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# Equity Returns, Firm-Specific Characteristics and Sector Rotation: Evidence from Turkey

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**ABSTRACT:** This paper examines the firm-spesific characteristics that affect on equity returns depending on sector rotation scheme throughout four financial cycle stages for an important emerging market, Turkey. For this purpose, using panel data for twenty-five non-financial equities selected from ISE-100 companies and twenty-six firm-specific characteristics in 2005Q1-2011Q1 it is analysed empirically whether firm-spesific factors that affect on equity returns differ among equity groups classified by sector rotation scheme throughout financial cycle stages. The firm-spesific characteristics have been reduced in five factor indexes which labelled liquidity, profitability, efficiency, growth, and valuation using factor analysis. We generated four dummy variables to classified equities using sector rotation scheme throughout financial cycle: "early expansion", "late expansion", "early recession", and "late recession". Panel regressions, with and without dummy variables, have been estimated using random coefficient model. In the full sample model, equity returns have been explained by only market return. In the with dummy variables model, equity returns of early and late recession equity groups explained by only market returns. Besides, in the early expansion and the late expansion groups, valuation factor is an important determinant of equity returns in addition to market return. Our finding shows that the factors that effect on equity returns differ among their belonging industries' sensitivity to business cycle.

**Keywords:** equity returns; business cycle; financial ratios; factor analysis; panel regression
**JEL Classifications:** C33; G15; G120

## 1. Introduction

What are the important drivers of equity returns? Do drivers of equity returns differ by firms' sensitivity to business cycle? The asset pricing literature is based on the efficient-market hypothesis (EMH) and the capital asset pricing model (CAPM). The efficient-market hypothesis argues that financial markets are efficient and equity prices represent actual values. This hypothesis advocates that any type of information that might affect equity prices have already been known by the investors who make their assumptions on the basis of such information. The CAPM advocated by Sharpe (1964) assumes markets are efficient. The CAPM concludes that an investor can earn greater return only by taking on more risk. In the CAPM model average stock return has been explaned only by market portfolio return. After the 1980, it has been examined additional factors that provide explanatory power other than β for average stock returns. Rosenberg et al. (1985) find a positive relationship between the average return and book to market value. Fama and French (1992) find that the size and book to market value variables capture the cross sectional variation in average stock returns. Lakonishok et al. (1994) find a strong positive relationship between average returns and book to market value and cashflow to price ratio. The CAPM could not explain these relations.

Leavons (1945) explained that diversification into separate industries may also not protect against fluctuations that could affect all industries simultaneously. Bodie et al. (2009) denoted that sector rotation, will be successful only if one anticipates the next stage of the business cycle better

than other investors. Sector rotation has represents firms' outperformance during business cycle. It has been used for the asset allocation to shift investment assets from one investment sector to another, at the current business cycle. Sectors have different sensitivity to the business cycle. Tan and Mathews (2009, 2010) explain that some industries, with rapid product turnover, show special dynamics moving through fluctuations that are not necessarily related to the business cycles. These are known as 'cyclical industrial dynamics'. Berman (1997) denoted that cyclical dynamics at the level of individual industries may present rather different patterns from those of the general business cycles. For example, while the fluctuations of many industries link with those in the aggregate economy, there were also many industries that are not sensitive to business cycles. The pharmaceutical, educational service, insurance and public service industries have no represent sensitivity to business cycles. The health service industry exhibits higher growth during recession stage. Filardo (1997) claims that the manufacturing sector may be more susceptible to the business cycle than the service sector because the product demand is more volatile due to the durable and tradable inherence of its product. Firms' sensitivity to business cycles has been determined through three factors; sales sensitivity/consumption flexibility, operation and financial leverage. In general, any sector provides systematic outperformance during any business cycle stage. Investor behaviour is same as consumer behavior across any industry stocks and products. Therefore, financial cycle is leading indicator of business cycle. In our work, it has been analysed whether firm-specific factors that affect on equity return differ firms classified by outperformance during four phases of financial cycle. At the same time, the firm classification helps to discard the heterogeneous behavior of financial ratios.

Hamdi and Abdelrazzak (1994) show that the presence of inter-relationships among the sets of financial ratios. In statistical language, this inter-relationship is called as multicollinearity. A smaller number of representative ratios should be sufficient to get most of the needed information. We can eliminate this effect using inductive methods. Factor analysis is the most popular amongst them. The method identifies latent factors inherent into the total set of financial ratios. Fama and French (1988) and Haugen and Baker (1996) used factor analysis to reduce financial ratios. In this way, we can generate a smaller number of factors to be used for analysis. In implication, twenty-six financial ratios reduced in five factors labelled as liquidity, profitability, efficiency, growth, and valuation using factor analysis.

We have investigated whether the factors that affect equity returns differs across firms grouped by outperformance during four stages of financial cycle, other named sector rotation scheme. In that way, it will be explored whether the factors that affect equity returns are only related to investor behaviors or it is also related to consumer behaviour via firms' sensitivity during business cycle. As mentioned in Dow and Gorton (1997) research, it will be investigated whether or not asset pricing model differs depend on sensitivity to business cycle.

Depending on the differencies in the demand flexibility of goods and services provided by companies, these companies will react differently to the changes during business cycle. Different sectors have been behaved cyclically stronger, weak or neutral. Because of that reason in our research differencies shall be analyzed with respect to behavioral changes during financial cycle stages. For the purpose to classify the companies, it will be used sectoral rotation schema which represents sectors' outperformance during business cycle stages, as embodied by the Stovall (1996) guide. As pictured in this scheme, industrial and basic materials sectors are stronger during expansion stages than other industries. And consumption goods and services sectors are also stronger during recession stages than other industries. Accordingly it surfaces that demand structure of firms outperformed during business cycle stages differs; institutional consumer for the firms ourperformed expansion stages and individual consumer for the firms outperformed during recession stages. Raw material and semi-finished goods flexibility is weaker compared to final goods and services. In that case, flexibility level of institutional consumer consuming raw material and semi-finished goods is lower than the behaviors of households/individual consumer consuming final goods and services. Behaviors in a household reflect theory of evolution in which survival impinges upon learning from mistakes all one's life and this in turn gains individual consumer a high level of flexibility. In our research, asset pricing models shall be estimated with and without dummy variables represented firms grouped by outperformance during four financial cycle stages. And it shall be determined whether these pricing models vary with respect to firms' outperformance during business cycle stages.

The rest of the study is as follows. The next section reviews the literature. Section 3 presents data and empirical methodology. Section 4 shows empirical results and the last section concludes the study.

## 2. Literature Review

The CAPM advocated by Sharpe (1964) has claimed that returns are positively and linearly related to systematic market risk. Instead, additional variables have been shown to affect equity returns. Rosenberg et al. (1985) find a positive relationship between the average return and book to market value. Fama and French (1992) find that the size and book to market value variables capture the cross sectional variation in average stock returns. Lakonishok et al. (1994) find a strong positive relationship between average returns and book to market value and cashflow to price ratio. Fama and French (1995) study has exhibited that there is correlation between expected return market to book value ratio. Oh et al. (2006) found out that there is an effect of lower price to earning ratio. Chang et al. (2008) have examined equity returns and price to earning ratio relation and it has been attested that in equities with high levels of expansion, price to earning is effectual in explaining the returns. These relations could not been explained the CAPM model.

In Moskowitz and Grinblatt (1999) study it has been demonstrated that in sector groups, identical dynamics drive the equities to move concurrently. Moskowitz and Grinblatt (1999) findings show that stocks in industry groups should move together. Sector constituents operate under identical market dynamics and regulatory environments, and tend towards similar capital structures. Bodie et al. (2009) comment: "... sector rotation, like any other form of market timing, will be successful only if one anticipates the next stage of the business cycle better than other investors," (pg. 574). DeStefano (2004) study separates the business cycle into four parts: The early stages of economic expansion, later phase of the expansion, early stage of the recession and later part of the recession. DeStefano says that many "of the results discussed above -suggesting systematic movements in stock returns, expected returns, risk premiums, and volatility- cast doubt on the common practice of modeling stock returns or expected returns as a constant linear function of risk or deterministic variables".

Factor Analysis has been used as a mean of eliminating redundancy and reducing the number of financial ratios by researcher. Chen and Shimerda (1981), Fama and French (1988), Haugen and Baker (1996), Tan et al. (1997), Titman et al. (2003), Welch (2004), Cooper et al. (2008), Hahn and Lee (2009), De et al. (2010) and Siqueira (2012) classified financial ratios using factor analysis. Econometric approaches employed in asset pricing models are open to variations. The earliest studies explaining equities returns on the basis of company characteristics are Fama, French (1992) cross sectional model, Fama and French (1993) time series model. Differing from these studies, in this particular research panel data model analyzing cross-sectional and time series model cumulatively has been employed. Another feature that differs from Fama and French (1988) studies is that as explanatory variable, a large number of company characteristics have been reduced via data reduction method to few numbers of homogenous factors groups and then employed as company characteristics. In this research since variables that affect equities returns change not only from unit to unit but also alongside time, it has been preferred to use Swamy random coefficient model which is one of the panel data models. In the field of econometrics the application of random coefficient panel data model in explaining equities returns is seen Kwan's (2002) research. In this particular research sensitivity of commercial bank equity returns towards interest ratios have been analyzed via random coefficient panel data approach on the basis of double-index model. Our research differs from this study in that random coefficient model is predicted separately for the equities groups established on the basis of different consumer behaviors within the four phases of financial business cycle and that market efficiency has been tested with respect to differences seen across units.

## 3. Data and Empirical Methodology

### 3.1. Data

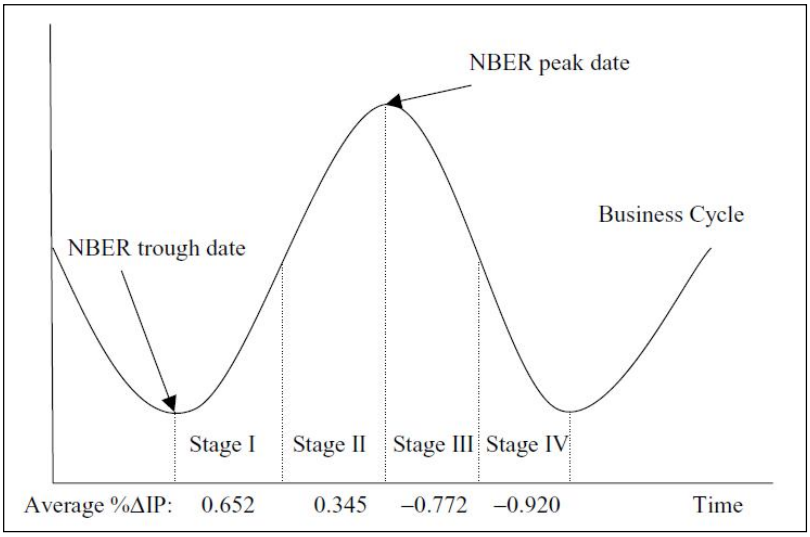
Our sample is composed of twenty-five non-financial firms selected from ISE-100 Composite Index over the period from 2005Q1 to 2011Q1. To include greater quantity of companies in research, it has been used the data of companies offered to public after 2005. With respect to financial ratios there is no homogeneity between real and financial sector. Since in financial sector the structure and financial

tables and rates used in drawing comparisons are not similar to real sector, the equity of this sector have been excluded from the scope of analysis. Towards the aim of forming more homogenous groups in data set, sector equities that cannot be adequately represented in terms of sectoral density in ISE and equities of which trading volume is comparatively lower but volatility is higher have been excluded from the study and in the research has been limited to data from twenty-five companies. We define twenty-six measures of firm-spesific characteristics: Current Ratio, Quick Ratio Siqueira (2012); Total Debt to Total Assets ratio (Welch (2004), Equity to Assets Ratio as defined Hahn and Lee (2009); Profit Margin, Asset Turnover, Return on Assets Ratio, Profit Growth, Price to Cash Ratio as defined by Haugen and Baker (1996); Asset Growth rate as defined by Cooper, Gulen, and Schill (2008); Price to Earnings Ratio, Book to Market Ratio as defined Fama and French (1988); Working Capital Growth as defined Titman et al. (2003); Cash Ratio, Financial Debt to Total Debt Ratio, Debt Growth, Gross Profit Margin, Operating Profit Margin, EBITDA Margin, Current Asset Turnover, Receivables Turnover, Equity Turnover, Tangible Assets Turnover, Working Capital Turnover, Inventory Turnover, EBITDA Growth, Sales Growth. The definition of firm-spesific characteristics have been represented in Table A1 at the appendix. Total twenty-six financial and fundamentals ratios have been reduced in five firm-spesific factor indexes using factor analysis method. Factors names have been given considering the financial ratios featuring in each of them as well as in the corresponding clusters are best represented by the factor name. Five firm-spesific factors respectively are labelled as liquidity, profitability, efficiency, growth, and valuation. Factor analysis result shows that Table 1.

In this study has employed technology, consumption goods, industry, basic goods, energy, food, health, public services and finance discriminations which are acknowledged as Global Industry Classification Standard (GICS®) sector definitions. In present study in defining the sectors of companies, GICS® standards have been used instead of ISE industry classification.

Variables used in the regression are comprised of the firm-specific factor indexes, ISE-100 Composite Index return as the proxy for the market portfolio return and Equity Returns. To collect the data it has been used FINNET Financial Analysis Program, Matrix Market Data Vendor. Stata software has been used to statistical and econometric analysis.

**Figure 1. Business Cycle Stages**

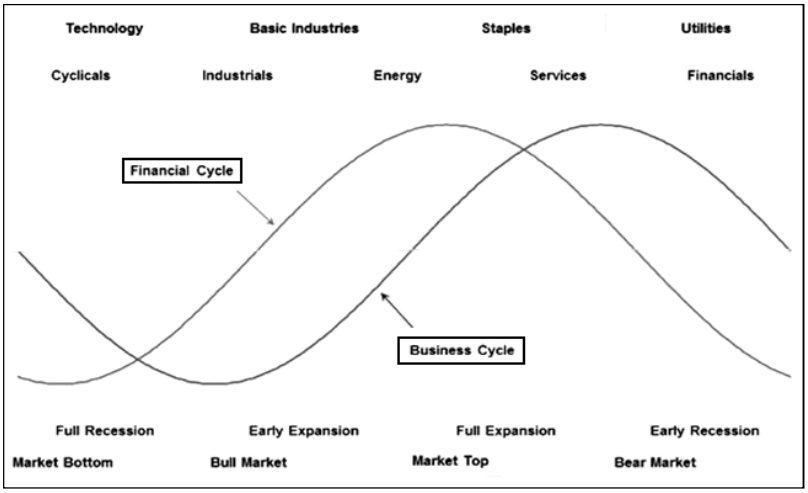



Source: DeStefano (2004)

In the model, we have used four dummy variables to investigate whether explanatory variables' slope chances by firms' sensitivity during business cycle stages or not (figure 1). For this purpose, companies have been grouped with respect to outpermance during business cycle using Stovall's (2007) equities business cycle and sector rotation scheme. In this study, business cycle stages are defined four phases as "Early Expansion", "Late Expansion", "Early Recession" and "Late Recession" identified by DeStefano (2004). The twenty-five companies in this research has initially

been sectoral grouped with respect to GICS® definitions; next they have been classified into four groups according to equities business cycle and sector rotation scheme illustrated in Sam Stovall's (2007) "Guide to S&P's Sector Rotation" and business cycle phases defined by DeStefano (2004).

**Figure 2. Sector Rotation throughout the Financial Cycle and Economic Cycle**




Source: Stoval (2004) Guide.

The sectors within these four business cycle phases are industrial (transportation) and information technology sectors for early recovery; industrial and materials for late expansion; staples, energy and healthcare for early recession; utilities, telecomunication services, financials and consumer discreationary sectors for late recession. Classified firms, using by financial cycle presented in the Figure 2, have been demonstrated in Table 2. We have generated four dummy variables for the stages of financial cycle using Table 1. Dummy variables take the value of 1 for each equity group which shows outperformance during financial cycle. They take the value of 0 for other groups.

### 3.2. Empirical Methodology

Factor analysis technique has been used for reduction of firm-specific explanatory variables. (Fama and French (1988), Haugen and Baker (1996), Titman et al. (2003), Welch (2004), Cooper et al. (2008), Hahn and Lee (2009), Siqueira (2012)) Factor analysis seeks to discover if the observed variables can be explained largely or entirely in terms of a much smaller number of variables called factors. Factor analysis provides us an empirical basis in creating fewer but independent variables out of highly correlated many variables by combining them. Another virtue of using this technique lies behind the fact that it relieves us of the problem of multicollinearity among the explanatory variables as the factors are not correlated while variables included in these factors are. Calculated factor indexes have been used as proxy for firm-spesific explanatory variables.

The behavior of the stock price that grouped by sector rotation scheme throughout the financial cycle have acquired a different character, due to the varied product process, input combination and demand elasticity of them. We have used random coefficient regression model to describe these differencies. The random coefficient model has been known hierarchical, mixed, multilevel, random coefficient, and varying parameter models. Swamy's random coefficiency model is used due to its ability to handle the autocorrelation and heteroskedasticity problem at time and unit level, through an investigation of efficiency differences acros groups. In application, Swamy's random coefficient model has been utilized since it proved to be more effective in examining inter-group efficiency difference and solving autocorrelation and heteroskedastisity problem within the dimension of time and unit. Since Generalized Least Squares (GLS) estimator used by Swamy is consistent in situations where Gauss-Markov hypotheses are verified, linearity hypotheses have been trialed. As the GLS estimator used by Swamy is consistent where Gauss-Markov assumptions are met, the assumptions of linearity were tested. If the data are generated by the random coefficiency model process, the RCM estimates will be more efficient than OLS estimates, and the RCM standard errors will be correct (Beck and Katz, 2007).

**Table 1. Sector Rotation Scheme throughout the Financial Cycle for Selected Companies**

| EARLY EXPANSION | LATE EXPANSION | EARLY RECESSION | LATE RECESSION |
|---|---|---|---|
| Industrials | Industrials | Consumer Goods/Staples | Utilities |
| *Transportation* | *Industrial Equipment* | *Food* | *Electricity, Gas* |
| GOODY | TTRAK | BANVT | PRKME |
| BRISA | *Infrastructure* | BIMAS | AKENR |
| Inf.Technology | ENKAI | Energy | AYGAZ |
| - | EGSER | *Petrolium* | Telecomunication Services |
| | Materials | TUPRS | ASELS |
| | *Metals* | Healthcare | Financials |
| | EREGL | - | - |
| | IZMDC | | Consumer Discreationary/ Cyclicals |
| | KRDMD | | *Media* |
| | KOZAA | | HURGZ |
| | *Chemicals* | | *Retail* |
| | EGGUB | | PTOFS |
| | PETKM | | BOYNR |
| | | | *Autos & Parts* |
| | | | DOAS |
| | | | FROTO |
| | | | *Leisure Goods* |
| | | | SASA |
| | | | ULKER |

Source: Authors (using S&P Sectoral Rotation Guide, GICS, DeStefano (2004))

Barth et al. (1979) quarterly observations on output prices, wages, materials price, inventories, and sales for seventeen manufacturing industries for the period from 1959Q1 to 1971Q2 to estimate a price equation fort he U.S manufacturing sector. "Pricing behaviour across industries is likely to vary, because input combinations are different, labor market is not homogeneous, and demand may be more elastic or inelastic in one industry than another." (Hsiao (2002): Barth et al. (1979)) The random coefficient model is used to account for heterogeneous sectoral behaviour. Barth et al. (1979) used the Swamy random-coefficient formulation, to estimate the price equation. In the equity return literature, Kwan (2002) explained equity returns using random coefficient model.

Asset pricing models which is based on firm-specific characteristics has been set as the (1) and (2) no equation in Swamy's random coefficient model. Equation 1 represents that the full sample equation.

$$R_{it} = \alpha_{it} + \beta_{0i} XU100R_{it} + \beta_{1i} LIQUIDITY_{it} + \beta_{2i} PROFITABILITY_{it} + \beta_{3i} EFFICIENCY_{it} \quad (1)$$
$$+ \beta_{4i} GROWTH_{it} + \beta_{5i} VALUATION_{it} + u_{it}$$

Equation 2 shows that equation with dummy variables, which represent equity groups classified by outpermance during four financial cycles.

$$R_{it} = \alpha_{it} + \beta_{0i} XU100R_{it} + \beta_{1i} LIQUIDITY_{it} + \beta_{2i} PROFITABILITY_{it} + \beta_{3i} EFFICIENCY_{it}$$
$$+ \beta_{4i} GROWTH_{it} + \beta_{5i} VALUATION_{it} + \sum_{s=1}^{4} \beta_{6is} DUMMY_{sit} + \sum_{s=1}^{4} \beta_{7is} DUMMY_{sit} * XU100R_{it}$$
$$\sum_{s=1}^{4} \beta_{8is} DUMMY_{sit} * LIQUIDITY_{it} + \sum_{s=1}^{4} \beta_{9is} DUMMY_{sit} * PROFITABILITY_{it}$$

$$\sum_{s=1}^{4}\beta_{10is}DUMMY_{sit} * EFFICIENCY_{it} + \sum_{s=1}^{4}\beta_{11is}DUMMY_{sit} * GROWTH_{it}$$
$$+ \sum_{s=1}^{4}\beta_{12is}DUMMY_{sit} * VALUATION_{it} + u_{it} \quad (2)$$

In the equations $R_{it}$ indicates equity returns variables. XU100Rit refers to ISE-100 Composite Index return variable, $LIQUIDITY_{it}$ indicates Liquidity Factor Index, $PROFITABILITY_{it}$ indicates Profitability Factor Index, $EFFICIENCY_{it}$ indicates Efficiency Factor Index, $GROWTH_{it}$ indicates Growth Factor Index, $VALUATION_{it}$ indicates Valuation Factor Index, $\alpha_{it}$ refers to market-independent average equity return; $\beta_{0it}$ refers to sensitivity of equity groups to market, $\beta_{ki}$ shows sensitivity of groups to factors, $\beta_{kis}$ shows sensitivity of equity return to factors for grouped companies during outperform to business cycle stage s and $u_{it}$ error term. $DUMMY_{sit}$ variables take the value of 1 for $i^{th}$ equity outperform to business cycle stages in t, in all other cases it takes the value of 0. s stand for equity groups of "Early Expansion", "Late Expansion", "Early Recession", and "Late Recession" take the values of from 1 to 4, respectively.

We check stationarity of data using three panel unit root test, which can be classified into two groups depending on whether they allow for cross-sectional dependence. These are Im et al. (2003) and Levin et al. (2002) which assumes cross-sectional independence and Breitung (2000) which assumes cross-sectional dependence. Levin et al. (2002) based on common unit-root process, Im et al. (2003) based on individual unit root process. All tests are normally distributed under the common null hypothesis of non-stationarity. We used respectively Wooldridge (2002) test and Breusch Pagan/Cook-Weisberg LM test to analyze autocorrelation and heterogeneity.

## 4. Empirical Results

Total twenty-six financial and fundamentals ratios have been reduced using factor analysis method. Factor analysis results represent in Table 2. There are fourteen firm-spesific variables that have significant factor loading bigger than 0.5. Factor 1 which is named "liquidity and leverage", has four variables with significant loadings. These variables are current ratio, quick ratio, cash ratio and total debt/total assets ratio. Factor 2 which is labelled profitability, have three variables with significant loadings. These three variables are gross profit margin, operating profit margin, and EBITDA margin. Factor 3 which is labelled efficiency, have two variables with significant loadings. These two variables are asset turnover and current asset turnover, move in same direction. Factor 4 which is labelled growth, have three variables with significant loadings. These variables are asset growth, debt growth, and EBITDA growth, move in same direction. Factor 5 which is named valuation, have two variables with significant loadings. These variables are price to earnings ratio and book to market value ratio. Because any liquidity and leverage ratios are in the same factor, we can say that our results provide partial support for the standard text-book classification of financial ratios.

The factor analysis reveals that liquidity accounts for 31% of the total change, whereas profitability accounts for 26%, efficiency accounts for 17%, growth accounts for 13%, and valuation accounts for 6%, adding up to a total of 93%. While fourteen variables reduced to five factors, twelve variables did not include any factor due to their factor loadings are smaller than 0.5.

The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) to check whether the sample is big enough. The sample is adequate if the value of KMO is greater than 0.5. All elements on the diagonal of this matrix should be greater than 0.5 if the sample is adequate (Field 2000: 446). As a result of KMO test which demonstrate in Table 2, the sample is adequate.

We check stationarity of panel data using three common panel unit root tests, the IPS test by Im, et al. (2003), LLC test by Levin et al. (2002) and Breitung (2000) test. The results of the tests have been shown in Table 3. The results indicate that all variables are stationary in level.

According to Wooldridge (2002) autocorrelation test shown in Table 4, the null hypothesis that error terms have serial correlations is refused. The results of the Breusch Pagan/Cook-Weisberg LM Test used to analyze the heterogenity presented in Table 4. Accordingly, homoskedasticity null hypothesis is accepted.

**Table 2. Factor Analysis Results**

| Variables that Significantly Load on the Factor | Factor Loading | KMO* | Factors Loaded Variables | Labelled Factors | Eigen Value | Perception | Cumulative Perception Percentage |
|---|---|---|---|---|---|---|---|
| Current Ratio | 0.895 | 0.693 | Factor 1 | Liquidity and Leverage | 3.579 | 0.312 | 0.312 |
| Quick Ratio | 0.873 | 0.689 | Factor 1 | | | | |
| Cash Ratio | 0.715 | 0.914 | Factor 1 | | | | |
| Total Debt/Total Assets | -0.739 | 0.715 | Factor 1 | | | | |
| Gross Profit Margin | 0.998 | 0.619 | Factor 2 | Profitability | 3.011 | 0.262 | 0.574 |
| Operating Profit Margin | 0.998 | 0.621 | Factor 2 | | | | |
| EBITDA Margin | 0.998 | 0.834 | Factor 2 | | | | |
| Asset Turnover | 0.758 | 0.557 | Factor 3 | Efficiency | 1.937 | 0.169 | 0.743 |
| Current Asset Turnover | 0.699 | 0565 | Factor 3 | | | | |
| Asset Growth | 0.749 | 0.516 | Factor 4 | Growth | 1.533 | 0.133 | 0.877 |
| Debt Growth | 0.715 | 0.565 | Factor 4 | | | | |
| EBITDA Growth | 0.512 | 0.708 | Factor 4 | | | | |
| Price to Earnings Ratio | 0.503 | 0.547 | Factor 5 | Valuation | 0.654 | 0.057 | 0.934 |
| Book to Market Value | 0.558 | 0.576 | Factor 5 | | | | |

Note: * represent Kaiser-Meyer-Olkin measure of sampling adequacy.

**Table 3. Panel Unit Root Tests**

| | Breitung (2000) | LLC (2002) | IPS (2003) |
|---|---|---|---|
| Equity Return | -14.187*(0.000) | -14.404* (0.000) | -14.688* (0.000) |
| Market Return | -4.914* (0.000) | -18.118* (0.000) | -12.742* (0.000) |
| Liquidity | -3.516* (0.000) | -3.0211* (0.001) | -7.074* (0.000) |
| Profitability | -10.583* (0.000) | -18.477* (0.000) | -15. 936* (0.000) |
| Efficiency | -6.070* (0.000) | -13.202* (0.000) | -14.554* (0.000) |
| Growth | -4.800* (0.000) | -6.408* (0.000) | -7.582* (0.000) |
| Valuation | -9.410* (0.000) | -11.682* (0.000) | -14.061* (0.000) |
| N | 25 | | |
| T | 25 | | |

Note: Probability values are in brackets. *denotes statistical significance at the 1% level.

**Table 4. Autocorrelation and Heterogenity Tests**

| | Wooldridge (2002) | Breusch Pagan/Cook-Weisberg LM |
|---|---|---|
| Full Sample | 3.77 (0.064) | 0.47 (0.493) |
| Early Expansion | 0.11(0.796) | 1.89 (0.168) |
| Late Expansion | 2.78 (0.135) | 0.83 (0.361) |
| Early Recession | 0.88 (0.447) | 1.27 (0.260) |
| Late Recession | 2.81 (0.119) | 3.05 (0.081) |

Note: Probability values are in brackets

The asset pricing models based on firm-spesific factors is accounted for in Swamy's random coefficiency model form as the equation 1 and 2. Group-specific coefficients of the Swamy's random coefficient models are presented in Table 5. Firm-specific coefficients have not been presented.

The returns for the early expansion equity group comprising the transportation and information technology sector stocks are explained by market return, in addition to liquidity, profitability, productivity, growth, and valuation factors. The beta coefficient, showing the sensitivity of equity return on market return, is 0.417, positive and statistically significant. It has the lowest beta coefficients for among others. It can be shown that the investors focus on more the company's performance of financial ratios and fundamentals rather than the growth potential of the stock market. Efficiency and growth factors have negative coefficients, which are statistically significant. High turnover ratios, named efficiency ratios, lead to idle liquidity, which have a negative impact on profitability. The negative coefficient for the efficiency factor shows that the investors price the idle liquidity and unstable cash flow risks that may come to pass under high turnover, in a negative manner. The coefficients of other firm-spesific variables are positive and statistically significant. It was observed that the market efficiency hypothesis is not valid for the shares in this group.

**Table 5. Estimation Results of the Random Coefficient Model**

| Dependent Variables: Equity Return | | Group-Secific Coefficients | | | |
|---|---|---|---|---|---|
| Explanatory Variables | Full Sample | With Dummy Variables Model | | | |
| | | Early Expansion | Late Expansion | Early Recession | Late Recession |
| Market Return | 0.955* (0.000) | 0.417* (0.066) | 0.981* (0.000) | 0.642* (0.000) | 1.234* (0.000) |
| Liquidity | 0.020 (0.733) | 0.643* (0.001) | -0.012 (0.914) | 0.027 (0.839) | 0.033 (0.623) |
| Profitability | 1.231 (0.722) | 51.275* (0.002) | -0.957 (0.846) | -0.444 (0.972) | 2.185 (0.618) |
| Efficiency | -0.039 (0.844) | -2.597* (0.004) | 0.176 (0.493) | -0.083 (0.905) | -0.137 (0.591) |
| Growth | 0.033 (0.750) | -1.442* (0.000) | 0.121 (0.422) | 0.087 (0.789) | 0.003 (0.983) |
| Valuation | 0.180** (0.096) | 1.065* (0.017) | 0.375* (0.028) | -0.092 (0.554) | 0.016 (0.852) |
| Constant | 0.040 (0.708) | -1.287* (0.001) | 0.204 (0.252) | 0.182 (0.669) | -0.012 (0.914) |
| N | 25 | 2 | 9 | 3 | 11 |
| k | 12 | 6 | 6 | 6 | 6 |
| T | 25 | 25 | 25 | 25 | 25 |
| d.f.** | 3743 | 293 | 1343 | 443 | 1643 |

Note: Probability values are in brackets. * denotes statistical significance at the 1% level. Degree of freedom calculated by (N*k*T)-(k+1).

For the late expansion equity group containing industry and basic materials sector stocks, equity returns have been explained by market return, in addition to the valuation factor, other named fundamentals. Therefore, it was observed that the market efficiency hypothesis is not valid for this equity group. Beta and the coefficient of the valuation factor are positive and statistically significant. Our findings reveal a significant relationship between fundamental factors and equity returns. Therefore, the market efficiency hypothesis is not valid for the stocks for this stage. The high valuation factor index of the stocks indicates the confidence in outlook for companies in the future. These results are in parallel with those by Fama and French (1988), that high valuation rates can be used to account for positive changes in returns in larger stocks, and that this indicates an inefficient market. As the sample in our study is selected from within ISE-100, the firms are large in scale. In the expansion stages, the goods and services with lower production elasticity generally exhibit strength. This findings its reflection on the firms' asset pricing models; returns define the pricing behavior through inflexible decision making mechanisms of the firms. This reinforces the hypothesis that the production elasticity determines the market efficiency level, and that different valuation models apply for different elasticity levels.

In the early recession stage equity group which includes food and energy firms' stocks, the equity returns can be explained only through the market return. In this group, the beta coefficient is found to be 0.642, which is a positive and statistically significant. The market efficiency hypothesis is validated for this group of stocks. Demand structure of the food, energy, and pharmaceuticals sectors comprises individual consumers. Their production elasticity is higher than basic materials sector. In general, during the early recession stage, the firms which offer necessary goods and services with lower production elasticity exhibit a relatively robust performance.

In the full recession stage of the business cycle, on the other hand, the relatively strong sectors include public services, retail, clothing, automotive, and household appliances. In recession stages, the individual consumers can reacts more quickly compared to institutional consumer, and can modify their habits in the light of the new facts. In such recession stages, consumption goods and services sector steps on its ability to match the pace of change of the business cycle. Accordingly, they maintain the expenses for their most critical necessities, constituting the most consistent segment of economic activities. The returns of the stocks in this stage are affected only by the market returns, which exhibit a quite high and statistically significant coefficient of 1.23. The asset pricing model estimates for this group of stocks converge with the findings of Sharpe (1965). In this respect, it is possible to argue that CAPM applies for the stocks of firms where the production elasticity is high.
Our study revealed that there are equity groups which the CAPM model is valid or not, within the market, simultaneously. The findings revealed that asset pricing model differ by firms' sensitivity to business cycle.

**5. Conclusion**

In this paper it has been shown that asset pricing behaviour differs across firms grouped by sectoral rotation during four business cycle stages. In this study, twenty-five firms listed in ISE-100 were analyzed, on the basis of the price data, twenty sıx firm-spesific characteristics, and ISE-100 index end-of-day close price. The firms were categorized on the basis of business cycles using a sectoral rotation scheme. The differencies of factors affected on equity returns among the equities grouped by outperformance during financial cycle were investigated using Swamy's random coefficiency model. Swamy's (1970) random coefficiency model requires linearity. Therefore, the whole sample and four sub-samples were subjected to Breitung, IPS, and LLC unit-root tests, Breusch Pagan LM heteroskedasticity test, and Wooldridge (2002) autocorrelation test. The asset pricing model have been estimated using Swamy's (1970) random coefficiency model, with equity returns as the dependent variable, and the market return and firm-spesific factor indexes as explanatory variables.

The results suggested that equity returns of basic materials and industry sector firms, which are relatively stronger in the recovery stage of the cycle, can be explained by market return and valuation factor. High valuation ratios bring in high returns for expansion stage equity groups. Lower elasticity of institutional consumer behavior, compared to individual consumer behavior reduces the efficiency regarding these stocks. Therefore, the asset pricing model for these stocks converges with Fama-French's III factors model. In sectors such as iron-steel, chemistry, cement, and construction, which constitute the core of production, high capital and investment requirements, and controlled risks lead to lower reaction times in the face of developments. The stocks of this stage were found to lack market efficiency. The returns on food and energy stocks, which are relatively stronger in the early recession stage of the business cycle, can be explained by market return, and the efficiency factor. The market efficiency hypothesis becomes invalid for the stocks of this stage. The consumer for the firms which are considered strong in the full recession stage is the households or individual consumers. Higher elasticity compared to the demand structure of the previous stage increase the efficiency regarding these stocks. The CAPM model can be valid for this equity group. The results show that the differences in asset pricing model are caused not only by investor behavior but also the structural differences in the production and consumption processes of sectors.

In our study, the categorization has been based on firms' sensitivity to business cycle. This data can be used for choosing stocks to include in the portfolio. In this vein, determining of the equity using sectoral rotation scheme and using affected factors to select the stocks to include in the portfolios will be increase the gain. This study may allow a clear response to the questions of which stocks to choose from which industry, and on the basis of which indicator, given the existing business cycle.

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## APPENDIX

**Table A1. Description of the Variables Used in Factor Analysis**

| Financial Ratios | Formula |
|---|---|
| Liquidity Ratios | |
| Cash Ratio | (Cash+Cash Equivalents+Invested Funds)/Current Liabilities |
| Current Ratio | Current Asset/Current Liabilities |
| Quick Ratio | (Current Assets/Inventory)/Current Liabilities |
| Profitability Ratios | |
| Gross Profit Margin | (Revenue-Cost of Goods Sold)/Revenue |
| EBITDA Margin | Earnings before interest, taxes, depreciation and amortization/Net Sales |
| Operating Profit Margin | Operating Income/Revenue |
| Return on Assets | Net Income/Total Assets |
| Efficiency Ratios | |
| Asset Turnover | Net Sales Revenue/Total Assets |
| Current Asset Turnover | Net Sales Revenue/Current Assets |
| Equity Turnover | Net sales/Equity |
| Inventory Turnover | Net sales/ Inventory |
| Receivables Turnover | Net Credit Sales/Average Accounts Receivables |
| Working Capital Turnover | Net Sales/Working Capital |
| Leverage Ratios | |
| Financial Debt/Total Debt | Total Financial Debt/Total Debt |
| Total Dept to Total Assets | (Short Term Dept+ Long Term Dept)/ Total Assets |
| Capital Structure | |
| Equity to Assets | Total Shareholder Equity/Total Assets |
| Growth Ratios | |
| Asset Growth | (Total Assetst- Total Assetst-1)/ Total Assetst-1) |
| Debt Growth | (Total Debtt- Total Debtt-1)/ Total Debtt-1) |
| EBITDA Growth | (EBITDAt-EBITDAt-1)/ EBITDAt-1) |
| Profit Growth | (Net Profit t- Net Profit t-1)/ Net Profit t-1) |
| Sales Growth | (Net Sales t- Net Sales t-1)/ Net Sales t-1) |
| Working Capital Growth | (Working Capital t- Working Capital t-1)/ Working Capital t-1) |
| Valuation Ratios | |
| Price to Cash Ratio | Share Price/Cash Flow Per Share |
| Book to Market Ratio | Book Value of Firm/Market Value of Firm |
| Price to Earnings Ratio | Current Share Price/Earning per Share |