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TIME-VARYING COUNTRY BETA APPROACH IN MODELLING COUNTRY RISK OF TURKEY

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ABSTRACT

This paper analyses Turkey's country risk using a time-varying country beta market model incorporating various macroeconomic variables over the period January 2004 to August 2015. To our knowledge this is the first study exploring Turkey's country risk using country beta approach. We confirmed that Turkey's country beta is time-varying and demonstrates a huge amount of volatility especially between 2004 and 2007. We find that government and private sector external debt and market interest rates are the significant macroeconomic factors that have influenced Turkey's country beta during the analysis period. These findings reveal an important structural macroeconomic change in Turkish economy that is concerns about the sustainability of government debt and public finances have shifted to private sector related issues. Specifically, while private sector external debt, which increased rapidly during this period, has a significant positive impact on Turkey's country beta, substantially lowered levels of government external debt (as a percentage of GDP) acts as a risk-reducing macroeconomic factor.

1. INTRODUCTION

Harvey (1991) measured country risk as conditional sensitivity (covariance) of the country's equity returns to a global stock market index. Using Harvey's (1991) approach, Harvey and Zhou (1993) estimated country betas for the first time for developed markets. In vein of Harvey (1991) and Harvey and Zhou (1993), Lessard (1996) suggested that the beta of an offshore investment project with respect to the investing company's benchmark portfolio can be estimated directly by regressing returns on relevant local shares against the home-market portfolio (adjusting for financial and operational leverage). Beta also can be measured indirectly by estimating the beta of the project relative to the local market portfolio and multiplying the result by the country beta, the beta of the local market portfolio relative to the home-market portfolio. Although above studies provide a rationale for using country beta as a measure of country risk, Harvey (1995a) found that country betas were lower than unity and statistically insignificant in many emerging countries and concluded that global standard asset pricing models like CAPM (which assume a complete integration of stock markets worldwide) fail to explain emerging stock market returns. Godfrey and Espinosa (1996) argue that, because of low correlation between emerging and global stock market returns, individual country betas (as measured with respect to a global stock index) do not reflect country-specific risks. Instead of using country betas as a systematic risk measure, they proposed a (relative) volatility measure (adjusted beta) as a total risk indicator that reflects the volatility of the local stock market relative to the volatility of the global stock market.

As the pace of globalization gained momentum, the degree of integration between emerging and global markets has increased significantly. Bekaert and Harvey (2014) argues that over the last 15 years, emerging markets transformed from an asset class exhibiting very low correlation with the rest of the world to one with a relatively high world market beta: risky but high expected returns which implies that country betas now reflect country-specific risks better. According to Phylaktis and Ravazzolo (2005), strengthened and increased financial linkages between open and semi-open markets during 1990’s compared to 1980’s, suggests that the relaxation of foreign ownership restrictions might have enhanced links with global markets. Voronkova (2004) provided evidence for the existence of significant long-run relations between the emerging Central European countries within the region and globally. Pukthuanthong and Roll’s (2009) extensive study also documents strong evidence of growing integration for 51 countries around the world. Further, they found that the pace of integration over time varies between countries. Members of the European community, plus a few others such as South Korea, have experienced the largest increases while in contrast, several countries have gone in the opposite direction, toward less integration (such as Bangladesh, Nigeria, Pakistan, Sri Lanka, and Zimbabwe). All of these findings suggest that over time country beta might have become a more accurate measure of a country’s risk.

Abell and Kruger (1989) demonstrated that the prediction of future betas using a time-varying beta model, which also incorporates significant economic variables, is more accurate than utilising historical betas. In addition to political, economic and financial variables, Erb et al. (1996a, 1996b) argue that country beta is also an important determinant of country credit ratings. Notably, Gangemi et al. (2000) drew attention to the point that for countries with a foreign debt that is predominantly official, country risk can be measured relatively easily by independent credit ratings (e.g. Somerville and Taffler, 1994; Afonso et al., 2011; Hilscher and Nosbusch, 2010). However, for countries with an important or larger amount of private sector external debt more refined or better country risk measures are needed. This point is especially relevant and important for the case of Turkey since after 2000–2001 economic crises private financial and non-financial corporations’ external debt has increased to unprecedented levels reaching 35.4 per cent of GDP as compared to government’s external debt of 14.7 per cent in 2014 (18.7 per cent and 28.0 per cent in 2002).

In this study, using macroeconomic variable-augmented country beta approach we have estimated Turkey's country risk during 2004–2015 period using monthly observations. The remainder of the paper is structured as follows: Section 2 reviews previous work on country beta while Section 3 presents the empirical methodology and estimation results. Section 4 concludes.

2. LITERATURE REVIEW

There are relatively a limited number of empirical studies modelling country risk using country beta approach. Gangemi et al. (2000) analysed Australia's country-specific risk using country beta model in the spirit of Harvey and Zhou (1993) and Erb et al. (1996a, 1996b). They investigated the impact of macroeconomic factors, with a special focus on open economy variables, using a time-series regression-based approach. They found that the only macroeconomic variable which has impacted on Australia's country risk significantly was exchange rates. Using various economic variables Wdowinski (2004) found that exchange rates and interest rates as indicators of monetary policy stance have relatively more power than real economic variables in explaining country beta of Poland. Using country beta approach, Verma and Soydemir (2006) investigated whether local and global risk factors influence Latin American (Mexico, Brazil, Argentina and Chile) country risk. They found that while domestic money supply and exchange rates are significant variables affecting country-specific risk, real interest and inflation rates of G-7 countries have a negative impact on individual country betas. Andrade and Telles' (2006) static empirical model confirms that monetary policy has a significant and stable effect on Brazil's risk as measured by country beta. Furthermore, they found that international reserves had a significant impact only in the fixed exchange rate period. In their paper Marshall et al. (2009) used time-varying beta estimates, extended by a dynamic conditional correlation GARCH model, as a proxy for country risk in emerging markets (EM). After confirming beta is time varying in twenty EM over the period 1995M01 to 2008M12, they found that their modelling strategy produces the lowest forecast errors among alternatives. The evidence also suggests that individual dynamic betas across EM are strongly associated with each country's and US interest rates, the Consumer Price Index and to a lesser extent the exchange rates.

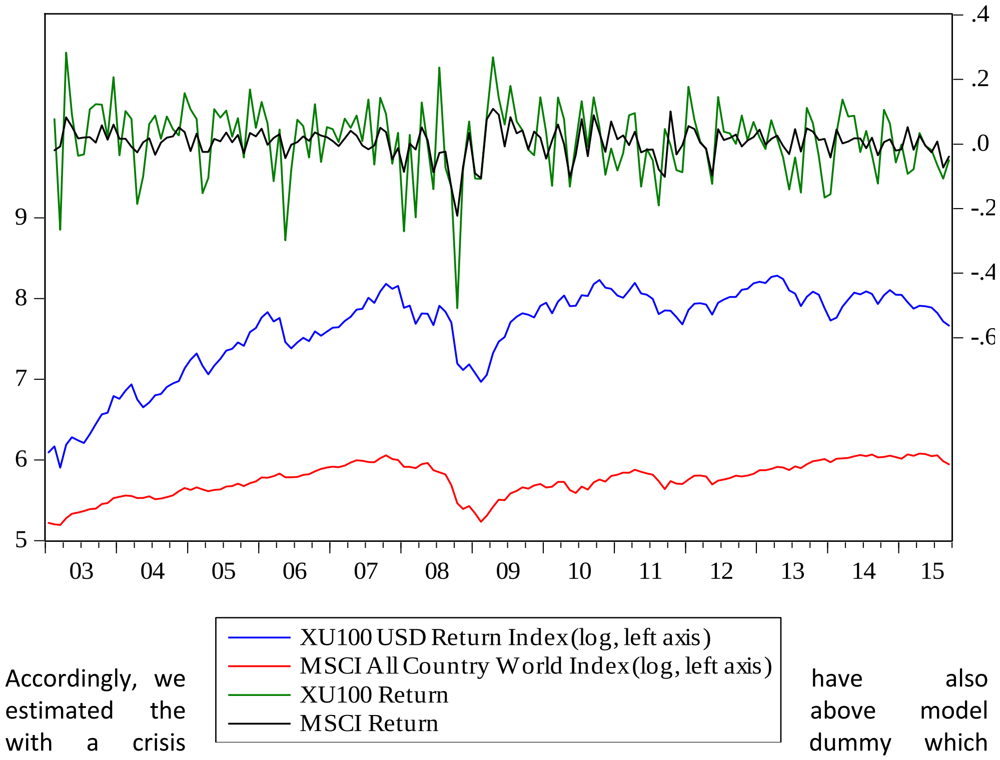
3. DATA AND METHODOLOGY

In this article we have employed the country beta model as our baseline specification for estimating Turkey's country risk. In this context, we have made the assumption that the country risk can be modelled in terms of the relationship between the returns on Turkish stock market and the world equity markets. In this regard, XU100 (BIST100) USD based return index and MSCI All Country World Equity Index have been used as proxies for Turkish and world equity markets, respectively. Using the conditional CAPM relationship on an international setting, the time-varying standard country beta model is defined as:

$$r_{tr,t} = \alpha + \beta_t r_{w,t} + e_t \qquad (1)$$

where r_{tr} represents the rate of return on domestic equities, r_w represents the rate of return on the global stock index and e_t is the random disturbance term. The parameter β is the basic country risk measure; as interpreted in standard CAPM when β increases, the country risk and hence the required (or expected) rate of return on domestic equities increases in relation to the global equities. The sample period chosen for analysis includes the recent global financial crisis which affected national stock markets to varying degrees. In order to account for possible impact of the crisis upon country beta we have utilised a crisis dummy. The breakpoint date was chosen by graphical observation of the data (Figure 1) and Zivot-Andrews and Perrron unit root tests with one structural break. Zivot-Andrews and Perron tests indicate a break point on July 2008 which is clearly seen from Figure 1 as well.[1]

Figure 1: Time Series Plot of Turkish and World Equity Indices and Returns



Accordingly, we have also estimated the above model with a crisis dummy which takes the form:

$$r_{tr,t} = \alpha + \beta_t r_{w,t} + \gamma D_c r_{w,t} + \varepsilon_t \qquad (2)$$

[1] Test results were not presented here for space considerations but are available upon request from the authors.

where D_c is a dummy variable taking the value of unity in July 2008 and zero otherwise.

However, empirical findings suggest that the expected returns of financial assets depend on the macroeconomic variables within the economic cycle (Fama and French, 1989; McQueen and Roley, 1993). Moreover, Ferson and Harvey (1991) and Jagannathan and Wang (1996) suggest that beta risk is time varying in part as a result of business cycles and the evidence presented by Dumas (1994), Erb et al. (1994, 1996a) and Diemonte et al. (1996) support this argument.

Within this framework, it is expected that the relation between the returns on domestic equities and the returns on the global equities be strongly related to macroeconomic variables, and consequently the parameter beta is also expected to vary significantly, as a response to macroeconomic shocks. The issue that needs to be addressed in this context is not related to the endogeneity of the country risk, since this is well established, but which and how macroeconomic variables are capable of significantly influencing the country risk (Andrade and Teles, 2006). In this sense, the central aim of this paper is to build an econometric model to evaluate the explanatory power of various macroeconomic variables in explaining Turkish country risk under the country beta approach. Based on this argument a time varying beta risk can be expressed as:

$$\beta_t = b_0 + \sum_{i=1}^{N} b_i E_{it} + u_t \tag{3}$$

where b_0 and b_i are the parameters to be estimated; E_{it} is the ith economic risk factor affecting beta at time t and u_t being the independent and identically distributed random disturbance term.

In modelling the relationship between stock market returns and macroeconomic risk factors, various indicators have been proposed and used in the relevant literature. Factors that potentially influence country risk include industrial production, real economic growth, productivity, unemployment, interest rates, inflation, current account balance related variables, public debt stock and other local factors (Fama, 1970; Chen et al., 1986; Abell and Kruger, 1989; Andersen et al., 2005; Jorion, 1991; Groenewold, 1997; Ely and Robinson, 1997; Kwon and Shin, 1999; Serra, 2000). Our guidance on the selection of explanatory variables comes from Gangemi et al. (2000), Andrade and Teles (2006), Verma and Soydemir (2006), Bilson et al. (2001) and Ferson and Harvey (1991). Bilson et al. (2001) find that domestic money supply, goods prices, real activity, and exchange rates are statistically significant in their association with emerging equity returns. Bilson et al. (2001) did not include interest rate as an important explanatory factor. However, they argued that it is not the interest rate itself but the yield and default spread that are more likely to influence equity returns. Since, there is an active secondary market for government debt securities in Turkey and the Central Bank of the Republic of Turkey's (CBRT) main monetary policy instrument is the short-term interest rate we used treasury average domestic borrowing rate as a potential risk factor explaining Turkish equity returns. The variables Turkish Lira–US Dollar exchange rate *(USD)*, foreign currency basket calculated as 'TL value of 1 USD+0.70 EURO' *(FXB)* and real effective exchange rate index *(REER)* were used as alternative measures for exchange rates but surprisingly none of them found to be statistically significant under different model specifications. This maybe due to the fact that we used the USD based rate of returns for Turkish stocks.

Based on the discussion above, time-varying model of Turkish country beta can be expressed as follows:

$$\beta_t = b_0 + b_1 CPI_t + b_2 EXGD_t + b_3 BUD_t + b_4 RATE_t + b_4 EXPD_t + b_5 REER_t + b_6 XM_t + b_7 RES_t + b_8 LOAN_t + b_9 IPI_t + v_t \quad (4)$$

where all variables are defined as their unanticipated components as estimated by ARIMA modelling of the variables. The abbreviations and brief descriptions for the variables are given in Table 1 below. However, the time-varying equation of beta as represented in Eq. (4) cannot be estimated since beta is not directly observable. The parameters of the model can be estimated by substituting Eq. (4) in time-varying standard country beta model, i.e. Eq. (1). Accordingly, the specific time-varying beta market model of Turkey's country risk to be estimated is:

$$r_{tr,t} = a + b_0 r_{w,t} + b_1 CPI_t r_{w,t} + b_2 EXGD_t r_{w,t} + b_3 BUD_t r_{w,t} + b_4 RATE_t r_{w,t} + b_4 EXPD_t r_{w,t} + b_5 REER_t r_{w,t} + b_6 XM_t r_{w,t} + b_7 RES_t r_{w,t} + b_8 LOAN_t r_{w,t} + b_9 IPI_t r_{w,t} + b_{10} D_c r_{w,t} + \epsilon_t \quad (5)$$

Since Eq. (5) is entirely in terms of observable variables, the values of parameters in Eq. (4) can indirectly be estimated.

Our sample period covers the period from January 2003 to August 2015 in monthly intervals.

Table 1: List of Potential Explanatory Economic Variables

Symbol	Description of the Variable	Data Source
RW (r_w)	MSCI All Country World Index Close Value	Bloomberg
RTR (r_{tr})	Istanbul Stock Exchange XU100 USD Based Return Index Close Value	BIST
DUM	Dummy variable for the 2007 – 2008 Global Financial Crises	–
CPI	Turkey Consumer Prices Index (2003=100)	SIS
EXGD	Government External Debt Stock (million TL) deflated by CPI	Treasury
BUD	Ratio of central government budget revenues to budget expenditures	Min. of Finance
RATE	Public Sector Average Domestic Borrowing Rate	Treasury
EXPD	Private Sector Long Term External Debt Stock (million USD)	CBRT
REER	Real Effective Exchange Rate, CPI Based (2003=100)	CBRT
XM	Ratio of Goods and Services Exports to Imports	CBRT
RES	CBRT International Reserves (million USD)	CBRT

LOAN	Total Bank Loans to Private Sector (2003 Constant Consumer Prices, Thousand TL)	CBRT
IPI	Industrial Production Index (2010=100)	SIS

We transformed the data in the following manner. First, Turkish Lira denominated variables were deflated by *CPI* and all data series were expressed in natural logarithms except *BUD, RATE* and *XM* were expressed in percentage terms. Second, variables were adjusted for seasonality. Then we take the first differences of all logarithmic variables to obtain continuously compounded rates of return and growth rates. Descriptive statistics of the variables employed in the study are presented in Table 2.

Table 2: Descriptive Statistics of the Return Series and Macroeconomic Variables

	Mean	Median	Max.	Min.	SD	Skew.	Kurt.	JB	Prob.	Obs.
BUD	0.9131	0.9327	1.5296	0.5296	0.1323	0.1230	5.5702	42.2204	0.0000	152
CPI	0.0068	0.0066	0.0255	-0.0063	0.0049	0.4201	3.9315	9.9012	0.0071	151
EXGD	0.0023	0.0020	0.0489	-0.0443	0.0162	-0.0428	3.0612	0.0698	0.9657	151
EXPD	0.0120	0.0117	0.1015	-0.0486	0.0228	0.7693	5.0846	42.2360	0.0000	151
IPI	0.0041	0.0075	0.1386	-0.2356	0.0542	-0.7573	6.4710	90.2345	0.0000	151
LOAN	0.0171	0.0153	0.0889	-0.0465	0.0188	0.5146	5.0195	32.3244	0.0000	151
REER	0.0004	0.0033	0.0624	-0.1083	0.0290	-0.9379	5.1653	51.6362	0.0000	151
RES	0.0091	0.0107	0.1314	-0.0766	0.0333	0.3204	4.0148	9.0631	0.0108	151
RATE	0.1589	0.1294	0.5993	0.0569	0.1047	2.2650	8.8432	346.2088	0.0000	152
RTR	0.0107	0.0284	0.2834	-0.5085	0.1134	-0.8585	5.2877	51.4758	0.0000	151
RW	0.0051	0.0110	0.1087	-0.2220	0.0459	-1.1839	6.8028	126.2608	0.0000	151
XM	0.7228	0.7208	0.9737	0.5836	0.0676	0.5775	4.0894	15.9647	0.0003	152

Then, we checked the time series properties of each variable by performing unit root tests. Test results are presented in Table 3. Results clearly indicate that *CPI, EXGD, EXPD, IPI, REER* and *RES* are I(1) while *RTR* and *RW* are I(0), as expected. Results for *BUD, LOAN, XM* and *RATE* are somewhat mixed, so we further investigated the stationarity of these series by applying breakpoint unit root tests under alternative model specifications and the results are presented in Table 4. For *BUD*, although ADF and PP tests indicate that the series is I(0), the null hypothesis of stationarity under KPSS test can be rejected. On the other hand, the null hypothesis of unit root process is rejected under different trend and break specifications so we regard *BUD* as I(0). According to ADF and KPSS tests *XM* seems to be I(1) but the null hypothesis of unit root process is strongly rejected under the PP test. All specifications of unit root with break tests confirm the result that the series is I(1). *RATE* is expected to be I(0) *a priori* like the other return series but the null hypothesis of stationarity under KPSS test is strongly rejected again. Considering possible breaks and referring to unit root with break test results we decided that this series is also I(0). Unit root with break test for *LOAN* under the model specification including trend and intercept indicates that the null hypothesis of unit root cannot be rejected and this result led us to include this variable as I(1).

Table 3. Unit Root Test Results

	ADF		PP		KPSS	
	Trend+Interc.	Intercept	Trend+Interc.	Intercept	Trend+Interc.	Intercept
BUD: Level	-10.03***	-9.36***	-0.2137***	-9.9811***	0.1477*	0.5456**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
1st Dif.	-9.79***	-9.72***	-63.01	-58.08***	0.1205*	0.2470
	(0.0000)	(0.0000)	(0.0001)	(0.0001)		
CPI: Level	-3.1713*	-1.2918	-3.3691*	-1.2679	0.2870***	1.4952***
	(0.0942)	(0.6327)	(0.0595)	(06437)		
1st dif.	-10.83***	-10.83***	-10.98***	-10.86***	0.0410	0.1589
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
EXGD: Level	-2.8893	-1.5338	-2.8808	-1.5271	0.0976	1.4370***
	(0.1690)	(0.5139)	(0.1717)	(0.5173)		
1st dif.	-13.30***	-13.27***	-13.32***	-13.37***	0.0367	0.0847
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
EXPD: Level	-0.7959	-2.0544	-0.8797	-1.7775	0.3186***	1.2178***
	(0.9629)	(0.2636)	(0.9546)	(0.3905)		
1st dif.	-7.8186***	-3.8448***	-8.3103***	-8.0814***	0.1521**	0.4200*
	(0.0000)	(0.0031)	(0.0000)	(0.0000)		
IPI: Level	-2.8812	-1.8638	-5.0023***	-1.3272	0.1331*	1.2993***
	(0.1716)	(0.3487)	(0.0003)	(0.6161)		
1st dif.	-24.01***	-24.02***	-26.42***	-26.09***	0.0566	0.0597
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
LOAN: Level	-2.1848	-3.5026***	-1.7366	-2.7258*	0.2490***	1.4355***
	(0.4942)	(0.0092)	(07302)	(0.0720)		
1st dif.	-10.2804***	-4.0277***	-10.5312***	-10.1392***	0.0911	0.4749**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
XM: Level	-2.2467	-2.4170	-5.7871***	-5.3027***	0.1077	0.3932**
	(0.4600)	(0.1388)	(0.0000)	(0.0000)		
1st dif.	-13.8397***	-13.8250***	-25.8519***	-25.2201***	0.0726	0.1866
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
REER: Level	-3.0508	-2.8366*	-2.8916	-2.8878**	0.2965***	0.3200
	(0.1222)	(0.0556)	(0.1682)	(0.0491)		
1st dif.	-9.2668***	-9.0469***	-9.1805***	-9.0699***	0.0328	0.2952
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
RES: Level	-0.9846	-1.7893	-1.3407	-1.6809	0.1968**	1.3858***
	(0.9421)	(0.3847)	(0.8738)	(0.4389)		
1st dif.	-12.1543***	-11.9286***	-12.2212***	-12.1019***	0.0598	0.2233
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
RATE: Level	-4.2476***	-5.4158***	-4.0601***	-4.9304***	0.2004**	1.1369***
	(0.0049)	(0.0000)	(0.0088)	(0.0001)		
1st dif.	-9.8127***	-9.3271***	-10.0764***	-9.7680***	0.1122	0.4677**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
RTR: Level	-11.5953***	-11.4027***	-11.5888***	-11.4027***	0.0363	0.3256
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
1st dif.	-10.2683***	-10.3027***	-70.2321***	-65.9535***	0.2389***	0.2390
	(0.0000)	(0.0000)	(0.0001)	(0.0001)		
RW: Level	-9.8510***	-9.8074***	-10.0289***	-9.9949***	0.0719	0.1182
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		
1st dif.	-12.2051***	-12.2481***	-21.4553***	-21.5348***	0.0185	0.0245
	(0.0000)	(0.0000)	(0.0000)	(0.0000)		

Critical values for KPSS unit root test at 1%, 5% and 10% are 0.2160, 0.1460 and 0.1190 for the model with trend and intercept; 0.7390, 0.4630 and 0.3470 for the model with only intercept, respectively. ***, ** and * indicate the rejection of null hypothesis at 1%, 5% and 10% significance levels. Values in parentheses are the associated one-sided p-values for the relevant test statistic.

Table 4: Unit Root with Break Test Results

Trend specification		Intercept	Trend and intercept		
Break specification		Intercept[1]	Intercept[2]	Trend[3]	Both[4]
BUD	Level	-11.2419***	-11.5995***	-11.3811***	-12.2708***
		2005M01	2008M08	2005M10	2008M08
	First Difference	-11.4738***	-11.4138***	-9.9901***	-11.7439***
		2007M03	2007M03	2004M07	2007M03
LOAN	Level	-4.6681**	-3.7106	-3.6797	-3.8636
		2010M02	2005M03	2005M12	2005M06
	First Difference	-11.1837***	-11.1550***	-10.6318***	-11.1417***
		2005M12	2005M12	2008M12	2009M08
XM	Level	-3.5609	-3.4127	-2.6585	-4.1358
		2009M10	2010M06	2011M06	2010M06
	First Difference	-14.4820***	-15.2178***	-13.8513***	-4.1358
		2009M02	2009M02	2015M08	2010M06
RATE	Level	-5.9593***	-4.5286	-4.3970*	-4.3787
		2008M11	2008M11	2015M02	2015M02
	First Difference	-10.2957***	-10.2739***	-10.6255***	-11.0281***
		2005M02	2005M02	2004M07	2006M07

***, ** and * indicate the rejection of the null hypothesis at 1%, 5% and 10% significance levels, respectively. Values in parentheses for ADF t-statistics are Vogelsang (1993) asymptotic one-sided p-values.

(1) Test critical values at 1%, 5% and 10% significance levels are -4.9491, -4.4436 and -4.1936, respectively.

(2) Test critical values at 1%, 5% and 10% significance levels are -5.3476, -4.8598 and -4.6073, respectively.

(3) Test critical values at 1%, 5% and 10% significance levels are -5.0674, -4.5248 and -4.2610, respectively.

(4) Test critical values at 1%, 5% and 10% significance levels are -5.7191, -5.1757 and -4.8940, respectively.

In an efficient financial market, it is expected that the stock market reacts only to unanticipated components of macroeconomic variables. Although earlier studies on the efficiency of the Turkish stock market provides evidence against market efficiency (Balaban, 1995; Balaban et al., 1996; Balaban and Kunter, 1997; Metin et al., 1997), using variance-ratio test statistics (which have better size properties and power than ADF test statistic) Ozdemir (2008) states that the Turkish stock market is efficient in later periods. As Elton et al. (2014) and Chen et al. (1986) argue, all the relevant explanatory factors in a multi-factor or multi-index asset pricing model should be measured as surprises or innovations, i.e. the unanticipated (unexpected) component of the variables. Before the estimation of the multi-factor model employed in this study, following the previous literature (e.g. Gangemi et al., 2000; Bilson et al., 2001; Verma and Soydemir, 2006; Andrade and Teles, 2006), first we measured the unanticipated components as the residuals from ARIMA models fitted to the macroeconomic data. A further advantage to using unanticipated components (residuals of the ARIMA models) of the macroeconomic risk factors as possible explanatory variables is that the potential problem of multi-collinearity is minimised (Gangemi et al., 2000). As displayed in Table 5, the highest correlations are around 0.38–0.39 for *RW–EXGD, RW–EXPD, RES–EXPD* and *RATE–REER*. All other correlations are around or less than 0.30 in absolute value.

Table 5: Correlations Between Unexpected Components of the Macroeconomic Variables (Residuals of the ARIMA Models), Sample: 2004M02 – 2015M08

	BUD	CPI	EXGD	EXPD	IPI	LOAN	XM	REER	RES	RATE
CPI	0.05775	1.0000								
EXGD	-0.1885	-0.0129	1.0000							
EXPD	0.2080	0.0205	0.2968	1.0000						
IPI	0.0794	0.0421	-0.0298	0.0045	1.0000					
LOAN	0.0294	-0.2436	-0.1500	-0.0921	0.1947	1.0000				
XM	-0.0786	-0.0448	-0.0614	-0.1693	-0.0591	-0.0432	1.0000			
REER	-0.0063	-0.0075	0.1159	0.0470	-0.0085	-0.0656	-0.1283	1.0000		
RES	-0.0452	-0.1541	0.2788	0.3802	-0.0187	-0.0017	-0.0032	0.3100	1.0000	
RATE	0.2549	0.1157	0.0141	0.0701	0.0095	-0.0306	0.0824	-0.3765	-0.0385	1.0000
RW	-0.0239	0.0055	0.3735	0.3858	0.0894	-0.0535	-0.2598	0.2695	0.3274	-0.1469

The most appropriate ARIMA models were identified by using various information criteria and by examining the autocorrelation of the residuals of each model fitted. The summary of the estimation results of the ARIMA models are provided in Appendix 1.

4. RESULTS

Single-Index Market Model without and with the Dummy Variable

Before the estimation of the full model expressed in equation (5), the results of the single index market model (SIMM) regressions with and without the crisis dummy variable are reported in Table 6. Referring to the table, SIMMs (without and with the crisis dummy, which takes the value of 1 in 2008M07, and 0 otherwise) were found to be significant in explaining Turkish USD based stock market returns with adjusted R^2 values of 45 per cent and 49 per cent, respectively. Indeed, Turkey's estimated betas of 1.5960 and 1.6248 were found to be statistically significant at the 1% level under both models. As expected, the recent global financial crisis had a positive (positive in the sense that Turkey's relative country risk had diminished) effect on Turkish stock market returns. Under both models, Turkey's estimated country betas are very high in this period, which renders support to the findings of Harvey (1995a), (1995b), Verma and Soydemir (2006) and Bekaert and Harvey (2014). Bekaert and Harvey (2014) demonstrates that in 2000's emerging market betas have increased compared to 1990's as a result of increased integration with the world capital markets, fluctuating between 1.2–1.6 band, making them a risky, high expected return asset class. High R^2 values indicate that global stock market returns have significantly high power in explaining USD based Turkish stock market returns. To the extent that world economic indicators explain global stock returns, they may explain the variability in Turkish stocks' returns due to increased integration. This issue is beyond the scope of this paper and will be the subject of another research.

Serial autocorrelation tests show no autocorrelation in residuals, with Durbin–Watson values around 2. The Breusch–Godfrey LM tests also indicate no evidence of autocorrelation up to lag lengths of 12. Breusch-Pagan-Godfrey unconditional heteroskedasticity tests indicate the existence of heteroskedasticity at 5% and 10% significance levels for model (1) and model (2), respectively. In contrast, LM tests for ARCH effects produced statistically insignificant values up to lag lengths of 12. We also test the stability of the estimated parameters of both models using the CUSUM and CUSUM of squares tests. Results suggest the parameters are stable for both models. (Figure 2 and Figure 3)

Table 6: SIMM Regression Results with and without the Crisis Dummy Variable

		Model 1 SIMM	**Model 2 SIMM with Dummy**
Constant	Coefficient	0.0018	–0.0003
	Std. Error	0.0070	0.0067
	t-Statistic	0.2617	–0.0439
	Probability	0.7940	0.9650
RW	Coefficient	1.5960***	1.6248***
	Std. Error	0.1497	0.1439
	t-Statistic	10.6630	11.2914
	Probability	0.0000	0.0000
RW*DUM	Coefficient	—	–10.2405***
	Std. Error	—	2.8745
	t-Statistic	—	–3.5625
	Probability	—	0.0005
Adjusted R^2		0.4495	0.4928
F-statistic		113.6986	68.0467
Prob (F-stat.)		0.0000	0.0000
D–W stat.		2.0347	2.0174
Breusch–Godfrey Serial Correlation LM Test	F(1,136)	0.0562	0.0200
	Prob.	[0.8130]	[0.8877]
	F(4,133)	1.0988	0.5749
	Prob.	[0.3599]	[0.6813]
	F(8,129)	1.6646	1.4834
	Prob.	[0.1131]	[0.1694]
	F(12,125)	1.1774	1.2774
	Prob.	[0.3064]	[0.2401]
Breusch-Pagan-Godfrey Heteroskedasticity Test	F(2,136)	4.5218**	2.3519*
	Prob.	[0.0353]	[0.0990]
ARCH(1)	F(1,136)	0.1385	0.1393
	Prob.	[0.7104]	[0.7095]
ARCH(4)	F(4,130)	0.3372	0.4186
	Prob.	[0.8525]	[0.7950]
ARCH(8)	F(8,122)	0.6299	0.7004
	Prob.	[0.7514]	[0.6907]
ARCH(12)	F(12,114)	0.5834	0.7300
	Prob.	[0.8518]	[0.7196]
J–B Normality Test	J–B test stat.	3.8901	4.7971*
		[0.1430]	[0.0908]

Figure 2: CUSUM and CUSUM of Squares Tests for Model 1 (SIMM)

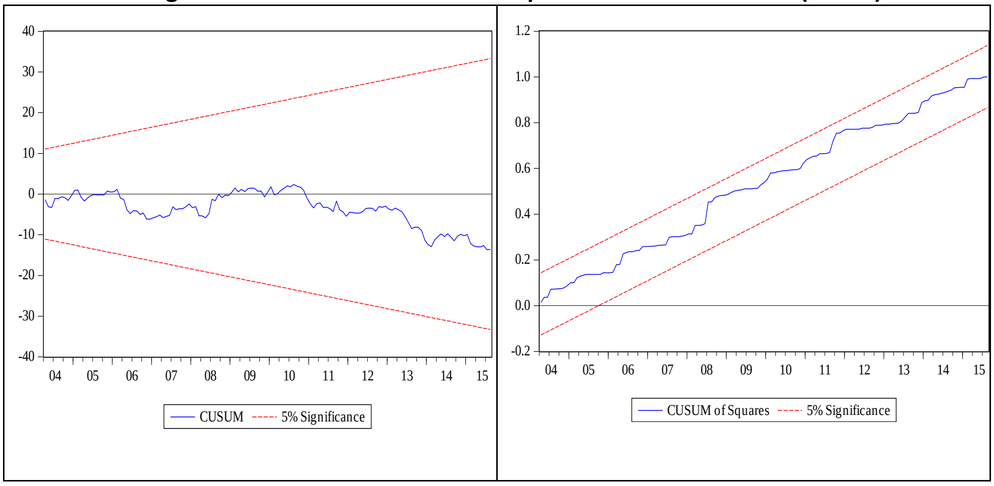
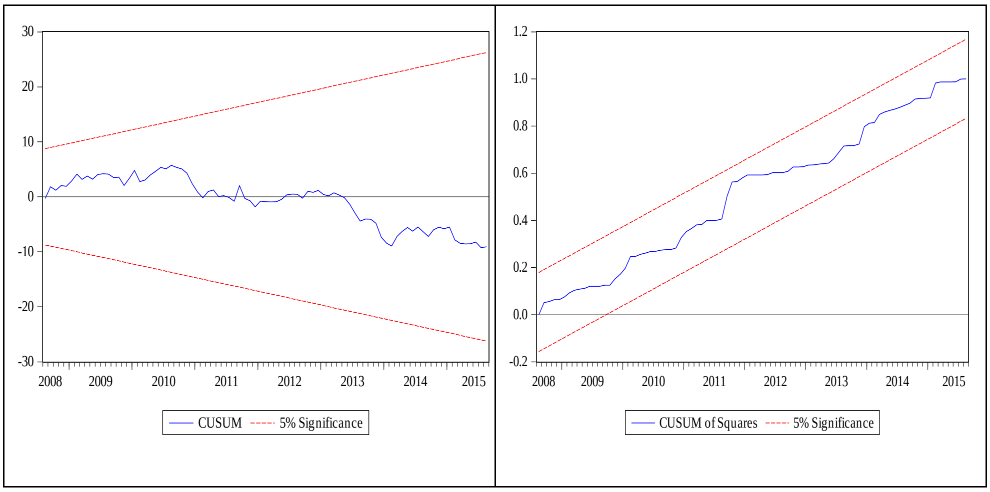


Figure 3: CUSUM and CUSUM of Squares Tests for Model 2 (SIMM with the break)



Macroeconomic Variable Augmented Country Beta Model

For the estimation of the full model in accordance with equation (5), we created new variables by interaction of global stock market returns and the unanticipated components of the macroeconomic variables. The sample period used in estimating equation (5) after adjustments spans over the period from February 2004 to August 2015. The estimation results of the full model are reported in Table 7. These results show that of the interactive macroeconomic variables, government external debt stock *(EXGD)*, government domestic borrowing interest rate *(RATE),* private sector long-term external debt stock *(EXPD)* and the dummy variable *(DUM)* have significant effect in explaining Turkish country beta and stock returns. This model explains 45 percent (adjusted R^2) of the variation in Turkish stock returns. The Durbin–Watson statistic takes a statistically insignificant value of 2.2425, which is consistent with the Breusch–Godfrey LM test results up to 12 lags. The Breusch-Pagan-Godfrey heteroskedasticity test value of 4.5218 indicates the presence of unconditional heteroskedasticity at 5% significance level. However, an absence of conditional heteroskedasticity is indicated by the statistically insignificant values of the ARCH LM tests up to 12 lags.

Table 7: Full Model Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Probability
C	0.0061	0.0057	1.0823	0.2812
RW	1.1729	0.1259	9.3141	0.0000
CPI*RW	-0.3243	33.5934	-0.0097	0.9923
EXGD*RW	-27.0264	9.8427	-2.7459	0.0069
BUD*RW	-0.7054	1.3553	-0.5205	0.6037
RATE*RW	38.7547	15.4814	2.5033	0.0136
EXPD*RW	26.4623	9.6093	2.7538	0.0068
REER*RW	4.1288	6.0391	0.6837	0.4954
XM*RW	2.4838	2.5432	0.9766	0.3306
RES*RW	7.4175	6.0916	1.2177	0.2256
LOAN*RW	-3.9623	13.8999	-0.2851	0.7761
IPI*RW	-2.1214	3.5341	-0.6003	0.5494
DUM*RW	-6.7761	2.2192	-3.0534	0.0028
Adjusted R^2	0.4501			
F-statistic	10.4142			
Prob (F-stat.)	0.0000			
D–W stat.	2.2125			
Breusch–Godfrey Serial Correlation LM Test	F(1,125)	1.8373		
	Prob.	[0.1777]		
	F(4,122)	0.7775		
	Prob.	[0.5419]		
	F(8,118)	1.5160		
	Prob.	[0.1588]		
	F(12,114)	1.2725		
	Prob.	[0.2444]		
Breusch-Pagan-Godfrey Heteroskedasticity Test	F(12,126)	4.5218**		
	Prob.	[0.0461]		
ARCH(1)	F(1,136)	0.0767		
	Prob.	[0.7823]		
ARCH(4)	F(4,130)	0.1622		
	Prob.	[0.9571]		
ARCH(8)	F(8,122)	0.6602		
	Prob.	[0.7255]		
ARCH(12)	F(12,114)	0.9870		
	Prob.	[0.4657]		
J–B Normality Test	J–B test stat.	1.3472		
	Prob.	[0.5099]		

Given that the full model includes a number of statistically insignificant variables, a more parsimonious model was estimated, whereby the significant macroeconomic variables along with the structural break dummy variable were included. The estimation results for this parsimonious model is reported in Table 8. Once again, along with the structural break dummy, those macroeconomic variables found to be significant in the full model estimation namely *EXGD*, *RATE* and *EXPD*, proved to be statistically significant in explaining Turkish country beta and stock returns under the parsimonious model. This model explains 54.64 percent of the variation in Turkish stock market returns.

The explanatory power of the parsimonious model increased significantly, as indicated by adjusted R^2's, over both single index market models (without and with the dummy variable) and full macroeconomic variable augmented market model. The Durbin–Watson statistic of 1.9694 indicates an absence of autocorrelation in residuals. This absence of autocorrelation is supported by Breusch–Godfrey serial correlation LM tests as well. The Breusch-Pagan-Godfrey and Glejser heteroskedasticity F test statistics take statistically insignificant values, supporting the absence of unconditional heteroskedasticity. Besides, insignificant ARCH LM conditional heteroskedasticity F test statistics enable us to reject the null hypothesis of conditional heteroskedasticity. On the other hand, the residuals from the estimated model seem to be non-normal as the Jarque–Berra test statistic takes a value of 5.3009 which is significant at 10%. Overall, with respect to the results of the diagnostic tests the estimated parsimonious model seems to be well-specified.

Table 8: Parsimonious Macroeconomic Model Estimation Results

Variable		Coefficient	Std. Error	t-Statistic	Probability
C		-0.0009	0.0068	-0.1369	0.8913
RW		1.6661	0.1484	11.2266	0.0000
EXGD*RW		-24.7575	10.0163	-2.4717	0.0147
RATE*RW		34.8123	13.0256	2.6726	0.0085
EXPD*RW		31.6754	9.6039	3.2982	0.0012
DUM*RW		-9.3797	2.7264	-3.4403	0.0008
Adjusted R^2		0.5464			
F-statistic		34.2428			
Prob (F-stat.)		0.0000			
D–W stat.		1.9694			
Breusch–Godfrey Serial Correlation LM Test	F(1,132)		0.0114		
	Prob.		[0.9150]		
	F(4,129)		0.5622		
	Prob.		[0.6905]		
	F(8,125)		1.1879		
	Prob.		[0.3115]		
	F(12,121)		0.8621		
	Prob.		[0.5870]		
Breusch-Pagan-Godfrey Het. Test	F(5,133)		0.3000		
	Prob.		[0.9121]		
Glejser Heteroskedasticity Test	F(5,133)		0.7175		
	Prob.		[0.6114]		
ARCH(1)	F(1,136)		0.6068		
	Prob.		[0.4373]		
ARCH(4)	F(4,130)		0.3843		
	Prob.		[0.8195]		
ARCH(8)	F(8,122)		0.5182		
	Prob.		[0.8409]		
ARCH(12)	F(12,114)		0.7073		
	Prob.		[0.7416]		
J–B Normality Test	J–B test stat.		5.3009		
	Prob.		[0.0706]		

The stability of the estimated parameters of both models using the CUSUM and CUSUM of squares test results suggest the parameters are stable for both models. (Figure 4 and Figure 5)

Figure 4: CUSUM and CUSUM of Squares Tests for the Full Model

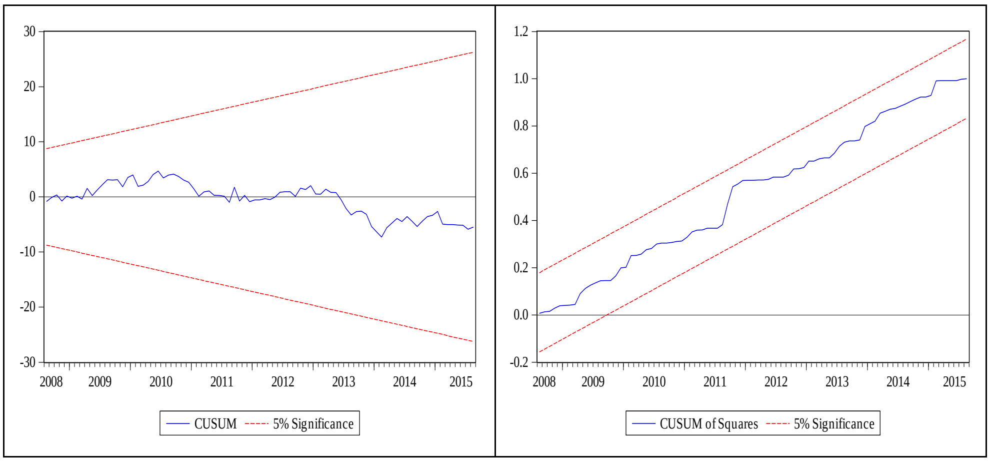
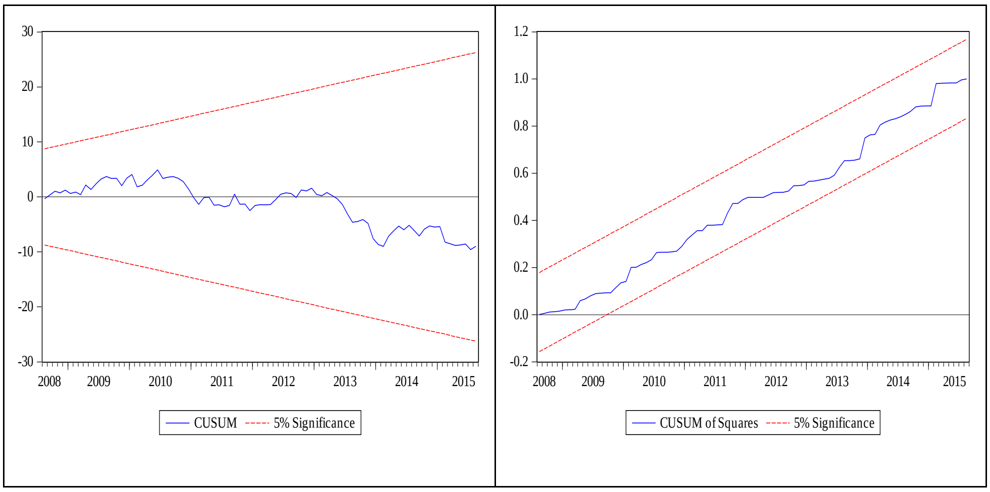
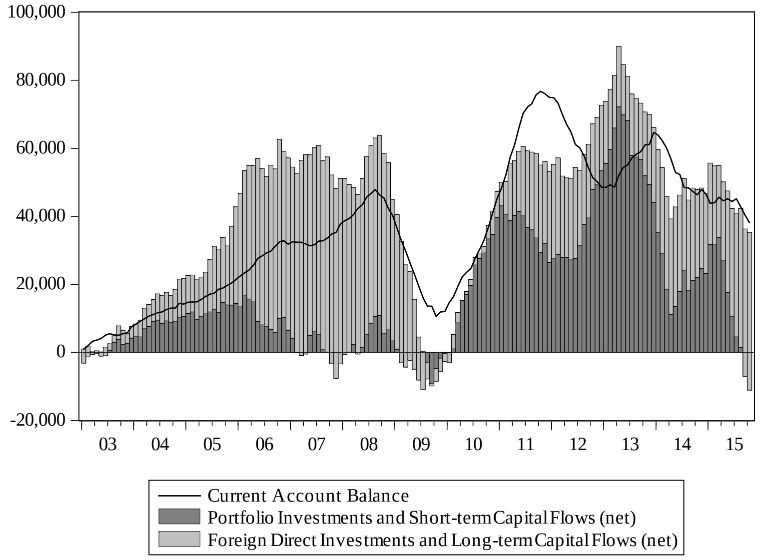


Figure 5: CUSUM and CUSUM of Squares Tests for the Parsimonious Model



According to the outcome of our preferred parsimonious model the base value for Turkey's country beta is 1.6661. Further, the results suggest that Turkey's country beta is affected negatively by a positive change in external government debt stock while a change in long-term external private debt stock has a positive impact on the beta. Turkey's structural current account deficits (especially resulting from heavy dependence on intermediate goods imports) have been a constraint on her economic growth (Elitok and Campbell, 2008; Halicioglu, 2012) and necessitates foreign capital inflows to finance domestic demand. Political and economic stability achieved after the economic crises of 2000–2001 and favorable global liquidity conditions in 2000's until the collapse of the global financial markets and hence the world economy, enabled Turkish banks and corporations to raise foreign currency denominated funds in international financial markets. While increased access to international financial markets had favourable impact on Turkey's economic growth, increased reliance on foreign external financing led to increased foreign exchange risk and balance sheet fragility of the corporate sector. Thus, sustainability of current account deficits has been a serious concern for policymakers, international institutions and investors. These concerns may have led to an increase in country risk premium and hence may have had a positive impact on country risk. In Figure 6 we plot Turkey's current account deficits and net short- and long-term capital flows in million USD.

Figure 6: Turkey's Current Account Deficits and Foreign Capital Flows (Million USD, 12 months cumulative)



At first glance, the negative relationship between the changes in government external debt stock and the country beta may be surprising or contradictory but because, the private sector external debt stock has increased rapidly relative to the government debt stock after 2000–2001 economic crises, concerns seem to shift from government finances to the sustainability of private sector external debt and current account deficits. Increased confidence in Turkish economy as reflected in decreasing country risk premium, made the government sector (including monetary policy) as the soundest pillar of Turkish economy together with the banking system. This positive relationship between the government external debt and the country risk may simply reflect these developments. This interpretation is reinforced by the above discussion about the private sector external debt stock. Indeed, when we excluded *EXGD* from our parsimonious model estimation, *EXPS*'s coefficient still took a statistically significant positive value. We also estimated the model without the *EXPD* and found that *EXGD*'s coefficient took a negative but insignificant value. Furthermore, besides being the benchmark market interest rate, movements in government's domestic borrowing rate in this period mainly stemmed from monetary policy operations and developments in international politics and world economy. Figure 7 plots the public sector borrowing requirement and public and private sector gross external debt stock as percentages of GDP.

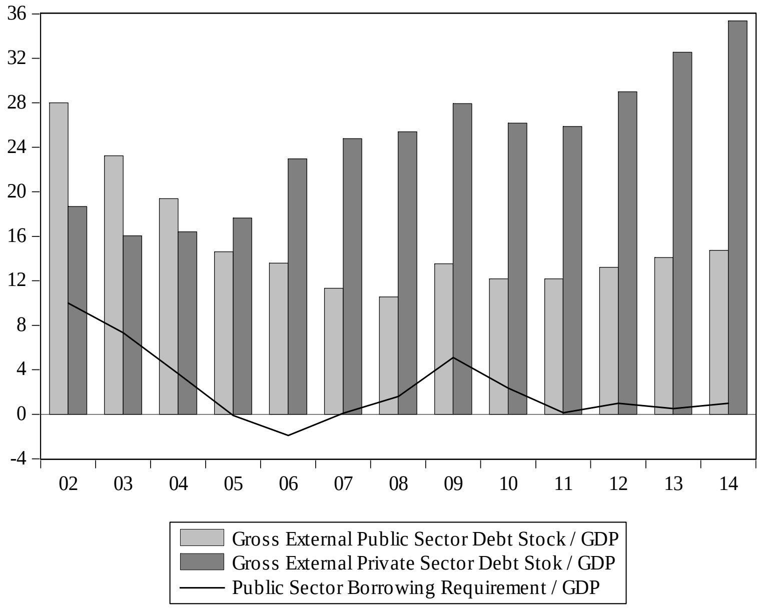


Figure 7: Government Budget Balance, Government and Private External Debt Stock (%)

Since the interest rate on government domestic debt securities *(RATE)* is regarded as the risk-free rate, its statistically significant positive coefficient estimate is in line with the fundamental notion of risky asset pricing theories, i.e. risky assets are priced as risk premium over risk-free rate. The coefficient on the break dummy is again statistically significant and takes a negative value as in SIMM with the break and full model estimations. In July 2008 (break date) while the global stock prices fell 2.75 per cent, Turkish stock market USD based index rose by 23.69 per cent of which about 5 per cent is attributable to the appreciation of Turkish Lira against USD in this month. As a result, the time-varying country beta estimate takes a negative value of -8.64 in July 2008 (Figure 8). We also produced the plot of Turkey's country beta by using our preferred parsimonious model. Figure 8 shows Turkey's country beta over the period 2004M02–2015M08, including the structural break, while Figure 9 shows the same plot excluding the break dummy. Table 9 shows associated summary statistics for the conditional beta series produced.

Figure 8: Turkey's time-varying country beta (Parsimonious model, including the break)

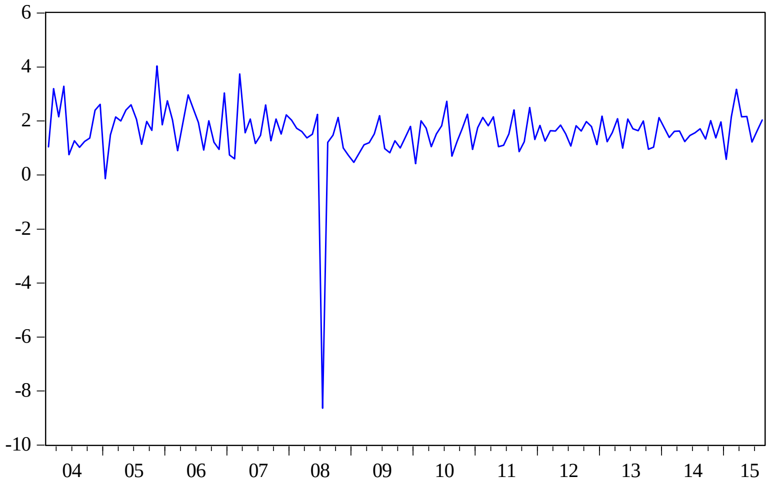
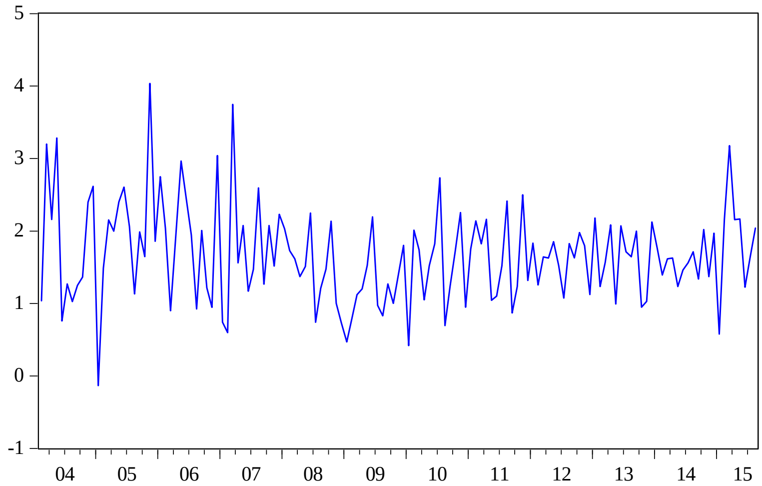


Figure 9: Turkey's time-varying country beta (Parsimonious model, excluding the break)



According to statistics presented in Table 9, we see that the average time-varying beta is 1.5954 (1.6629 with the break excluded). These averages are higher than the point estimate of 1.6661 reported in Table 9. Further, we see that (aside from the crash beta) betas vary between a low of -0.1334 to a high of 4.0341. Hence, while the point estimate accurately captures the mean effect of beta over the period, it ignores the time-varying nature of Turkey's country beta.

Table 9: Descriptive statistics for the time-varying country beta estimated using the parsimonious mode, 2004M02–2015M08

	Including the Break Dummy	Excluding the Break Dummy
Mean	1.5955	1.6629
Median	1.6272	1.6272
Maximum	4.0341	4.0341
Minimum	-8.6389	-0.1334
Std. Dev.	1.0970	0.6672
Skewness	-5.6985	0.5983
Kurtosis	55.8825	4.0338
Jarque-Bera	16,949.04	14.4821
Probability	0.0000	0.0007
Sum	221.7671	231.1468
Sum Sq. Dev.	166.0709	61.4276
Observations	139	139

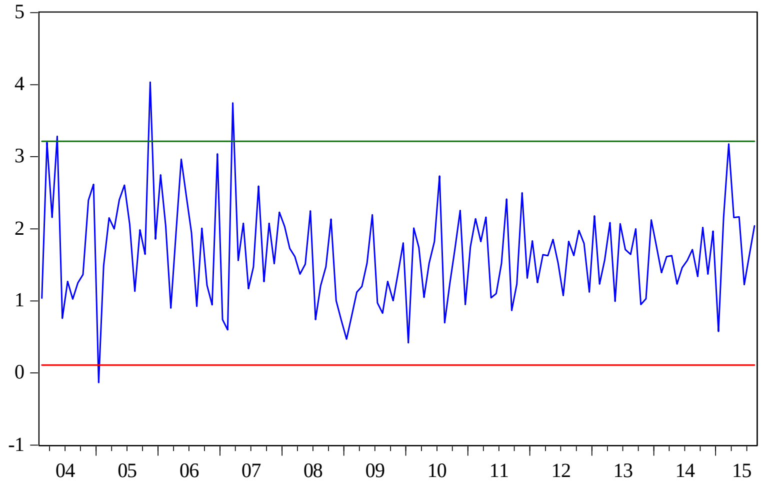
It is quite clearly visible from Figure 8 that, apart from the break date denoting the recent global crisis, the model produces several outliers. Also it is apparent that Turkey's country beta fluctuates more between 2004 and early 2008, compared to the later period. Since the 2004–2007 period is a period of economic and financial restructuring and relatively improving political and macroeconomic stability, concerns and uncertainties regarding whether the government's commitment to pursue sound economic policies and willingness to undertake structural reforms (especially fiscal discipline, price stability and current account deficits) would continue in the future might have caused risk perceptions to be higher in this period.[2]

With respect to outlier betas some are worth mentioning. In Figure 10 we plot the forecasted beta (excluding the break) produced by our parsimonious model and 99% confidence interval bands. From the figure, notably three outlier betas are easily detectable, namely January and November 2005 and March 2007 beta estimates. In January 2005, when the estimated beta takes its minimum value over the whole period, the decline in beta mainly was the result of a decline in interest rates due to a lowering of official O/N borrowing and lending rates by the CBRT which were transmitted rapidly to market interest rates and, a decrease in private sector external debt compared to its previous increasing trend. In November 2005, a large unanticipated increase (6% over the previous month) in private sector external debt accounted for almost all of the positive

[2] Using simple structural breakpoint unit root tests we found that there is a structural break around the first half of 2008 in estimated time-varying country beta (excluding the break) series. We divided the whole sample into two subsamples (2004M02 – 2008M03 and 2008M04 – 2015M08) and compared the descriptive statistics of the series. Not surprisingly we found that the average beta and its standard deviation is 1.86 and 0.82 for the first subsample and 1.55 and 0.52 for the latter. Further, beta series are non-normal for the whole sample but normally distributed for the two subsample periods.

change in beta. Finally, in March 2007 unanticipated increases in both private sector external debt and interest rates caused beta to jump to 3.75. Overall, the fluctuations first in unanticipated changes in private sector external debt and then interest rates caused Turkey's country beta to exhibit large volatility in the period considered.

Figure 10: Turkey's time-varying country beta within 99% confidence intervals



5. CONCLUSION

In this paper, following Harvey (1991), Harvey and Zhou (1993), Erb et al. (1996a, 1996b), Gangemi et al. (2000), Verma and Soydemir (2006) and Andrade and Teles (2006), we analysed Turkey's country risk using a time-varying country beta market model incorporating various macroeconomic variables over the period January 2004 to August 2015. In this context, Turkey's country beta is allowed to vary as a function of a set of domestic macroeconomic variables. To our knowledge this is the first study exploring Turkey's country risk using country beta approach. Instead of using observed values of those macroeconomic variables, we tried to decompose the anticipated (expected) and unanticipated (unexpected) components by employing ARIMA models based on the notion that in an efficient market, stock prices only react to unanticipated movements in economic variables.

Among the macroeconomic variables used, only government and private sector external debt and market interest rates found to be statistically significant in influencing Turkey's country beta during the analysis period. According to the outcome of our preferred parsimonious model, the base value for Turkey's country beta is 1.6661. Further, findings suggest that Turkey's country beta is modified in a negative direction by a positive change in external government debt stock while a change in external private debt stock has a positive impact on the beta. These findings reveal an important structural macroeconomic change in Turkish economy during this period. The considerable growth in Turkish private sector's external debt after 2000–2001 economic crises which is inseparably related with increasing current account deficits, has raised concerns on its sustainability and opened up a policy debate regarding its potential adverse effects on the economy. In a period of decreasing domestic private savings but favorable global liquidity conditions and increasing economic and political stability, heavy reliance on foreign capital inflows helped to finance domestic demand and boosted economic growth while current account deficits reached unprecedented levels as a percentage of GDP. On the other hand, due to strengthened fiscal discipline, substantially lowered levels of government external debt (as a percentage of GDP) have acted as a risk-reducing macroeconomic factor. Consequently, it seems to us that concerns about the sustainability of government debt and public finances have shifted to sustainability of private sector external debt and current account deficits.

Another important result revealed in the study is large fluctuations in Turkey's estimated country betas, varying between a low of -0.1334 to a high of 4.0341 excluding the crash dummy. Especially this is more pronounced between 2004 and 2007. Since this sub-period is a period of economic recovery and transformation, concerns regarding the government's commitment to undertake structural reforms, pursue fiscal discipline and high economic and financial fragility may have caused risk perceptions to persist at high levels even under favorable global liquidity conditions.

Finally, the coefficient on the break dummy was statistically significant and takes a negative value as in SIMM with the break and economic variable-augmented model estimations. In July 2008 (break date) while the global stock prices fell 2.75 per cent, Turkish stock market USD based index rose by 23.69 percent of which about 5 percent is attributable to the appreciation of Turkish Lira against USD in this month. As a result, the time-varying country beta estimate takes a negative value of -8.64 in July 2008. This negative coefficient may reflect, relatively sound macroeconomic and financial fundamentals of Turkey vis-à-vis the advanced countries where the economies affected most adversely.

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Appendix 1. ARIMA Modelling of Macroeconomic Variables to Estimate Unanticipated Components

	Macroeconomic Variable				
	BUD	**CPI**	**EXGD**	**EXPD**	**IPI**
Constant	0.9277*** (0.0047)	0.0067*** (0.0002)	0.0016 (0.0017)	0.0149 (0.0123)	0.0039** (0.0016)
AR(1)	1.0149*** (0.0187)	—	—	0.1931*** (0.0585)	–0.5480*** (0.0684)
AR(3)	—	—	0.1517** (0.0817)	0.2384*** (0.0701)	—
AR(4)	—	–0.1981** (0.0762)	—	–0.3271*** (0.0731)	—
AR(7)	—	—	—	0.2241*** (0.0613)	—
AR(9)	—	—	–0.1476** (0.0817)	0.4845*** (0.0694)	—
AR(10)	—	–0.4140*** (0.0994)	—	—	—
AR(11)	—	—	—	—	0.2194*** (0.0694)
AR(12)	–0.0763*** (0.0156)	—	0.2300*** (0.0816)	—	—
MA(1)	-0.9878*** (0.0093)	—	—	—	—
MA(2)	—	—	—	0.3200*** (0.0616)	—
MA(4)	—	—	—	0.2850*** (0.0627)	—
MA(6)	—	—	—	0.4239*** (0.0559)	—
MA(8)	—	—	—	0.1516** (0.0631)	—
MA(9)	—	—	—	–0.6199*** (0.0565)	—
MA(10)	—	0.4266*** (0.0769)	—	—	–0.1842*** (0.0425)
MA(11)	—	—	—	—	–0.6345*** (0.0499)
MA(12)	—	–0.5138*** (0.0722)	—	—	0.4113*** (0.0456)

Standard errors in parentheses. ***, **, * denote significance at 1%, 5% and 10%, respectively.

Appendix 1 continued. ARIMA Modelling of Macroeconomic Variables to Estimate Unanticipated Components

	Macroeconomic Variable				
	LOAN	**XM**	**REER**	**RES**	**RATE**
Constant	0.0131***	0.0002	–0.0008	0.0085**	–0.0478
	(0.0016)	(0.0010)	(0.0008)	(0.0040)	(0.0861)
AR(1)	—	–0.7205***	0.8379***	–0.1987***	—
		(0.0655)	(0.0559)	(0.0739)	
AR(3)	—	0.9569***	—	—	—
		(0.0282)			
AR(4)	0.4606***	0.4548***	—	—	—
	(0.0494)	(0.0744)			
AR(5)	0.5985***	—	—	—	—
	(0.0713)				
AR(8)	—	—	—	–0.5962***	—
				(0.0731)	
AR(10)	–0.2044***	—	—	—	0.3270***
	(0.0634)				(0.0686)
AR(11)	0.2141***	—	—	—	—
	(0.0508)				
AR(12)	–0.2497***	—	—	—	—
	(0.04848)				
MA(1)	—	0.1638***	–0.5321***	0.2196***	—
		(0.0178)	(0.0839)	(0.0537)	
MA(2)	0.3471***	–0.1618***	–0.4385***	0.1516***	—
	(0.0477)	(0.0184)	(0.0777)	(0.0380)	
MA(3)	0.3036***	–0.9717***	—	0.3368***	—
	(0.0582)	(0.0138)		(0.0786)	
MA(4)	–0.7017***	—	—	0.2210***	—
	(0.0688)			(0.0560)	
MA(5)	–0.3446***	—	—	—	0.2816***
	(0.0537)				(0.0658)
MA(8)	—	—	—	0.8199***	—
				(0.0416)	
MA(10)	—	—	—	—	–0.7000***
					(0.0692)
MA(11)	–0.4652***	—	—	0.2206***	—
	(0.0141)			(0.0793)	
MA(12)	–0.0850***	—	—	—	—
	(0.0237)				

Standard errors in parentheses. ***, **, * denote significance at 1%, 5% and 10%, respectively.