in Turkey. Kaplan (2008) shows the existence of a long-run relationship between real economic activity and stock prices and also the direction of causality is from stock prices to real economic activity in Turkey. Also involving average trading volume of the bonds and bills market as the component, Soytaş and Küçükkaya (2011) fail to find any long-run causality between financial development and economic growth over the period of 1991Q3 to 2005Q4 in Turkey. Also involving the BIST total volume/GDP ratio as the indicator of capital market development with several other banking sector indicators, Araç and Ozcan (2014) findings support both supply leading and demand following hypothesis.[3] The authors suggest that economic growth causes financial development through increasing banks' assets in the long run in Turkey. Employing fixed effect panel regression method and Dimutrescu-Hurlin test, Karabıyık and Taşkın (2016) show that there is neither linear nor causal link for stock market development and economic growth in Turkey. Coşkun and Umit (2016) argue that the policies on the development of stock market and contributions of stock market to the growth may have some structural limitations in Turkey.

2.2. Capital market sub-components and growth nexus

Our study differs from existing stock market-growth literature due to taken into account both impacts of capital market sub-components and government bond market. Beside stock market, development of capital market sub-components is analyzed by various institutional studies. For example, OECD (2011) argues that institutional investors, namely pension funds, insurance companies, mutual funds, and sovereign wealth funds, reduce reliance on the banking system, acting as shock absorbers at times of financial distress and contributed to the capital market development and economic growth. Ong and Sy (2004) discuss that in emerging markets, the exponential growth in the local mutual fund industry has clearly contributed to the development of local securities and derivatives markets, which in turn, has been key in attracting investment inflows from overseas funds.

There are rare studies in the literature analyzing capital market sub-components and growth nexus. By employing granger causality test and co-integration analysis, Fink et al. (2003) conclude that real economic activity is significantly influenced by the development of the bonds market. Nistor et al. (2013) find that there is a causality relationship from mutual fund investments to growth rate in Romania. Using sample of 54 countries, Zandberg and Spierdijk (2013) do not find any effect of changes in the degree of pension funding on economic growth in the short-run and the evidence is mixed for the long-run. The authors also find evidence of interdependence between bond market capitalization growth and real output growth in Japan, Finland and Italy. Holzmann (1997) and Fontaine (1997) analyze the benefits of pension fund developments in the case of Chile. Mishra et al. (2010) find that foreign institutional investment inflows, also involving overseas pension funds and mutual funds, have the potential of influencing the process of economic development of India. Using data of 69 industrial sectors in 34 OECD countries for the period 2001–2010, Bijlsma et al. (2014) find that increased amount of assets held by pension funds and other institutional investors is associated with more efficient financial markets. Utilizing a panel vector auto-regression model for 35 countries over the period of 1993–2011, Pradhan et al. (2016) infer that bond market development (along with the other model variables) is the significant drivers of economic growth in the long run. From the market development perspective, Mizen and Tsoukas (2014) demonstrate that regional initiatives have been an important step towards greater bond issuance by firms in Asia, mostly by fostering market deepening and improving liquidity.

2.3. Government bond market and economic growth

There is no simple relationship between debt and growth, many factors matter for a country's growth and debt performance and no single threshold for debt ratios that can delineate the bad from the good (International Monetary Fund, 2012). The literature also reveals that public debt to GDP ratio and economic growth has generally negative or an inverted U-shaped relationship.[4]

For example, Schclarek (2004) finds no statistically significant relationship between gross government debt and per capita GDP

[3] There have been four sets of hypotheses related to financial development and economic growth tested in the literature. The first is the *supply-leading hypothesis*, which contends that financial development is a necessary pre-condition to economic growth. The second is the *demand-following hypothesis*, which suggests that causality runs from economic growth to financial development. Third is the *feedback hypothesis*, which suggests that economic growth and financial development are mutually causal and they can complement and reinforce each other. Finally, the *neutrality hypothesis* suggests that financial development and economic growth are independent of each other (Pradhan et al., 2016).

[4] See Panizza and Presbitero (2013) for a comprehensive review of the literature.

Table 3
Summary statistics.

Variable	Observation	Mean	Std. Dev.	Min	Max
GDP	126	67,798,215	7,750,910	48,758,716	84,764,760
SMCAP	126	261500.30	47688.71	130543.00	344792.60
FUNDS	126	29743.91	4797.48	22427.71	42548.55
BMCAP	126	9378.51	9495.03	12.39	23815.45
TRADED	126	33232.96	8717.40	13373.16	55751.75
DIBS	126	223785.04	13506.52	199501.33	245889.36
EMP (%)	126	42.63	2.58	37.30	47.50
CPI (2006/01 = 100)	126	156.15	36.43	100	226.05
REER (2006/01 = 100)	126	91.64	7.04	75.51	106.56

Note: SMCAP = stock market capitalization, FUNDS = the sum of pension and mutual funds' total asset values, BMCAP = market capitalization of corporate bonds, TRADED = stock market total traded value, DIBS = total value of short and long term government bonds, EMP = rate of employment, CPI = consumer price index, REER = reel effective exchange rate.

growth in developed countries. Also involving Turkey in their analysis, Reinhart and Rogoff (2010) find that the relationship between government debt and real GDP growth is weak for debt/GDP ratios below a threshold of 90 percent of GDP and also across both advanced countries and emerging markets, high debt/GDP levels (90 percent and above) are associated with notably lower growth outcomes. Kumar and Woo (2010) detect an inverse relationship between initial debt and subsequent growth and also find some evidence of nonlinearity, with only high (above 90 percent of GDP) levels of debt having a significant negative effect on growth. By also defining a concave (inverted U-shape) relationship between variables, Checherita-Westphal and Rother (2012) argue that a higher public debt-to-GDP ratio is associated, on average, with lower long-term growth rates at debt levels above the range of 90–100% of GDP. Panizza and Presbitero (2013) argue that a non-monotone relationship between debt and growth are related to data/methodology and suggest whether high levels of public debt have a negative effect on long-run growth is an empirical question. Among others, Smyth and Hsing (1995), Cohen (1997), Pattillo et al. (2002), Clements et al. (2003) find a non-linear effect of external debt on economic growth. Dreger and Reimers (2013) define negative impact of the debt to GDP ratio is particularly strong for non-sustainable debt ratios.

As an example of counter evidence, Fincke and Greiner (2015) analyze the relationship between public debt and economic growth in Brazil, India, Indonesia, Malaysia, Mexico, South Africa, Thailand and Turkey and find a significantly positive, although very small correlation. Using a panel data set of 38 countries and applying the generalized method of moments techniques for dynamic panels, Thumrongvit et al. (2013) find that government bonds are positively related to economic growth. Using 93 low income and emerging markets data over 1975–2004, Abbas and Christensen (2007) estimate that moderate levels of noninflationary domestic debt are found to exert a positive impact on economic growth. By employing public and private debts as the proxy of debt market in Bursa Malaysia over the period of 1981–2014, Nordin and Nordin (2016) find stock market capitalization and the debt market have significant and positive influence on the real GDP per capita.

3. Data and the empirical model

3.1. Data description

The study primarily tests the capital market development and economic growth nexus and also explores the relationship between government bond market and economic growth over the period of January 2006 and June 2016 in Turkey by utilizing several measures of capital market development and the set of conditioning information. The choice of data period is shaped by data availability concerns.

Economic growth is proxied by Gross Domestic Product (GDP). The quarterly GDP series are transformed into monthly by using industrial production index as the proxy and following Fernandez (1981) and Kara and Ogunc (2012) methodology. The quarterly GDP series are retrieved from the CBRT databases. To measure the capital market development we employ natural logarithms of *(i)* stock market capitalization (SMCAP), *(ii)* stock market traded value (TRADED), *(iii)* corporate bond market capitalization (BMCAP), and *(iv)* total market value of mutual funds and pension funds (FUNDS).[5] Corporate bond market capitalization involves all types of fixed income securities issued by private companies in BIST involving long-term corporate bonds, short term corporate bonds (commercial paper), asset-backed securities, profit and loss sharing certificate, real estate certificates,[6] bank bills, bank guaranteed bills, and warrants. Moreover, total value of short and long term government bonds (DIBS) is used to measure the development level of the government bond market. The data of capital market development variables and DIBS are compiled from the Monthly Statistical Bulletin of the Capital Markets Board of Turkey.

To assess the strength of the relationship between capital market development and economic growth, we control three macroeconomic covariates in the regressions that are also widely employed in the related literature. First, we include inflation rate (INF), which is the growth rate of the consumer price index (CPI). Second, the growth rate of the employment (EMPG) is included given that employment growth is widely used in the growth regressions. Finally, we use the growth rate of the reel effective exchange rate (REERG). All monetary variables are made real using monthly consumer price index. We remove the seasonal components of the GDP and employment series.

Table 3 presents the descriptive statistics for the variables used in our empirical analysis. There are considerable variations in our variables across time. For example, real GDP ranges from a low of 48,758,716 (TL) to 84,764,760 (TL). Stock market capitalization also shows significant variation, ranging from 130,543 (mn TL) to 344,792 (mn TL). Moreover, as a control variable, reel effective exchange rate index ranges from 75.51 to 106.56.

3.2. Principal component analysis

The correlation matrix presented in Table 4 confirms the interrelations between the indicators, and suggests that capital

[5] We intentionally exclude other sub-markets of BIST such as derivatives and precious metals/diamond markets due to data constraints and relevancy.

[6] There have been no issuance for real estate certificates and the only one small issuance for profit and loss sharing certificate (in 2012 January) during observation period.

Table 4
Correlations between capital market development variables.

	SMCAP	FUNDS	BMCAP	TRADED
SMCAP	1.0000			
FUNDS	0.5077	1.0000		
BMCAP	0.5832	0.6574	1.0000	
TRADED	0.6878	0.6431	0.4865	1.0000

Note: For abbreviations, see Table 3.

Table 5
Principal component analysis for capital market development variables.

	PCA 1	PCA 2	PCA 3	PCA 4
Eigenvalues	2.7834	0.5659	0.4428	0.2079
% of variance	0.6958	0.1415	0.1107	0.0520
Cumulative %	0.6958	0.8373	0.9480	1.0000
Eigenvectors				
Variable	Vector 1	Vector 2	Vector 3	Vector 4
SMCAP	0.4991	−0.4881	0.5167	−0.4850
FUNDS	0.5050	0.4091	−0.5662	−0.5069
BMCAP	0.4879	0.5910	0.4792	0.4278
TRADED	0.5077	−0.4951	−0.4151	0.5699

Note: All variables are used in their natural logarithm forms in the PCA. For abbreviations, see Table 3.

market development indicators may contain common information, which may lead to multi-collinearity and over-parameterization problems. This multi-collinearity problem is a further justification for the construction of a new aggregate measure. When all four indicators (SMCAP, FUNDS, BMCAP and TRADED) are simultaneously included in the regressions, we generally obtain inconsistent results, because of the high correlation between capital market development indicators. At this point, PCA solves the problems of multi-collinearity.[7] It should be noted that PCA does not search for causal relations; instead, it searches for interdependence between indicators, without defining the direction of the causal relation.[8]

Using these four capital market development indicators (in natural logarithms), we develop an aggregate measure (CAPD) to represent the level of development in the Turkish capital market.[9] This aggregate measure employs principal component analysis, which deals with the problems of over-parameterization and multi-collinearity. Theoretically, this new aggregate measure is able to capture most of the information from the original dataset.

The results of the extraction of PCA for capital market development indicators are presented in Table 5. The capital market development indicator corresponds to the first principal component, the only one with an eigenvalue greater than 1, and which explains about 70% of the total variance. The remaining principal components are not considered since their marginal contributions are relatively small, namely that the corresponding eigenvalues are much smaller than 1. For instance, while the second principal component explains 14% of the variation, the third principal component explains 11% of the variation, and the last principal component explains only 5% of the variation. The synthetic variable, namely the aggregate measure of capital market development (CAPD), is computed as a linear combination of the four widely used indicators (in their natural logarithms) with weights given by the first eigenvector.

3.3. Empirical strategy

The goal is to develop an empirical strategy that would enable us to estimate the effects of capital market sub-components on GDP. The basic regression model that we aim to estimate is expressed in Equation (1). Whereas in Equation (1) *lnGDP* is the dependent variable, similar equations can be written with other variables taking turns to act as the dependent variable, which will allow for the possibility that causality may follow in any direction.

$$lnGDP_t = \alpha_0 + \alpha_1 CAPD_t + \alpha_2 \ln(DIBS_t) + \alpha_3 EMPG_t + \alpha_4 INF_t + \alpha_5 REERG_t + \varepsilon_t \quad (1)$$

where GDP_t is the monthly Gross Domestic Product at time t, $CAPD_t$ is the aggregate measure of capital market development, which is constructed through the principal component analysis of four natural logarithmic capital market development variables, $DIBS_t$ is the total value of short and long term government bonds, $EMPG_t$ is the employment growth rate, INF_t represents the inflation rate, and $REERG_t$ represents the growth rate of the reel effective exchange rate index. Finally, ε_t is the usual error term. *ln* denotes the natural logarithm.

For investigating the relationship between capital market development and GDP, we first analyze the stationarity properties of the series by employing Ng-Peron (2001) unit root test, which provides robust results over the other conventional unit root tests for small samples. We then investigate the direction of causality between GDP and CAPD by utilizing both standard Granger Causality test and more powerful Toda and Yamamoto (1995) causality test. After finding the direction of the causality, we investigate long-run cointegration relationship between the variables by employing Bounds test approach proposed by Pesaran et al., 2001. After defining cointegration between the variables, we use ARDL model in order to analyze the short- and long-term static spillover relationships between *(i)* capital market development and GDP, and *(ii)* government bond market development and GDP. Fully Modified OLS (FMOLS)[10] and Dynamic OLS (DOLS)[11] models are also used for robustness check. Finally, we employ both Markov Switching Regression model and Kalman Filter model which allow us to investigate the dynamic spillover relationship between capital market development and GDP in Turkey.

4. Empirical results

In the empirical analysis, we employ both static and dynamic modeling tools in order to investigate the effects of the capital market sub-components on GDP. We have two main explanatory variables, namely capital market aggregate (CAPD) and total value of short and long term government bonds (DIBS). We first check the issue of multicollinearity and find no multicollinearity between the CAPD and DIBS.

In this respect, we investigate the stationarity properties of the variables by employing Ng-Peron (2001) unit root test. The results for the unit root tests are presented in Table 6. The null hypothesis for MZ_a and MZ_t tests indicate unit root and the null hypothesis for

[7] Principal component analysis has been used to reduce a large set of correlated variables into a smaller set of uncorrelated variables. See Stock and Watson (2002).

[8] See Appendix A for detailed explanation of principal component analysis.

[9] We exclude DIBS in the principal component analysis because it has a negative correlation with all other capital market development variables. Instead, we use DIBS as an explanatory variable for the regressions between government bond market development and economic growth.

[10] FMOLS model is more robust for serial correlation, endogeneity and multicollinearity problems and superior for simple OLS model (Stock and Watson, 1993).

[11] In the DOLS model, right hand side differenced lead and lag variables are used in order for control endogeneity and serial correlation problems (Stock and Watson, 1993).

Table 6
Ng-Perron unit root test results.

	MZ_a	MZ_t	MSB	MPT
GDP	−8.955	−2.111	0.235	10.193
ΔGDP*	−37.590	−4.29487	0.114	0.768
CAPD	−16.433	−2.864	0.174	5.558
ΔCAPD*	−43.716	−4.635	0.106	0.668
DIBS	−5.305	−1.603	0.302	17.088
ΔDIBS*	−38.073	−4.352	0.114	0.675
REERG*	−40.325	−4.486	0.111	0.619
EMPG*	−33.031	−4.048	0.122	0.790
INF*	−163.221	−28.567	0.017	0.055

Note: Ng-Peron critical values for GDP, CAPD and DIBS variables; MZa, MZt, MSB, MPT respectively; for %1 significance level −23.80, −3.42, 0.14 and 4.03; for %5 significance level −17.30, −2.91, 0.17 and 5.48. Ng-Peron critical values for ΔGDP, ΔCAPD, ΔDIBS, REERG, EMPG and INF variables; MZa, MZt, MSB, MPT respectively; for %1 significance level −13.80, −2.58, 0.17 and 1.78; for %5 significance level −8.10, −1.98, 0.23 and 3.17. * denotes %1 significance level, ** denotes %5 significance level.

MSB and MPT tests indicate stationary. According to Table 6, GDP, CAPD and DIBS variables are found I(1) and all control variables, namely REERG, EMPG and INF, are found I(0).

After stationarity check, we investigate causality direction between CAPD and GDP by employing both standard Granger Causality test and Toda and Yamamoto (1995) Causality test. The Toda-Yamamoto test has superior properties over the standard granger causality test due to eliminating the need for pre-testing for cointegration. It is also used irrespective of stationary check. For application of the Toda-Yamamoto test, maximum order of integration of investigated variables is required and it is found 1 according to Ng-Perron test. The Toda-Yamamoto test estimates augmented VAR model with maximum level of integration. We first estimate VAR(m) model in levels and extended VAR(m) model with maximum order of integration number (dmax). We then estimate augmented VAR (m + dmax) model. By employing VAR(m + dmax) model, we avoid from information loss of differencing. After we estimate augmented VAR model, we perform WALD test for the first "m" variables. The results for the Standard Granger Causality and Toda and Yamamoto (1995) Causality tests are presented in Table 7. The results suggest that there is a unidirectional causality running from capital market development (CAPD) to economic growth (GDP).

After causality analysis, we investigate the short- and long-run cointegration relationships between the variables by employing the Bounds test approach proposed by Pesaran et al., 2001. The Bounds test approach has three main advantages over the conventional cointegration models; *(i)* it can be used irrespective of the integration level of regressors, *(ii)* it is relatively more efficient in the case of small and finite sample data sizes (Narayan and Narayan, 2004), and *(iii)* by applying the Bounds test approach we obtain unbiased estimates of the long-run model (Harris and Sollis, 2003).

To explore the short- and long-run relationships between economic growth and capital market development variables, we use the following equation in the UECM (Unrestricted Error Correction Model) form:

Table 7
Causality test results.

Causality Test	From	To	Prob Value	Results
Granger Causality	GDP	CAPD	0.296	No Causality
Granger Causality	CAPD	GDP	0.000	Causality
Toda Yamamoto	GDP	CAPD	0.268	No Causality
Toda Yamamoto	CAPD	GDP	0.000	Causality

Table 8
Cointegration test results (Dependent variable: Δ*LnGDP*).

K	F -Statistic	Critical Value at %1 Significance Level	
		Bottom Bound	Upper Bound
2	9.94	5.15	6.36

$$\Delta LnGDP_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1,i}\Delta LnGDP_{t-i} + \sum_{i=1}^{m} \alpha_{2,i}\Delta CAPD_{t-i} + \sum_{i=1}^{m} \alpha_{3,i}\Delta LnDIBS_{t-i} + \alpha_4\Delta REERG_t + \alpha_5\Delta EMPG_t + \alpha_6\Delta INF_t + \alpha_7 LnGDP_{t-1} + \alpha_8 CAPD_{t-1} + \alpha_9 LnDIBS_{t-1} + \varepsilon_t \quad (2)$$

where Δ is the first difference operator, $\Delta LnGDP_t$ represents the change in natural logarithm of GDP as proxy for economic growth. In Equation (2), the terms with summation signs represent the error correction dynamics while the ones without the summation sign represent a long-term relationship.

The result of the cointegration test using Bounds test approach is presented in Table 8. In Table 8, the calculated F-statistic (9.94) exceeds the upper critical bound value (6.36) at 1% significance level. Therefore, Table 8 provides evidence that there is a long-run relationship between economic growth and capital market development.[12]

After defining cointegration relationship between the variables, we compute the static short term spillover coefficients between CAPD, DIBS and GDP growth, and long term spillover coefficients between CAPD, DIBS and GDP by utilizing the ARDL model. ARDL model representation for our study is shown in equation (3):

$$LnGDP_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1,i} LnGDP_{t-i} + \sum_{i=0}^{n} \alpha_{2,i} CAPD_{t-i} + \sum_{i=0}^{p} \alpha_{3,i} LnDIBS_{t-i} + \alpha_4 REERG_t + \alpha_5 EMPG_t + \alpha_6 INF_t + \varepsilon_t \quad (3)$$

Defining the maximum number of lags as 8 and employing Schwarz criterion to find the optimal lag number, ARDL (3,1,0) model is selected as the best fit model. The estimated short- and long-term spillover coefficients and model diagnostics are presented in Table 9.

According to Table 9, while capital market aggregate (CAPD) has positive and statistically significant effects on both GDP and GDP growth, government bond market variable, namely DIBS, has a negative and statistically insignificant effect on GDP, though its effect on GDP growth is negative and statistically significant at 10% level. According to the ARDL model results, the aggregated index of the capital market development is positively and statistically significantly associated with GDP in the long term. Moreover, one point increase in government bond market growth measure causes 0.2 point decrease in GDP growth in the short term. The results also show that ARDL (3,1,0) model's error terms are normally distributed and there are no serial correlation, heteroscedasticity and misspecification problems in our specification. Moreover, stability

[12] If the calculated F statistic is greater (less) than the upper (bottom) bound of the critical values, we reject (could not reject) the null hypothesis of no co-integration.

Table 9
Estimated short and long term spillover coefficients for ARDL (3,1,0) model.

Estimated long term spillover coefficients (Dependent variable: *LnGDP*)		
Variables	**Coefficient**	**T statistics**
CAPD	0.070	6.690*
DIBS	−0.359	−1.148
REERG	−0.0008	−2.124**
EMPG	3.331	1.387
INF	−0.044	−2.283**
C	13.672	3.565*
Estimated short term spillover coefficients (Dependent variable: Δ*LnGDP*)		
Variables	**Coefficient**	**T statistics**
ΔCAPD	0.006	5.983*
ΔDIBS	−0.205	1.842***
ECT(1)	−0.091	−3.931*
REERG	−0.001	−2.341**
EMPG	0.303	1.479
INF	−0.004	−2.642*
C		
Diagnostic Checks		
χ^2_{BG} [a]	0.785[0.458]	
χ^2_{NORM} [b]	1.939[0.379]	
χ^2_{WHITE} [c]	0.086[0.769]	
χ^2_{RAMSEY} [d]	0.822[0.412]	
Stability Checks		
Cusum Test	Stable at 5% level	
Cusum Square Test	Stable at 5% level	

Notes: *, **, and *** denote 1%, 5%, and 10% significance level, respectively. ECT is the error correction term.
CUSUM and CUSUMSQ tests proposed by Brown et al. (1975) are used to examine the presence of parameter stability.
[a] Lagrange multiplier test of residual serial correlation.
[b] Based on the test of skewness and kurtosis of residuals.
[c] Based on the regression of squared residuals on squared fitted values.
[d] Ramsey's RESET test using the square of the fitted values.

checks confirm the stability of the parameters.

In addition to the ARDL model, we estimate FMOLS and DOLS models for the robustness check of the model parameters. Basically, FMOLS and DOLS models confirm the results of the ARDL model. Table 10 shows that while the effect of CAPD on GDP is positive, the effect of DIBS on GDP is negative in both FMOLS and DOLS models. According to the FMOLS-DOLS model results, capital market development has a positive effect on GDP and 1% increase in government bond market development measure causes about 0.5% decrease in GDP in the long term.

After static analysis, we employ Markov Switching Regression and Kalman Filter models as the dynamic modeling tools. Markov Switching Regression model is a linear regression model with nonlinearities arising from discrete changes in regime. We assume two regimes in the economy. Regime 1 and Regime 2 represent the high and low volatility regimes, respectively. The volatility state is assumed to be the outcome of an unobserved first-order K^{th} state Markov process, which can be described by transition probabilities, $P\left(s_t = \frac{k}{s_{t-1}} = i\right) = p_{ij}$. Each probability figure, p_{ij}, is the probability

Table 10
Robustness test results.

Variable/Model	FMOLS	DOLS
CAPD	0.044*	0.043*
DIBS	(-0.541)*	(-0.529)*
C	24.7036*	(24.550)*
Control Variables		
REERG	(-0.001)	(-0.0002)
EMPG	(-2.880)**	(-0.122)
INF	(-0.013)	(-0.005)

Note: *, ** and *** denote 1%, 5% and 10% significance levels, respectively.

Table 11
Markov switching regression model.

Variable/Model	Markov Model
REGIME 1 (high volatility)	
CAPD	0.039*
DIBS	(-0.601)*
C	25.433*
REGIME 2 (low volatility)	
CAPD	0.030*
DIBS	(-0.501)*
C	24.239*
CONTROL VARIABLES	
EMPG	(-0.236)
REERG	(-0.003)*
INF	(-0.004)

Note: *, ** and *** denote 1%, 5% and 10% significance levels, respectively.

that state *i* is followed by state ?? (Bautista, 2003). The first-order Markov assumption requires that the probability of being in a regime depends on the previous state (Ertuğrul and Öztürk, 2013). Hence, the transition probability matrix is simplified to:

$$p = \begin{vmatrix} p_{11} & p_{21} \\ p_{12} & p_{22} \end{vmatrix}, \text{where } \sum_{j=1}^{2} p_{ij} = 1. \quad (4)$$

Table 11 shows that Markov Switching Regression model results are consistent with the static model results in the sense that while CAPD is positively associated with GDP, the relationship between DIBS and GDP is negative in both high and low volatility regimes.

The time varying regression parameter estimates for the relationship between CAPD, DIBS and GDP is presented in Fig. 1. According to Fig. 1(a), dynamic coefficients of CAPD are consistent with both static and Markov Switching Regression models. The time varying parameter (TVP) value has showed a sharp increase from 0.015 as of March 2010 to 0.041 as of February 2013, which suggests the rising positive impacts of capital market development on the level of GDP. On the other hand, the TVP estimates for the relationship between DIBS and GDP is shown in Fig. 1(b). The results suggest a negative relation between DIBS and GDP, which is also consistent with both static and Markov Switching Regression models. On the other hand, the time varying parameter value for the relationship between DIBS and GDP has showed a little change from −0.5934 as of October 2009 to −0.5881 as of June 2014.

5. Concluding remarks and policy implications

History reveals that capital markets have been providing finance to economic activities from infrastructure investments in 19th century to dotcom firms in 21th century, however there have been mixed results on the relation between stock markets and economic development in the empirical literature. Moreover, recent global financial crisis brings into consideration one more time whether stock market is the place of irrationalities and casino capitalism instead of providing support for growth.

Despite its well-regulated and globally integrated nature, capital market has played limited role for the economic development in Turkey. To explain whether sub-components of the Turkish capital market provide contribution to economic growth, the paper has two main interconnected research questions over the period of January 2006 and June 2016. First, in the context of stock market-growth nexus, we analyze for the first time the aggregated effects of mutual funds, pension funds, corporate bond and stock markets on economic growth. Second, we explore the government bond market and economic growth relation. Therefore, the study also aims to compare the contributions of the sub-components of the

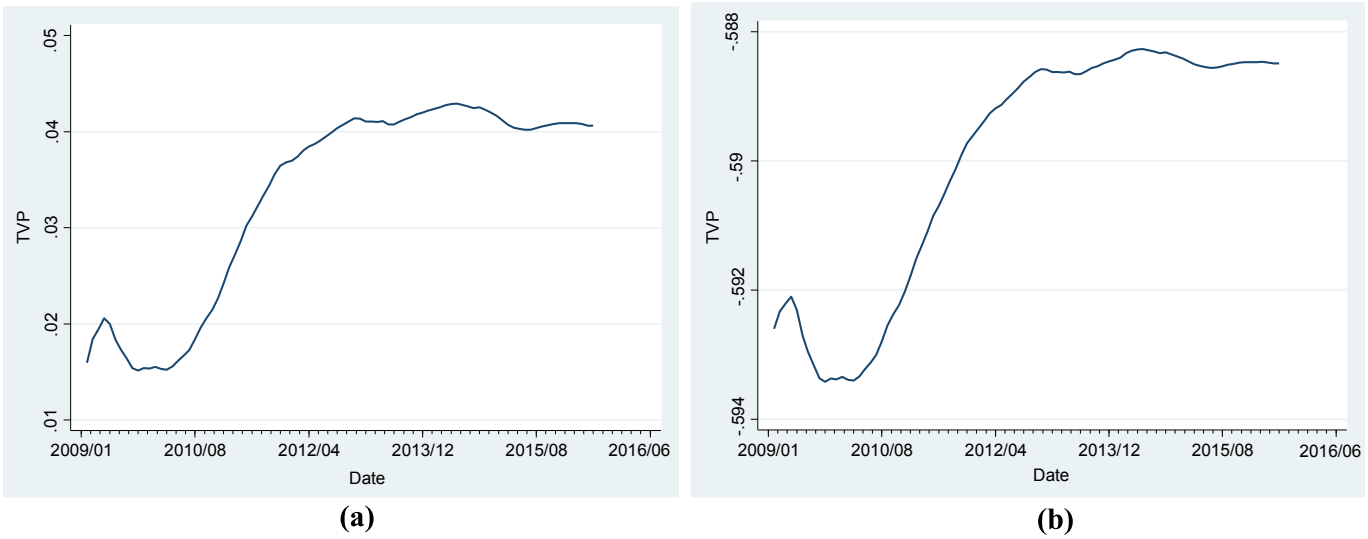

Fig. 1. (a). TVP estimates for CAPD and GDP Fig. 1(b). TVP estimates for DIBS and GDP.

capital market and government bond market to economic growth. Model outcomes suggest five evidences.

First, Standard Granger Causality and Toda and Yamamoto (1995) Causality tests show that there is a unidirectional causality running from capital market development to GDP. Second, we provide evidence that there is a long-run cointegration relationship between capital market development variable and GDP. Third, ARDL and DOLS/FMOLS models collectively suggest that capital market development has a positive (see i.e. Harris, 1997) and government bond market development has a negative effect (see, i.e., Kumar and Woo, 2010; Checherita-Westphal and Rother, 2012) on economic growth. Fourth, Markov Switching Regression model results are consistent with the static model results in high and low volatility regimes. Fifth, time varying regression parameter estimates suggest that dynamic coefficients of the capital market development and government bond market development variables on GDP are consistent with both static and Markov Switching Regression models.

These evidences suggest significant implications and interesting policy framework for Turkey. Supporting supply-leading hypothesis, positive linkage between capital market development and economic growth suggests that market development may be awarded with higher economic growth in capital market despite bank-based nature of the Turkish economy and cultural/structural limitations in investing capital market instruments. In this respect, we may argue that the higher market capitalization in stock, mutual funds, pension funds, and corporate bond markets may positively support economic growth. Therefore, financial deepening enhancing policies in capital market sub-components are highly suggested. On the other hand, negative relationship between government bond market development and economic growth may suggest that the components of capital market may have asymmetric effects on economic growth in Turkey.

To keep policy suggestions within limits, we may focus on two broad policy frameworks. In the short term, policy makers may support market dynamics to improve market capitalization and liquidity. Taken into account the dependency on short term capital inflows and higher percentage of foreign ownership in BIST equity market, we may suggest that keeping foreign investors on the table seems a prerequisite for the economic growth benefit of Turkish capital markets. In the long-term, however, changing financing pattern of corporate Turkey, heavily need to utilize bank credit, and changing investment pattern of Turkish households, heavily prefer to invest on Turkish Lira/FX deposit accounts, housing, and gold, may create long term demand to capital market assets. As an interesting policy suggestion for the positive relation between capital market development and economic growth, a more financially secure environment where foreign investment is mostly substituting local investment in capital market sub-components may also support economic growth and financial security mutually, and minimize the risks of sudden capital outflows.

Taken as a whole, these empirical findings suggest that market development activities in Turkish capital market may be awarded by higher economic growth potential. But, policy makers should specifically note that encouraging using more supply/demand side capital market assets may translate into changing finance and investment cultures of the economic agents. This long-term market development idea may face with natural boundaries connected to various pull (i.e., institutional deficiencies in capital markets such as less efficient investor protection system) and push factors (i.e., better investment environments in competed markets). As the future research avenue, the contribution of the capital markets to the economic growth would be analyzed from the perspective of optimal design of the regulation, supervision, and enforcement activities. Further research in this area could also explore the implications of the negative relationship between government bond market and economic growth. In this respect, the more resource allocation to government bond market may result crowding-out effect in the sense of less resource to other capital market subcomponents and hence lower economic growth. This phenomenon may be analyzed in the context of interactions between economic growth and private vs. government financing.

APPENDIX A

Principal component analysis:

Principal Component Analysis (PCA) is a well-established technique for dimensionality reduction (Stock and Watson, 2002). The popularity of PCA comes from three important properties:

i. It is the optimal (in terms of mean squared error) linear scheme for compressing a set of high dimensional vectors into a set of lower dimensional vectors and then reconstructing.

ii. The model parameters can be computed directly from the data, for example, by diagonalizing the sample covariance.
iii. The compression and decompression are easy operations to perform given the model parameters, they require only matrix multiplications.

Historically PCA was first formulated in a statistical setting: to estimate the principal components of a multivariate random variable $\boldsymbol{x}$ from given sample points $\{x_i\}$. For a multivariate random variable $x \in \mathbb{R}^D$ and any $d < D$, the d "principal components" are defined to be d *uncorrelated* linear components of $\boldsymbol{x}$:

$$y_i = u_i^T x \in \mathbb{R}, \quad i = 1, \ldots, d \tag{A.1}$$

for some $u_i \in \mathbb{R}^D$ such that the variance of y_i is maximized subject to

$$u_i^T u_i = 1, \quad Var(y_1) \geq Var(y_2) \geq \ldots \geq Var(y_d). \tag{A.2}$$

For example, to find the first principal component, we seek a vector:

$$u_1^* = \arg \max_{u_1 \in \mathbb{R}^D} Var\left(u_1^T x\right), \quad \text{s.t.} \quad u_1^T u_1 = 1. \tag{A.3}$$

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