# Equity Risk Premium in Turkey

by

Gürhan Canan

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**Abstract**

Equity risk premium (ERP) is the key component of many risk and return models in finance. It is frequently used in academic research and business practice. There exists several approaches to estimate the ERP. This paper reviews shortly different approaches. The selected approaches are used to estimate the ERP for Turkey. Advantages and limitations of each approach are discussed extensively.

**Keywords:** ERP, Dividend Discount Model, Residual Income Model, Country Risk Premium, Time-Series Regressions

**Özet**

Hisse senedi risk primi finansda yer alan birçok risk ve getiri modelinin kilit parçasıdır. Akademik araştrmalarda ve iş dünyasında sıklıkla kullanılmaktadır. Hisse senedi risk priminin tahmin edilmesinde birçok model mevcuttur. Bu çalışmada kısaca farklı modeller gözden geçirilmektedir. Seçilen modeller Türkiye için hisse senedi risk primi tahminlerinde kullanılmaktadır. Her bir modelin avantajları ve kısıtları ayrıntılı olarak tartışılmaktadır.

**Anahtar Kelimeler:** Hisse Senedi Risk Primi, Temettü skontolama Modeli, Artık Gelir Modeli, Ülke Risk Primi, Zaman Serisi Regresyonları

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# 1 Introduction

The equity risk premium (ERP) is the expected rate of return on stocks in excess of the risk-free rate. Put differently, the ERP is the minimum incremental return that investors require to switch from risk-free assets such as Treasury bills to risky stocks.

ERP can formally be defined as follows:

$$ERP_t(k) = E_t(R_{t+k}) - R^f_{t+k} \tag{1}$$

Here, $ERP_t(k)$ denotes the ERP estimate at time t for the time horizon k. $E_t(R_{t+k})$ is the expected rate of return on stocks over the period from t through t+k and $R^f_{t+k}$ is the risk-free rate over the same interval. If we hold t constant and allow k to vary, we obtain the term structure of the ERP at time t.

ERP is an important determination of cost of capital for firms. Managers use it to identify projects that create shareholder value, value potential acquisition targets, and compare the costs of various sources of financing when making capital structure decisions. Investors use the ERP to make asset allocation decisions.

Despite the importance of the ERP, no consensus exists on how to best measure it. Different approaches often yield strikingly different estimates even when they are based on the same set of data. Measuring the ERP is particularly challenging in emerging countries in which there are limited historical data on stock and bond returns and the existing returns are highly volatile.

In this paper, we provide estimates of the ERP in Turkey that are based on various backward and forward-looking estimation approaches as well as survey evidence. Our ultimate objective is to provide the reader practical guidance on a rich set of empirical approaches to estimate the ERP and discuss the advantages and limitations of each estimation approach.

The rest of this paper is organized as follows. We start by reviewing some of the most common approaches used in several academic studies. Then, we use those approaches to estimate the ERP in Turkey. We compare the results of selected approaches based on their advantages, limitations and underlying assumptions. Moreover, we compare our ERP model-based estimates with the ERP estimates reported in some cross-country studies and surveys.

## 2 Literature Review

Only a few academic studies discuss the theoretical and empirical limitations of each approach and compare the ERP estimates based on alternative approaches (see, for example, Damodaran (2012) and Dimson et al. (2003)). Academics and practitioners have proposed various approaches to calculate the ERP[1].

Dimson et al. (2003) estimate the ERP for 17 countries using a 106-year period and find an annual historical geometric average premium of +4.74 percentage points and an arithmetic average premium of +6.07 percentage points. They also find that the geometric and arithmetic average premium decreases to +4.04 percentage points and +5.15 percentage points, respectively, when Treasury bonds are assumed risk-free. Salomons & Grootveld (2003) compare historical ERPs of developed and emerging markets and find that emerging markets have significantly higher premiums, on average. On an equal weighted basis, they find that annualized arithmetic average ERP in The Group of 7 (G7) countries and emerging countries are +3.6 percentage points and +12.7 percentage points, respectively, over the period 1976-2001, suggesting that the ERP is roughly nine percentage points higher in emerging countries than in developed countries. Notably, they find negative arithmetic average ERPs in Egypt, Indonesia, and Pakistan, just like the ERP we find in Turkey.

While several macroeconomic variables appear to predict a significant component of the U.S. ERP in sample Campbell & Thompson (2008), Welch & Goyal (2008) have recently argued that the variables used in earlier studies fail to predict the ERP out of sample.[2]

[1] See, for example, Damodaran (2012), Godfrey & Espinosa (1996), Claus & Thomas (2001), Fernandez et al. (2014), and Welch & Goyal (2008)

[2] Out-of-sample OLS regressions use time-series data available at the time where it can be used to predict future ERP. In other words, out-of-sample OLS regressions are a back-testing procedure to measure the forecasting power of economic variable to be used to predict the future ERP.

# 3 Estimation Approaches

## 3.1 Backward-looking Approaches

### 3.1.1 Historical Premium

In historical ERP calculations, we use BIST 30 Total Return Index as stock index and KYD 91 Days Index as bond index. BIST 30 Total Return Index is a market-capitalization weighted index and includes gross dividends. The KYD 91 Days Index, on the other hand, includes zero-coupon and fixed-rate coupon Treasury bonds denominated in TL. It is also market-capitalization weighted where market capitalization of a bond is calculated by multiplying dirty prices with its nominal issue per hundred TL. BIST 30 Total Return Index includes the stocks that are the most liquid, having the highest free float market capitalization values traded at BIST exchange. The KYD 91 Days Index includes the Treasury bonds which have, on average, three months left to the maturity.

Historical ERP returns are calculated based on buy-and-hold strategy; investor buys a stock and bond portfolio where the weight of each bond and stocks in the index portfolios are assumed to be equal to the weights in indices. Put another way, investor tries to replicate the index portfolio and at the end of holding period, after rebalancing of portfolio, investor rolls its portfolio to the next period. Although it may not be possible to replicate the index portfolio fully, ETF and index funds may be practically solve the replication problem to some extent. There are two BIST 30 ETF but no KYD 91 Days ETF. But there are many fixed income funds which are benchmarked to the KYD 91 Days Index if investor wants to invest in the bond index portfolio.

ERP is the excess return of overall stock market over bond market and we use BIST 30 Index rather than BIST 100 Index, although it is accepted as benchmark index in the stock market, or any other index, such as BIST All Share Index, since we want to remove the liquidity premium out of the ERP as much as possible. On the other hand, Treasury bonds are sufficiently liquid such that liquidity premium of BIST 30 Index stocks over Treasury bonds can be assumed as small as to be ignored.

We start by estimating the historical realized ERP in Turkey using both arithmetic (simple) and geometric average excess stock returns over the risk-free rates. We use monthly data series to calculate the averages and convert them to annual ERPs using the formula below.

$$Geometric\, average\, ERP = (1 + Geometric\, average\, monthly\, excess\, stock\, return)^{12} - 1 \quad (2)$$

The relation between the arithmetic (simple) average and the geometric (compounded) average is given by the formula:

$$r_{arithmetic} = r_{geometric} + \frac{1}{2}\sigma^2 \quad (3)$$

The higher the variance is, the larger the difference will be between the arithmetic and geometric returns. For stocks, the difference between the arithmetic and geometric averages is about 5.60 percent per year in Turkey. For bonds, the difference is much smaller (roughly 10 basis points). As a result, the performance of stocks relative to bonds looks better when arithmetic averages are compared than when geometric averages are compared. If stock and bond returns follow a random walk, the use of annual arithmetic returns is appropriate. However, if there is mean reversion or mean aversion, then the use of arithmetic returns over longer time periods is not appropriate. With mean reversion, the arithmetic average return will be closer to the geometric average return.

As discussed in a white paper by the Capital Markets Association of Turkey (see (TSPAKB, 2011)), the average stock holding period of Turkish investors is approximately 35 days. As a result, we use monthly stock and bond returns in our historical average ERP calculations. Our main estimation period is from January 2002 through December 2014, although, as discussed below, we experiment with various alternative estimation windows. Even though the BIST 30 Index has a history going back to January 1997, we start the ERP estimation on the inception date of the KYD 91 Days Index in January 2002.

Table 1 shows summary statistics for the 156 monthly stock and bond returns during our estimation window. As shown, the average monthly stock return and bond return is +1.81 percentage points and +1.53 percentage points, respectively, suggesting that stocks outperformed bonds in our estimation windows. Not surprisingly, we find that the volatility of stock returns is substantially higher than the volatility of bond returns. We also find that both stock and bond returns are right skewed and exhibit high kurtosis, suggesting that the distribution of the returns are not exactly normal.

To examine when stocks outperformed bonds (and vice versa), in Figure 1, we plot the difference between monthly stock and bond returns. As shown, we find that the difference between monthly stock and bond returns varies greatly over our estimation window and this is mainly due to the high volatility of stock returns rather than bond returns, as shown in Figure 1. We also observe that stocks significantly under-perform over bonds in years 2002, 2003 and 2008 where Turkey have faced the negative impact of 2001 local crisis and 2008 global financial crisis respectively.

Overall, as shown in Table 2, we find that the historical geometric average ERP is -2.45 percentage points, whereas the historical arithmetic average ERP is +3.95 percentage points. The difference between the two estimates arises from high stock return volatility during our estimation period, as discussed before. We extend the initial historical ERP estimates several different ways and report our findings in Table 2. First, we extend our sample period by using data reported in (Basci & Ekinci, 2005) for the period from 1990 through 2001.[3] For the extended period from 1990 through 2014, we find that the historical geometric average ERP is slightly more negative (-4.37 percentage points). Because (Basci & Ekinci, 2005) do not report the arithmetic averages of their return series, we could not calculate the arithmetic average ERP for the extended period. Second, we examine whether historical realized ERP estimates are sensitive to the estimation window. Indeed, we find that the sign of results as well as the magnitude of the ERP estimates are quite sensitive to when we start our estimation window. For example, if we estimate the historical ERP for the period 2004 through 2014, instead of the 2002 through 2014 period, we find a geometric average monthly ERP of +3.81 percentage points. This is 6.26 percentage points higher than the original estimate. The increase is mainly due to excluding years 2002 and 2003 during which stocks substantially underperformed bonds (see Figure 1). Third, we estimate the ERP using quarterly and annual stock and bond returns, instead of monthly returns, and find that the geometric average ERP is not very sensitive to

[3](Basci & Ekinci, 2005) find an annual geometric average nominal stock return (real bond return) of +90.96 (+14.12) percentage points for the period 1990-2001. We convert real bond returns that they report into nominal returns using the geometric average inflation rate that they provide. Next, we combine the annual geometric average stock and bond returns for their sample period with the numbers for our sample period using the geometric average return formula.

the compounding period. However, when we estimate arithmetic average ERP using quarterly and annual stock and bond returns, we find that the ERP is +2.17 percentage points and +4.45 percentage points, respectively. The big difference between arithmetic average ERP based on quarterly vs. monthly/annual returns arises from the high volatility of stock returns which is further amplified with the longer holding period of stocks and bonds. Overall, the evidence suggests that the historical ERP estimates are highly sensitive to how we average returns, our estimation period, and the assumed holding period of stocks and bonds.

Despite to the disadvantages of historical returns in ERP estimation, it may be the most commonly used approach since it is very easy and straightforward to calculate. Our small survey also confirms popularity of historical ERP approach with 12 respondents out of 20 respondents claim that they use historical returns to calculate the ERP in Turkey.

Historical ERP has a puzzling remark in the academic literature. Mehra & Prescott (1985) argue that historical stock returns over bonds have been very high such that it implies an implausibly high level of investor risk aversion. For our total estimation period, 1990-2014, we observe a negative geometric average ERP. Basci & Ekinci (2005) find the negative ERP for the period 1990-2001. They try to explain the negative historical ERP by including inflation and default risk to the Mehra & Prescott (1985) model and conclude that inflation risk alone cannot explain the observed negative ERP without incorporating a high rate of default risk.

### 3.1.2 Godfrey-Espinosa Model

As discussed in the previous section, historical ERP calculations require long time-series of historical data that are generally unavailable in emerging countries. Godfrey & Espinosa (1996) propose a model for ERP estimation in emerging stock and bond markets with short histories and noisy return series. The model deals with the lack of large historical data by using the available long time-series data of a developed market, in our case the US stock market. The assumption is that the risk of a class of asset traded in an emerging market can be estimated by comparing the volatility of the asset in the domestic market with the volatility of same class of asset traded in a developed market.[4] In other words, relative volatilites of two stock markets reflect the relative risk of stock investments in those markets.

[4] Godfrey & Espinosa (1996) argue that the Capital Asset Pricing Model (CAPM) is not a suitable approach to estimate the riskiness of emerging market stocks; CAPM betas are lower in emerging markets than developed markets, although stock returns are significantly more volatile in emerging markets.

The model may be best illustrated with the following formula:

$$ERP_{emerging} = Credit\,spread + Adjustment\,factor \times (\frac{\sigma_{emerging}}{\sigma_{developed}}) \times ERP_{developed} \quad (4)$$

When using this formula to estimate the ERP in Turkey, we choose the U.S. as the benchmark developed country. Damodaran (2012) estimates that the current ERP in the U.S. is +5.80 percentage points, thus we set $ERP_{developed}$ equal to this number.[5] The annual volatility of the S&P500 index returns over our estimation window is 4.25 percentage points, and as shown in Table 1, the volatility of the BIST 30 Index returns is 9.68 percentage points. Thus, the relative volatilities of the two stock indices, or $\sigma_{emerging}/\ \sigma developed$, equals 2.28. Godfrey & Espinosa (1996) argue that differences in risk-free rates may also affect the ERP estimates and to account for this they suggest adjusting relative stock volatilities with an adjustment factor. Erb et al. (1995) finds that roughly 40 percent of share volatilities in developed vs. emerging markets can be explained by credit risk differences and thus, following Erb et al. (1995), we use an adjustment factor of 0.60. Finally, we define credit spread as the difference in the yields of 10-year maturity, dollar-based sovereign debt of Turkey and the U.S., which was equal to roughly 2 percent at the end of 2014.

Overall, using the Godfrey & Espinosa (1996) model, we find an ERP of +9.93 percentage points. This is more than 10 percentage points higher than the ERP estimates based on historical geometric average returns during 2002 through 2014 time window. One concern with the Godfrey & Espinosa (1996) approach is that, part of the volatility of stock returns arises from illiquidity rather than downside risk, and ignoring this may lead us to overstate both relative stock return volatility and the ERP estimate based on Godfrey & Espinosa (1996) model.

### 3.1.3 Country Risk Premium

Damodaran (2012) proposes a model that is similar to the Godfrey & Espinosa (1996) model, but rather than comparing volatilities across emerging and developed markets, he uses credit default swap (CDS) spreads and dollar-denominated Treasury bond yield spreads to estimate the additional risk premium for emerging markets (which he refers to as the country risk premium).

[5] Damodaran (2012) estimates the ERP using an implied ERP approach that is based on a dividend discount model, which we discuss in detail later. He updates the figures used in that model quarterly and publishes the his estimates at pages.stern.nyu.edu/ adamodar/. +5.80 percent is his most recent implied ERP estimate as of May 2015.

His model may be best illustrated using the following formula:

$$ERP_{emerging} = ERP_{developed} + Country\, risk\, premium \times \frac{\sigma_{equity}}{\sigma_{bond}} \tag{5}$$

In our estimations, we use three alternative measures of country risk premium. First, we calculate the difference between expected default probabilities of equal-maturity, dollar-denominated Turkish vs. US sovereign bonds using Moody's sovereign ratings and historical default frequencies associated with those ratings.[6] Moody's sovereign ratings and historical default frequencies associated with those ratings is given in Table 3. Turkey has foreign currency long-term rating of Baa3, BBB-, BB+ from Moody's, Fitch and Standard and Poor's respectively. As seen in Table 3, default probability of Turkey based on Moody's sovereign ratings net of US[7] is +2.0 percentage points. It is assumed as proxy for the country risk premium of Turkey net of US. Second, we calculate the difference between the yield spreads of 10-year dollar-denominated bonds issued by Turkish vs. U.S. Treasuries. The difference between the yield spreads is assumed as another proxy for the country risk premium. Third, we calculate the difference between the spreads of 5-year CDS traded on Turkish vs US Treasury bonds as the last proxy for the country risk premium of Turkey. Since our country risk measures show the credit risk of Treasury bonds, we incorporate an adjustment factor, $\sigma_{equity}/\sigma_{bond}$, to calculate the relative risk of stock vs. bond investments in the domestic market. The adjustment factor, $\sigma_{equity}/\sigma_{bond}$, is calculated as 6.4 over our estimation window. Finally, as in the Godfrey & Espinosa (1996) model, we choose the U.S. as the benchmark developed country and use a +5.80 percent ERP for the U.S.

Overall, based on alternative measures of credit risk, we obtain ERP estimates that range between +7.38 and +19.82 percentage points, as shown in Table 4. The last two measures in Table 4 where we use $\sigma_{equity}/\sigma_{bond}$ as an adjustment factor in order to estimate the country risk premium give higher than the other three measures since relative volatility of stocks over bonds in the domestic market is such a large number, 6.4. Note that the ERP estimates based on Godfrey & Espinosa (1996) and Damodaran (2012) models are dollar based estimates and thus, they are not directly comparable with Turkish Lira-based historical realized ERP estimates. Note also that ERP estimates based on models using relative volatilities in developed markets

[6]We obtain similar results using S&P and Fitch ratings.

[7]U.S. has foreign currency long-term rating of Aaa by Moody's. This corresponds to the default rate of 0 percentage points.

and emerging markets are highly sensitive to recent volatilities in stock and currency markets.

Godfrey & Espinosa (1996) model and Damodaran (2012) country risk premium model assume that country risk is not diversifiable, at least completely; otherwise the additional risk of stock investment in emerging markets wouldn't exist. We don't have a data on how much of stock investment of local investors takes place in global stock markets but it is true that home bias in stock investment is significant. Moreover, we should also have a strong evidence of low correlation over stock markets since country risk wouldn't be diversifiable in high positively correlated stock markets. If we assume that country risk is not diversifiable, at least completely, and correlation between stock market returns high enough such that even if investor is diversified his portfolio globally, positive correlation between stock market returns prevents the diversification of country risk away.

As shown in Salomons & Grootveld (2003), emerging markets have higher average ERP than in developed markets. This supports the argument for additional country risk premium. In addition to this, survey respondents in Fernandez et al. (2014) estimate the ERP higher in emerging markets than in developed markets which indicates that they naturally assume an additional risk of stock investment in emerging countries over developed markets.

As told previously, we use the default spreads of bonds and CDS as proxy for country risk premium. The default spreads vary over time with the market movements since they are traded on the markets therefore we can use either current spread or average spread over a time period as proxy for country risk premium. We see in Figure 3 that the bond yield and CDS spreads net of US is between roughly 2 and 3 percentage points in 2012-2014 period. As of January 2015, if we take the ERP in U.S., benchmark developed country, 5.80 percentage points, we find close ERP estimates of 7.99 and 7.38 percentage points respectively, as shown in Table 4. We see from Figure 3 that CDS spreads and bond yield spreads move together in 2012-2014. There is no available CDS information prior to 2012, thus we didn't illustrate the bond spreads for that period. Since we see high volatility in CDS and bond yield spreads, taking averages of those over a period would be much more consistent if we assume that fundamentals of the country didn't change dramatically. On the other hand, using last (current) default spread reflects the market movements in much more timely manner. Sovereign ratings are criticized for being slower to the market movements rather than bond and CDS spreads.

In Godfrey & Espinosa (1996) model and Damodaran (2012) country risk premium model, using relative volatilities as an adjustment factor in different measures of country risk premium, $(\sigma_{developed}/\sigma_{emerging})$ and $(\sigma_{stocks}/\sigma_{bonds})$, may seem intuitive but markets that are risky and illiquid have often low volatility as well. Why should we link bond default and CDS spreads to the ERP? It can be rationalized such that an investor can earn excess return of 2.19 percentage points on dollar-denominated Turkish Treasury bond in the beginning of January 2015 thus investor shouldn't prefer to invest in Turkish stocks unless if he/she expects a higher return.

## 3.2 Forward-looking Approaches

### 3.2.1 Dividend Discount Model

In addition to the backward-looking approaches described above, we also estimate the ERP using several forward-looking approaches. For example, we estimate the ERP in Turkey using a dividend discount model (DDM), as explained in Damodaran (2012).[8]

In our DDM, there is an initial high dividend growth phase, followed by a second phase during which dividends grow at a stable and relatively lower rate until perpetuity.

The model may be best illustrated with the formula below:

$$P_0 = \sum_{t=1}^{5} \frac{E[D_t]}{(1+k)^t} + \frac{E[D_5](1+g)}{(k-g)(1+k)^5} \quad (6)$$

where

$P_0$ : Current index value

$k$ : Total stock premium $(r_f + ERP)$

$g$ : Expected dividend growth rate

$E[D_t]$ : Expected dividend at period t

In our empirical analysis, we use three different proxies for the initial dividend growth rate: historical geometric average nominal earnings growth rate over the last decade (12.9 percent), current return on equity (ROE) (10.2 percent), and average ROE over the last five fiscal years (11.9 percent). We define ROE as the ratio of current fiscal year's aggregate annual earnings to previous aggregate year-end book value. For the second and third proxies that are based on

[8]Damodaran (2012) incorporates share repurchases to the ERP calculations. It is uncommon for Turkish companies to repurchase their own shares unless they are in the process of delisting from the BIST exchange and thus we ignore stock repurchases in our calculations.

ROE, we calculate dividend growth using the following formula:

$$Growth\,rate = (1 - Dividend\,payout\,ratio) \times Return\,on\,equity \tag{7}$$

Since we assume a constant payout ratio, in our model, earnings and dividends grow at the same rate. Also, we assume that the terminal (second stage) growth rate is equal to the expected long-term GDP growth. In other words, we assume that the aggregate earnings of the BIST 30 companies will grow at the same pace as domestic income. Moreover, we assume that the long-term expected growth rate of the aggregate earnings is five percent. This is the expected GDP growth rate estimated in the Medium-Term Program (2015-2017).

We scale all parameter values (book value, cash-dividends and earnings) by the corresponding index values; the parameter values at period t are scaled by the index value at the same period. We scale by index values since indices are kind of virtual assets and have no currency; and they are itself scaled by index divisor values. Nominator of a stock index is sum of free-float market capitalization values of index constituents. Denominator is just a number to scale the nominator value in order to obtain the starting index value. Over time, index divisor is adjusted with the corporate actions such that index value at the start of next business day equals to the current index close value. Next, we calculate payout ratio (using cash dividends) and ROE. In Table 2, we provide estimated ROE values for the period, 2001-2014. In order to obtain the scale coefficients (unit adjusters) at period t, we divide the index value at period t by total market capitalization value of index constituents. This calculated scaling factor (unit adjuster) at period t is multiplied with the total book value, dividend and earnings of index constituents in order to obtain the scaled parameter values at period t, as shown in Table 5.

We use several alternative measures of initial dividend amount:

1. Trailing twelve month total cash dividend in the index

2. Average dividend yield over the last five (or ten) years times current index value

3. Average dividend payout ratio over the last five (or ten) years times trailing twelve months total earnings in the index

The average dividend yield over the last five (ten) years is 2.18 (2.33) percentage points, whereas the dividend yield at the end of 2014 is 1.59 percentage points. Moreover, the average payout ratio over the last five (ten) years is 22.84 (24.78) percentage points, whereas the payout ratio at the end of 2014 is 20.11.

We next turn to the initial dividend amount that is expected to accumulate at the estimated growth rates. We use estimated initial dividend scaled by index value in our ERP estimations.

Now, we calculate the historical dividend yield and payout ratios of BIST 30 over our sample period, given in Table 5, which are used to estimate the initial scaled cash-dividend amount. Initial scaled cash-dividend amounts based on different alternative measures are given in Table 6.

Overall, using different parameter values, we estimate the ERP between +2.10 and +3.11 percentage points as of January 2015. This is substantially lower than Damodaran (2012) ERP estimate for the US of +5.81 percentage points. Why do we obtain a lower ERP estimate for Turkey? One reason is relatively low dividend yields in Turkey. As shown in Figure 5, historically, the dividend yield of BIST 30 has ranged between one and two percent. In contrast, the S&P 500 Index has an average dividend yield of 5.03 percentage points and 5.25 percentage points over the last five and ten years, respectively. Since initial dividend is a relatively small portion of the BIST 30 index value and we assume that the payout ratio remains constant over time, a relatively low level of ERP is required to obtain the current value of the index.

Average payout ratio of BIST 30 is roughly 20 percentage points, as shown in Table 5. It is lower than the average payout ratio of S&P 500 which is roughly 36 percent over the same period.

Since the DDM that is based on Damodaran's assumptions produces lower ERP estimates than the ERP in the US, which we do not find plausible, we also estimate the ERP via DDM using different assumptions. For example, Damodaran assumes that dividend payout ratio is constant. Moreover, transition to the long-term terminal growth rate is discrete such that growth rate changes instantaneously at the end of first stage and stay at that level perpetually. In our alternative model, we assume that the dividend payout ratio, return on equity (ROE), and long-term growth rate all revert to their expected long-term levels over time. We select parameter inputs that set the present value of the expected dividends equal to the current value of the index. Therefore, the model allows for the smoothest transition to the terminal growth rate. We estimate the ERP at half-year intervals from 2006 to 2014 and find that it ranges between 6.19 and 9.63 percentage points.

We estimate the ERP at half-year intervals since analysts update their earnings and dividend forecasts at half-year intervals. We start the estimation window in 2006 since several variables used in model (e.g., earnings and dividend forecasts and index-weighted book values), are unavailable for earlier years.

DDM-based ERP estimations described above are top-down approaches. In other words, we do not classify constituent stocks according to their estimated growth patterns but rather, we estimate an index-level long-term growth rate and long-term ROE and use those estimates to project dividends at a two stage growth model where ROE and dividend payout ratio slowly revert to their long term levels in equal increments over time.

Bloomberg estimates the ERP using a bottom-up DDM approach, whereby it first estimates the ERP of individual stocks and then calculates a market-capitalization weighted average of those estimates to obtain a market-wide ERP. Bloomberg's DDM assumes that the payout ratio at the perpetual growth stage is constant and equals 45 percent. It also assumes that the long-term growth rate is equal to the product of plowback ratio (55 percent) and cost of equity, which ensures that the growth rate at the constant dividend growth period does not exceed the cost of equity.

Figure 2 provides a comparison of our half-year ERP estimate based on a top-down approach and Bloomberg's estimate based on a bottom up approach. Bloomberg's estimates are available after the second half of 2008 and thus, this is our comparison period. As shown, our ERP estimate based on the alternative DDM is 1.02 to 8.18 percentage points higher than Bloomberg's ERP estimate except the estimate made for the period at the end of 2009. Our DDM estimate is 0.16 percentage points lower than Bloomberg's ERP estimate at the end of 2009. In addition, at the end of 2014, Bloomberg estimates and ERP of +5.76 percentage points, whereas our alternative DDM-based estimate is +8.68 percentage points. Our alternative DDM estimate is usually higher than Bloomberg's ERP estimate; primarily because our mean-reverting assumption suggests higher dividend payout ratios at the terminal stage in our alternative DDM. Also our DDM estimate is closest among all other ERP estimates to survey-based average ERP estimates. Finally, note that both of these two estimates are smaller than our ERP estimate based on the Godfrey and Espinosa (1996) model.

One important concern about DDM-based ERP estimations is that the resulting ERP estimate is highly sensitive to the assumed values of the model inputs. Moreover, DDM is not applicable for stocks that do not pay any dividends. This is a problem even when a top-down approach is used if a significant fraction of the stock index constituents does not pay dividends.

To illustrate the ERP estimate by DDM, on December 31, 2014, the BIST 30 Index is closed at 106149.76. The expected dividend yield on the index is 1.59 percentage points based on trailing 12 months cash-dividends on the index. Growth rate of the earnings on the index is 12.90 percentage points based on the historical earnings growth rate at the last decade. The first stage of the model is five years and growth rate in the terminal stage is assumed as 5 percentage points. Therefore, cash-flows of the expected dividends on the index can be shown as below:

$$106149.76 = \frac{1900.34}{(1+k)} + \frac{2145.47}{(1+k)^2} + \frac{2422.21}{(1+k)^3} + \frac{2734.66}{(1+k)^4} + \frac{3087.4}{(k-0.05)\times(1+k)^5} \qquad (8)$$

This give ERP estimate of 2.36 percentage points which is very small number when it is compared with the ERP value reported in Damodaran (2012) for U.S. by the same model. When we try the several alternatives of dividend growth estimates and initial dividend amount in the DDM, we find close ERP estimates varying from 2.10 to 3.11 percentage points as shown in Table 8.

Due to the implausibly smaller ERP estimates that we find with the DDM, we suggest a variant of the DDM where we assume mean-reversion of parameter values used in the model. We need index-weighted parameter values of our alternative DDM and Residual Income Model as we scaled in Damodaran's DDM. In Table 9, we give the index-weighted parameter values used to estimate the ERP in half-year intervals from 2006-2014.

To illustrate our model, we get dividend and earnings estimates of the BIST 30 Index for the current (2015) and next year. Individual company per share estimates are multiplied with the total number of shares and divided by the index divisor to obtain the index-weighted estimates. [9]Suppose that $D_1$ and $D_2$ are 0.1 and 0.15 respectively and $E_1$ and $E_2$ are 0.3 and 0.4 respectively. Suppose also that the book value at the end of previous period, $B_0$, is 2.2 ($B_1$=$B_0$+$E_1$-$D_1$=2+0.3-0.1=2.2). This implies that the ROE in period two is 18.18 percentage points ($E_2/B_1$=0.4/2.2=18.18). We assume terminal growth rate as 5 percent as we assumed in DDM as well. Long-term ROE estimate is taken as the average of end-of-year ROE values over the last ten years.

We assume that ROE and dividend payout ratio reverse to the long-term estimates in equal increments. We don't make any estimation on long-term dividend payout ratio; it is calculated internally by the model inputs, long-term ROE and growth rate estimates. Dividend growth

[9]Historical data is available on Bloomberg calculated as explained here.

rate is also determined by the model parameters. The long-term dividend payout ratio is equal to 1-$\frac{g}{ROE}$. In our setting, our long-term growth rate estimate is 5 percent and our long-term ROE estimate is 11 percent which is average ROE over our examination period, 2001-2014. This gives us a long-term dividend payout ratio estimate as 54.54 percent.[10] We use 2-year Turkish Treasury bond yields as risk-free rates in our alternative DDM. In Table 10, we give all parameter values used to estimate the ERP for the end of 2014. The first row is the expected parameter values for 2015 and 2016, and other parameter values of the further periods (years) are determined by the model inputs with the mean-reversion assumption of long-term growth rate and ROE over the remaining eight years.

### 3.2.2 Residual Income Model

To overcome these limitations of the DDM-based ERP estimations, we use an alternative forward-looking model where future expected streams of residual income rather than dividends are discounted to calculate the current value of the stock index. Residual income equals expected earnings in excess of the book value times the cost of capital.

The model may be best illustrated with the formula below.

$$P_0 = B_0 + \sum_{t=1}^{5} \frac{E[E_t] - kB_{t-1}}{(1+k)^t} + \frac{E[R_5](1+g)}{(k-g)(1+k)^5} \tag{9}$$

where

$B_t$ : Total book value of the index at period t

$E[R_t]$ : Expected total residual income of the index at period t

$E[E_t]$ : Expected total earnings of the index at period t

$P_0$ : Current index value

$g$ : Expected growth rate of residual income

$k$ : Total stock premium ($r_f$ + ERP)

Claus & Thomas (2001) use this model to estimate the ERP. They refer to their ERP estimate as the implied ERP. When calculating the implied ERP for Turkey, we make the same assumptions that we make in our alternative DDM approach, except that we calibrate long-term ROE such that long-term payout ratio is equal to the average payout ratio over the last decade.

[10] Average long-term dividend payout ratio for our examination period, 2001-2014, is calculated as 27.48 percentage points. Thus, in the long-term, we suggest a significant increase in dividend payout ratios of BIST 30 companies.

We estimate the ERP in half-year intervals from 2006 to 2014.

We make the same mean reverting assumption of parameter values in Residual Income Model as we made in our alternative DDM. By the end of 2014, we find the ERP as 9.66 percentage points which is 1.04 percentage points higher than the ERP estimate of our alternative DDM for the same period. As seen in Figure 2, our Residual Income Model give higher ERP estimates than the alternative DDM ranging from 0.65 to 1.30 percentage points. As we give for the alternative DDM in Table 10, we give parameter values determined by model inputs and ERP estimation result for the end of 2014 in Table 11.

Overall, we find that the implied ERP is 0.65 to 1.30 percentage points higher than alternative DDM-based ERP estimates. For example, as shown in Figure 2, we find that the implied ERP peaks during the first half of 2010 at +10.93 percentage points. It was at +9.66 percentage points at the beginning of 2015 and it was estimated +8.68 percentage points at the same period by our alternative DDM. However, the implied ERP is one of the closest approaches along with our alternative DDM ERP estimates to survey-based average ERP estimates. For example, Fernandez et al. (2014) surveys market professionals and academic researchers and finds an average ERP estimate of +9.3 percentage points for Turkey in 2015. Finally, the magnitude of the implied ERP estimate is more in line with the idea that emerging markets should offer higher ERP than developed markets. In particular, Claus & Thomas (2001) find an average implied ERP of +3.39 percentage points for the US that is below our implied ERP estimate for Turkey.

### 3.2.3 Surveys

As an alternative approach of ERP estimate, surveys, we sent a short email on the period May 4 - May 15 2015 to about 35 email addresses of portfolio and research managers of brokerage and investment houses. The survey is composed of three questions below:

1) What is the ERP that you estimate for Turkey in 2015?

2) What is the risk-free rate that you use for Turkey in 2015?

3) What approach do you use to estimate the ERP?

As shown in Table 7, average ERP estimate for Turkey is 8.84 percentage points similar to the results found by Fernandez et al. (2014). However, standard deviation of the results is 6.07 percentage points. Thus, survey results don't give consistent ERP estimates. Surprisingly, risk-free rate that survey respondents use also vary significantly, as shown in Table 7. We use

2-year Turkish Treasury bond yield as risk-free rate which is the common practice in many academic studies as well. Majority of survey respondents seem to use historical returns in order to estimate the ERP but variation of the results produced by historical returns implies that process of calculating the ERP, even with the same set of data series, is highly subjective to the study in question depending on the selection of data used and estimation period.

### 3.2.4 Time-series regressions

Our final forward-looking approach is to estimate time-series regressions in which the ERP is regressed on lagged values of a set of macroeconomic variables and to use the estimated coefficients to forecast ERP (see Welch & Goyal (2008) and Campbell & Thompson (2008)).

A standard predictive OLS regression for ERP is

$$r_{t+1} = \alpha + \beta x_{i,t} + \epsilon_{t+1} \tag{10}$$

where $r_{t+1}$ is the ERP in period t+1, $x_{i,t}$ is matrix of macroeconomic variables, and $\epsilon_{t+1}$ is a random error term.

In this approach, a sample of T observations is partitioned into t in-sample and T-t out-of-sample observations. The initial out-of-sample regression uses the first t data points as if investors use that predictive regression to obtain ERP estimate in real-time. In order to generate a second set of regression , we regress the time-series data available through t+1. We repeat this process through the end of the available data. We generate out-of-sample forecasts of the ERP using an expanding estimation window. With this procedure, we obtain a series of predictive regressions where forecasting power of these out-of-sample regressions can be compared with the historical average ERP, natural benchmark, calculated from the in-sample data. The historical arithmetic average ERP, ($\overline{r}_{t+1} = \frac{\sum_{j=1}^{t} r_j}{t}$) is a benchmark forecast model corresponding to a constant expected ERP. If macroeconomic variable of interest, $x_{i,t}$, contains information useful for predicting the ERP, $\hat{r}_{i,t+1}$ should perform better than $\overline{r}_{t+1}$.

In our regressions, we use the same set of explanatory variables that Welch & Goyal (2008) use. The variables are earnings per share over share price, dividend yield, book-to-market ratio, volatility of the BIST 30 index and inflation. ERP estimates are one-month-ahead forecasts. We use monthly data in our estimations. Our period of analysis is from January 2004 to December 2014.

We apply out-of-sample (rolling) OLS regressions for our sample period for each macroeconomic variable. Besides single-variable OLS regressions, in our study, we create a combined regression where all explanatory variables are placed in a single OLS regression.[11] If a negative ERP is estimated by an OLS regression among all rolling regressions, we replace it with zero since expected ERP normally shouldn't be a negative value. Output of the OLS regression with the largest sample of data (2004-2014) indicates that none of the coefficients is significantly different from zero at 95 percent interval. In combined OLS regression where all variables are included, none of the variables except volatility is significant at 95 percent interval as well. Volatility is a slightly negative value as seen from the regression output in Figure 3.

Since none of the coefficients in all predictive regressions is significant, one may want to favor to use the benchmark, historical average monthly ERP, in order to estimate the ERP for the next period. In order to compare the forecasts $\hat{r}_{i,t+1}$ and $\overline{r}_{t+1}$, we use the out-of-sample $R^2$ proposed by Campbell & Thompson (2008).

$$R_{OS}^2 = 1 - \frac{\sum_{k=P_0+1}^{P}(r_{R+k} - \hat{r}_{j,R+k})^2}{\sum_{k=P_0+1}^{P}(r_{R+k} - \overline{r}_{R+k})^2} \tag{11}$$

When $R_{OS}^2 \geq 0$, selected predictive regression model is better than the historical arithmetic average monthly ERP. Our result differs from the result of Welch & Goyal (2008) and Campbell & Thompson (2008) such that the out-of-sample regressions forecasts are unable to outperform the historical average monthly ERP. We graph historical out-of-sample $R^2$ values for each predictive regression model in the appendix part. As seen from the graphs, out-of-sample $R^2$ for all predictive regression models have been consistently a positive value indicating that historical arithmetic average monthly ERP isn't better than predictive regression models in forecasting next period ERP unlike the result of Welch & Goyal (2008).

However, our short estimation window reduces the power of our out-of-sample regressions.[12] Moreover, as shown previously, none of the variables in each predictive regression model has significant coefficients. Therefore, neither predictive regression models nor historical average ERP, overall time-series regression approach, should be used in estimation of ERP in Turkey.

[11] Welch & Goyal (2008) find that regression-based predictive models using a large set of macroeconomic variables are unable to generate better ERP estimates out of sample than the historical average ERP. However, Campbell & Thompson (2008) argue that, in predictive models, imposing restrictions on regression coefficients and ignoring variables whose coefficients are indistinguishable from zero improve the prediction performance of out-of-sample regressions relative to the historical average ERP.

[12] We only have eleven years (2004-2014) of monthly data series, or 132 observations.

# 4 Conclusion

This paper studied several ERP estimation approaches, namely the Historical Premium, Godfrey-Espinosa Model, Country Risk Premium, Dividend Discount Model, Residual Income Model and Time-series regressions. The methods gave quite different estimates. We believe that forward-looking approaches are better than backward-looking approaches. Among the forward-looking approaches, we believe that Residual Income approach gave the most consistent ERP estimates which are most closest to our survey results and Fernandez et al. (2014) as well. The ERP in Turkey is estimated as 9.66 percentage points as our last ERP in January 2015. However, one should be aware of the fact that Residual Income Model, like Dividend Discount Model, requires many assumptions where the estimation results may vary significantly with the underlying assumptions.

Even if the ERP is a simple and intuitive concept to understand, the process of calculating it varies by which approach is used and what assumptions the approach is based on. But this shouldn't prevent estimating the ERP by means of structured and well-defined approaches since ERP is such an important variable which needs to have rigorous treatment to estimate it.

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# A Tables

Table 1: Summary statistics of historical monthly return series, 2002-2014

| | BIST 30 | KYD 91 |
|---|---|---|
| N | 156 | 156 |
| Mean | 1.81% | 1.53% |
| Median | 2.32% | 1.18% |
| Standard deviation | 9.68% | 1.51% |
| Skewness | 12.36% | 61.83% |
| Kurtosis | 3.33 | 10.20 |
| Minimum | -24.16% | -6.46% |
| Maximum | 29.87% | 8.18% |

Table 2: Historical ERP estimates over different time periods

| | Arithmetic average | Geometric average |
|---|---|---|
| Monthly returns (2002-2014) | 3.95% | -2.45% |
| Quarterly returns (2002-2014) | 2.17% | -2.43% |
| Annual returns (2002-2014) | 4.45% | -2.66% |
| Monthly returns (2004-2014) | 7.92% | 3.81% |
| Monthly returns (1990-2014) | - | -4.37% |

Table 3: Moodys sovereign ratings and corresponding historical default frequencies

| Moody's rating | Corresponding sovereign default rates |
|---|---|
| Aaa | 0.00% |
| Aa1 | 0.25% |
| Aa2 | 0.50% |
| Aa3 | 0.70% |
| A1 | 0.85% |
| A2 | 1.00% |
| A3 | 1.15% |
| Baa1 | 1.50% |
| Baa2 | 1.75% |
| Baa3 | 2.00% |
| Ba1 | 2.40% |
| Ba2 | 2.75% |
| Ba3 | 3.25% |
| B1 | 4.00% |
| B2 | 5.00% |
| B3 | 6.00% |
| Caa1 | 7.00% |
| Caa2 | 8.50% |
| Caa3 | 10.00% |

Table 4: Alternative measures of country risk premium of Turkey as of January 2015

| Alternative measures of country risk premium | US ERP (Benchmark) | Turkey | U.S. | Turkey Country Risk Premium | Turkey ERP |
|---|---|---|---|---|---|
| Bond yield spread (net of US) | 5.80% | 4.36% | 2.17% | 4.36%-2.17%=2.19% | 7.99% |
| CDS spread (net of US) | 5.80% | 1.75% | 0.17% | 1.75%-0.17%=1.58% | 7.38% |
| Moody's sovereign rating (net of US) | 5.80% | 2.00% | 0.00% | 2.00%-0.00%=2.00% | 7.80% |
| Bond yield spread($\times(\sigma_{stocks}/\sigma_{bonds})$) | 5.80% | 4.36% | 2.17% | 2.19% $\times 2.05 = 4.49$% | 10.29% |
| CDS $\times(\sigma_{stocks}/\sigma_{bonds})$) | 5.80% | 1.75% | 0.17% | 1.58% $\times 2.05 = 3.24$% | 9.04% |

Table 5: The Dividend Discount Model Parameters by Year

| Year | Market cap (mil. TL) | Index level | Unit adjuster | Book value (mil. TL) | Cash dividends (mil. TL) | Earnings (mil. TL) | Index dividend yield | Index payout ratio |
|---|---|---|---|---|---|---|---|---|
| 2001 | 52.02 | 17,516 | 0.0337% | 12.16 | 0.45 | 0.63 | 0.86% | 70.73% |
| 2002 | 40.86 | 12,886 | 0.0315% | 18.48 | 0.23 | 0.54 | 0.56% | 41.83% |
| 2003 | 72.98 | 24,310 | 0.0333% | 30.36 | 0.41 | 6.06 | 0.56% | 6.75% |
| 2004 | 96.88 | 32,153 | 0.0332% | 57.51 | 1.34 | 7.64 | 1.38% | 17.55% |
| 2005 | 143.50 | 50,468 | 0.0352% | 66.51 | 2.26 | 7.07 | 1.58% | 31.96% |
| 2006 | 147.64 | 48,551 | 0.0329% | 76.57 | 2.90 | 10.24 | 1.96% | 28.26% |
| 2007 | 215.57 | 70,457 | 0.0327% | 98.40 | 3.94 | 19.80 | 1.83% | 19.89% |
| 2008 | 128.74 | 35,002 | 0.0272% | 118.95 | 6.60 | 24.48 | 5.13% | 26.98% |
| 2009 | 247.41 | 66,992 | 0.0271% | 137.24 | 4.51 | 16.98 | 1.82% | 26.55% |
| 2010 | 292.98 | 81,338 | 0.0278% | 158.57 | 5.31 | 26.35 | 1.81% | 20.13% |
| 2011 | 220.52 | 61,698 | 0.0280% | 166.20 | 7.21 | 23.12 | 3.27% | 31.19% |
| 2012 | 359.15 | 97,728 | 0.0272% | 200.55 | 6.19 | 30.69 | 1.72% | 20.17% |
| 2013 | 319.62 | 82,448 | 0.0258% | 227.84 | 8.00 | 35.40 | 2.50% | 22.59% |
| 2014 | 421.04 | 106,150 | 0.0252% | 260.08 | 6.68 | 33.20 | 1.59% | 20.11% |
| Trailing 12 month | 421.04 | 106,150 | 0.0252% | 260.08 | 6.68 | 33.20 | 1.59% | 20.11% |
| | | | | | | 5-year average | 2.18% | 22.84% |
| | | | | | | 10-year average | 2.32% | 24.78% |
| | | | | | | 14-year average | 1.90% | 27.48% |

Table 6: Alternatives of initial dividend amounts in DDM

| | |
|---|---|
| Scaled Cash-Dividends Trailing 12 months | 1,683.22 |
| Scaled Cash-Dividends (Average yield-last decade) | 2,474.97 |
| Scaled Cash-Dividends (Average yield-last 5 years) | 2,312.45 |
| Scaled Cash-Dividends (Average payout-last decade) | 2,074.68 |
| Scaled Cash-Dividends (Average payout-last 5 years) | 1,911.84 |

Table 7: Survey Results:Expected ERP of Turkey in 2015

| Survey Respondent | Question 1 | Question 2 | Question 3 | Total Stock Return |
|---|---|---|---|---|
| 1 | 5.00% | 10.00 | Historical returns | 15.00% |
| 2 | 5.50% | 9.50 | Historical returns | 15.00% |
| 3 | 7.10% | 9.20% | Historical returns | 16.30% |
| 4 | 13.50% | 9.50% | Discounted cash flows | 23.00% |
| 5 | 6.00% | 10.00% | Historical returns | 16.00% |
| 6 | 9.44% | 9.50% | Historical returns | 18.94% |
| 7 | 6.00% | 8.00% | Discounted cash flows | 14.00% |
| 8 | 22.00% | 4.00% | Discounted cash flows | 26.00% |
| 9 | 9.00% | 10.00% | Historical returns | 19.00% |
| 10 | 4.50% | 8.50% | Historical returns | 13.00% |
| 11 | 5.50% | 8.50% | Historical returns | 14.00% |
| 12 | 12.00% | 8.50% | Historical returns | 20.50% |
| 13 | 9.00% | 9.00% | Discounted cash flows | 18.00% |
| 14 | 6.00% | 9.00% | Historical returns | 15.00% |
| 15 | 6.50% | 9.00% | Historical returns | 15.50% |
| 16 | 16.00% | 9.00% | Discounted cash flows | 25.00% |
| 17 | 10.00% | 9.00% | Discounted cash flows | 19.00% |
| 18 | 10.00% | 10.00% | Discounted cash flows | 20.00% |
| 19 | 5.00% | 10.00% | Historical returns | 15.00% |
| Average ERP | 8.84% | Std. deviation of ERP estimate | 6.07% | |
| Average risk-free rate | 8.96% | Std. deviation of risk-free rate | 1.33% | |

Table 8: ERP estimates in Turkey by DDM in January 2015

| | Growth Choices | | |
|---|---|---|---|
| Initial dividend choices | Historical earnings growth rate (last decade) | Fundamental growth rate(based on current ROE) | Fundamental growth rate (based on average ROE-last 5 years) |
| Dividends(Trailing 12 months) | 2.36% | 2.10% | 2.26% |
| Dividends(Average yield-last decade) | 3.45% | 2.92% | 3.11% |
| Dividends(Average yield-last 5 years) | 3.23% | 2.76% | 2.94% |
| Dividends(Average payout-last decade) | 2.90% | 2.52% | 2.69% |
| Dividends(Average payout-last 5 years) | 2.67% | 2.35% | 2.52% |

Table 9: Index-weighted parameter values used in alternative DDM and Residual Income Model

| BIST 30 Index | | | | | | |
|---|---|---|---|---|---|---|
| Date | Index-weighted estimated earnings current year | Index estimated earnings next year | Index estimated dividend next year | Index estimated dividend current year | Index value | Index weighted book value |
| 30.12.2005 | 3478.62 | 4504.4 | 868.4 | 743.6 | 50467.53 | 24878.73 |
| 30.06.2006 | 4590.25 | 5351.58 | 1265.53 | 1008.14 | 44734.31 | 24140.66 |
| 29.12.2006 | 4249.37 | 5327.16 | 1190.12 | 948.48 | 48551.38 | 27768.34 |
| 29.06.2007 | 5374.96 | 5914.24 | 1542.82 | 1336.23 | 58413.71 | 30795.78 |
| 31.12.2007 | 5854.41 | 6425.83 | 1974.83 | 1605.71 | 70457.3 | 33911.92 |
| 30.06.2008 | 6242.53 | 7249.15 | 2362.92 | 2133.73 | 42223.6 | 37383.27 |
| 31.12.2008 | 6689.37 | 6280.45 | 1874.29 | 1992.34 | 35001.85 | 35379.39 |
| 30.06.2009 | 4842.48 | 5801.41 | 1647.6 | 1352.1 | 46698.59 | 34555.11 |
| 31.12.2009 | 5761.35 | 6555.69 | 1885.62 | 1447.21 | 66992.07 | 39107.4 |
| 30.06.2010 | 7243.76 | 8530.25 | 2483.94 | 1952.84 | 68770.59 | 41833.94 |
| 31.12.2010 | 7882.62 | 8538.87 | 2560.72 | 1988.72 | 81338.13 | 48554.36 |
| 30.06.2011 | 8026.86 | 9010.8 | 3087.04 | 2510.94 | 76930.43 | 49384.53 |
| 30.12.2011 | 7100.43 | 8110.77 | 2422.58 | 2044.51 | 61698.29 | 48931.8 |
| 29.06.2012 | 7878.58 | 8873.71 | 2795.33 | 2375.59 | 76263.58 | 51299.82 |
| 31.12.2012 | 8527.47 | 9596.33 | 2758.69 | 2566.6 | 97728.24 | 57491.91 |
| 28.06.2013 | 9643.87 | 10416.48 | 3026.14 | 2819.36 | 92705.75 | 57384.9 |
| 31.12.2013 | 9323.24 | 10247.1 | 3185.26 | 2792.76 | 82447.87 | 62104.46 |
| 30.06.2014 | 9001.26 | 10664.86 | 2986.15 | 2993.52 | 96651.63 | 64399.09 |
| 31.12.2014 | 9425.69 | 10685.48 | 2883.72 | 2931.53 | 106149.76 | 67179.06 |

Table 10: Calculated parameter values and ERP estimation results of the alternative DDM for the January 2015

| Period (years) | Forecast earnings growth rate | Forecast ROE | Forecast dividend payout ratio | Forecast book value current year | Forecast earnings | Forecast dividends |
|---|---|---|---|---|---|---|
| 1 | 9.74% | 14.03% | 30.59% | 67,179.06 | 9,425.69 | 2,883.72 |
| 2 | 11.54% | 15.91% | 27.43% | 74,933.01 | 10,685.48 | 2,931.53 |
| 3 | 10.63% | 14.97% | 29.01% | 83,324.10 | 11,820.85 | 3,429.76 |
| 4 | 9.92% | 14.47% | 32.21% | 91,936.32 | 12,993.89 | 4,381.67 |
| 5 | 9.22% | 13.98% | 35.40% | 100,674.74 | 14,192.09 | 5,453.67 |
| 6 | 8.52% | 13.48% | 38.59% | 109,432.70 | 15,401.06 | 6,643.10 |
| 7 | 7.82% | 12.98% | 41.78% | 118,093.64 | 16,604.75 | 7,943.81 |
| 8 | 7.11% | 12.49% | 44.97% | 126,533.49 | 17,785.73 | 9,345.89 |
| 9 | 6.41% | 11.99% | 48.16% | 134,623.48 | 18,925.55 | 10,835.56 |
| 10 | 5.70% | 11.50% | 51.35% | 142,233.41 | 20,005.15 | 12,395.22 |
| LONG TERM | 5.00% | 11.00% | 54.54% | 332,287.76 | 570,163.06 | 380,108.71 |
| | ERP | 8.68% | | | | |
| | Index value | 106,149.76 | | | | |
| | Rf (2-year bond) | 8.02% | | | | |

Table 11: Calculated parameter value and ERP estimation result of the Residual Income Model for January 2015

| Period (years) | Forecast earnings growth rate | Forecast ROE | Forecast dividend payout ratio | Forecast book value current year (Mil. TL) | Forecast earnings (Mil. TL) | Forecast dividends (Mil. TL) |
|---|---|---|---|---|---|---|
| 1 | 9.74% | 14.03% | 30.59% | 67,179.06 | 9,425.69 | 2,883.72 |
| 2 | 11.54% | 15.91% | 27.43% | 74,933.01 | 10,685.48 | 2,931.53 |
| 3 | 10.63% | 14.97% | 29.01% | 83,324.10 | 11,820.85 | 3,429.76 |
| 4 | 9.92% | 14.47% | 32.21% | 91,936.32 | 12,993.89 | 4,381.67 |
| 5 | 9.22% | 13.98% | 35.40% | 100,674.74 | 14,192.09 | 5,453.67 |
| 6 | 8.52% | 13.48% | 38.59% | 109,432.70 | 15,401.06 | 6,643.10 |
| 7 | 7.82% | 12.98% | 41.78% | 118,093.64 | 16,604.75 | 7,943.81 |
| 8 | 7.11% | 12.49% | 44.97% | 126,533.49 | 17,785.73 | 9,345.89 |
| 9 | 6.41% | 11.99% | 48.16% | 134,623.48 | 18,925.55 | 10,835.56 |
| 10 | 5.70% | 11.50% | 51.35% | 142,233.41 | 20,005.15 | 12,395.22 |
| LONG TERM | 5.00% | 11.00% | 54.54% | 290,657.47 | 445,272.20 | 296,848.14 |
| | ERP | 9.66% | | | | |
| | Index value | 106,149.76 | | | | |
| | Rf (2-year bond) | 8.02% | | | | |

# B Figures

Figure 1: Historical monthly ERP values, 2002-2014

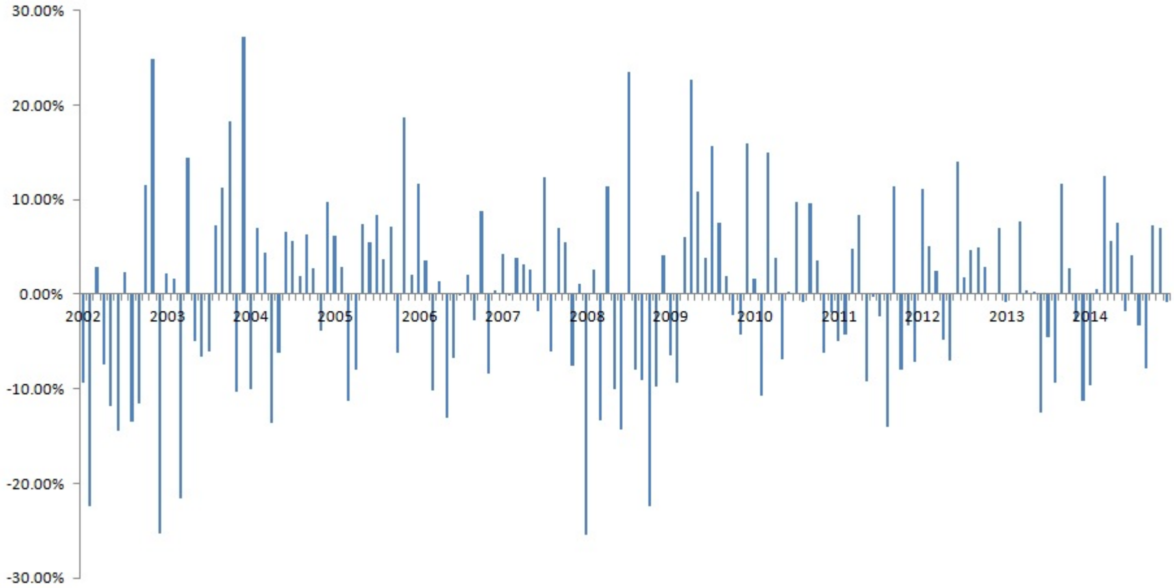

Figure 2: ERP estimates by three alternative models, 2005-2014

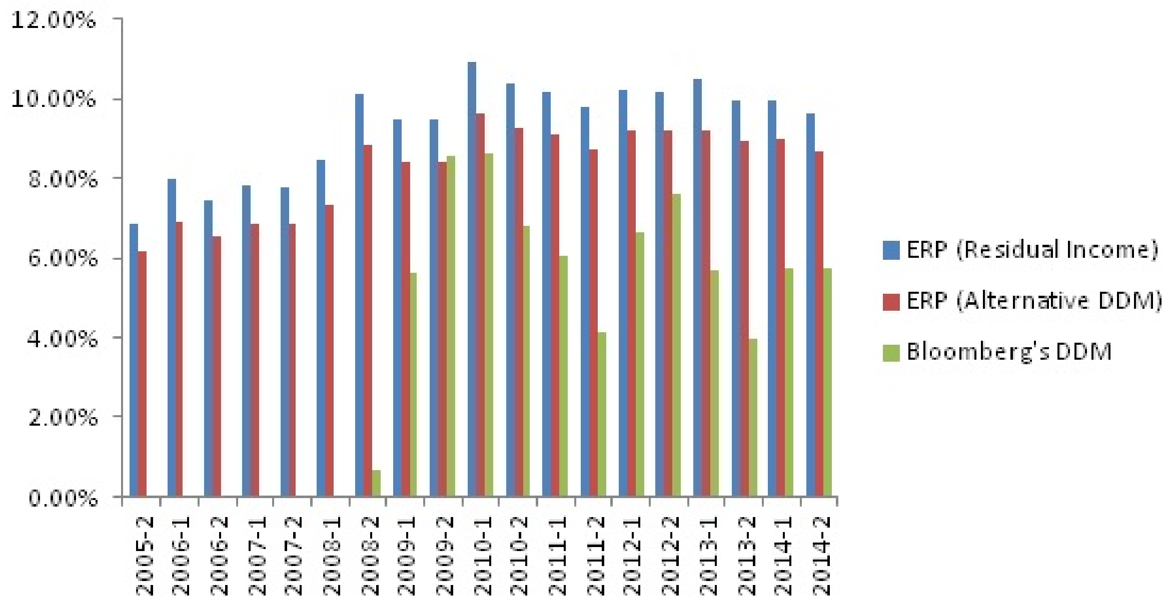


Figure 3: Turkish sovereign bond yield and CDS spreads (net of US) in 2012-2014