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Emine Kaya
Malatya Turgut Özal University, Turkey, emine.kaya001@hotmail.com

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Cash Flow and Accrual Anomalies: Evidence from Borsa Istanbul

Emine Kaya*
Malatya Turgut Özal University, Faculty of Social and Humanities Sciences, Accounting and Finance, Management Department, Malatya/Turkey.

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This study aims to determine the persistence of earning and its components and whether investors accurately evaluate the information related to the earning and its components. The study covers the firms operating in Borsa Istanbul between 2005-2017 time period. We sort the accruals and cash flows into five portfolios. Then, we employ linear regression and Mishkin test estimations. Moreover, we compare the asset pricing models with nine metrics in explaining the cash flow and accrual anomalies. Linear regression and Mishkin test estimations show that the persistence of earning is high. The other finding is that cash flow and accrual do not correctly reflect on the stock prices. Also, our results show that the financial asset pricing model is successful in explaining the cash flow and the accrual anomalies. As a result, we can see that the financial asset pricing model continues to be an important model in explaining asset prices. On the other hand, our study is different from the other studies since it uses the Fama and French Five Factor Model to determine the cash flow and accrual anomalies.

Keywords: *Efficiency market hypothesis; asset pricing models; accrual anomaly; cash flow anomaly; Mishkin test; persistence estimations.*

JEL Classification: G11, G12, G14.

Introduction

The origin of efficient market hypothesis goes back to the 1960s. Eugene F. Fama and Paul A. Samuelson independently develop the market efficiency from two different research each other (Lo, 2007). Samuelson (1965) states that the price of a financial asset randomly fluctuates and future information cannot be predicted. Fama, Fisher, Jensen, and Roll (1969) and Fama (1970) define the term of efficient market as a market that rapidly reflects the new information.

Efficient market and the random walk hypotheses are major issues in the financial literature. Since random walk claims that excess returns cannot be obtained using past price movements and the validity of efficient market hypothesis is important for financial theories and investment strategies. If a stock market is efficient, the pricing mechanism efficiently allocates the capital in an economy. The inefficiency of financial markets may trigger the competent authorities to correct it (Borges, 2010).

The efficiency of stock market implies that the information quickly and accurately reflects prices and the random walk process characterizes the efficient stock market. When a stock price has a random walk process, if stock price

* Corresponding author's email: emine.kaya001@hotmail.com

gets a price shock, this shock becomes permanent. In addition, the property of random walk shows that future returns cannot be predictable with previous observations (Özdemir, 2008), and the stock price volatility increases without any bound for a long time. The opposite of this situation, if stock prices have mean reversion processes, the price level will return to its trend in a long time and this situation proves that investors can forecast future return with past behavior, and trading strategies can be developed to earn higher return (Lee, Lee, and Lee, 2010).

Behavioral finance assumes that the efficient markets hypothesis has lost its validity. Shiller (1998) emphasizes that the important principles of efficient markets hypothesis are not entirely true. Thus, there are some deviations from the market efficiency. The most crucial examples of these deviations are the anomalies observed in the financial markets in the past years. On the other hand, Thaler (1987) states that the anomaly is an unusual behavior for the capital markets that does not agree with the theory. Hou, Xue, and Zhang (2018) detect that there are approximately 400 different anomalies for the cross-section stock returns in the United States.

Earning consists of accruals and cash flows and investors do not distinguish the difference between accrual and cash flows. In this case, since the accruals cause the accounting manipulation, investors may cause mispricing of the accruals. The persistence of the earning increases with the decrease of accrual and the increase of cash flow. In other words, the persistence of accruals is lower than the persistence of cash flows (Bradshaw, Richardson, and Sloan, 2001). When accruals are priced higher and cash flows are priced lower, mispricing causes the decrease of earning in the future. As a result of the decrease in the earning, the response of the market to earning announcements is negative and stock returns follow a negative trend. This situation is called accrual and cash flow anomalies.

Accrual and cash flow anomalies are firstly addressed by Sloan (1996). Sloan (1996) states that the impact of cash flows and accruals on earning is different but investors fixate on earning and ignore this difference. Contrary to Fama (1970), Sloan (1996) argues that investors fail to determine the impact of accruals and cash flows on earning. Fama and French (2008) emphasize that accrual and cash flow anomalies are the most common anomalies in size groups, cross-sectional regressions, and portfolio-based tests. Mashruwala, Rajgopal, and Shevlin (2006) try to determine why accruals anomaly exists and indicate that there are some constraints for the accruals. Konstantinidi, Kraft, and Pope (2016) and Patatoukas (2016) debate whether the accrual anomaly shows asymmetric persistence for economic losses or economic gains years.

Call (2008) shows that analyst cash flow forecasts may reduce earnings manipulations and increase earnings quality. Moreover, Call, Chen, and Tong (2009) suggest that analyst cash flow forecasts are helpful for analysts and investors. Previous studies prove that investors do not accurately price accruals (Sloan, 1996). But, accruals are important in the prediction of future abnormal returns. Xie (2001) shows that discretionary accruals significantly and positively affect abnormal returns while non-discretionary accruals do not positively affect the abnormal returns. On the other hand, high accrual and low cash flow firstly cause high returns for the firms and then, the firms may earn low returns.

Fairfield, Whisenant, and Yohn (2003) propose that the mispricing of accruals is caused by the growth of net asset value. LaFond (2005) states that accrual anomaly is important due to the dependence between accruals and the accounting system. Also, examining the general aspects of accruals provides evidence for the existence of market efficiency (Pincus, Rajgopal, and Venkatachalam, 2007) and the robustness of the accrual anomaly (Dechow, Khimich, and Sloan, 2011). These situations increase the importance of determining the existence of cash flow and accrual anomalies.

After accounting scandals such as Enron and WorldCom became, cash flow and accrual information demand of investors considerably increased and cash flow forecasts started to important in recent years. Thus, determining the relationship between the components of earning and stock return is important for stock valu-

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ation in the literature and this situation is the motivation of our study.

The purpose of this study is to examine the existence of accrual and cash flow anomalies for Borsa Istanbul. We organize the general operation of the study by following Sloan (1996), Xie (2001), Pincus et al. (2007), Sehgal, Subramaniam, and Deisting (2012), Fama and French (2015), and Cox and Britten (2019). On the other hand, our study examines how Fama and French Five-Factor Asset Pricing Model (FF5FM) explains accrual and cash flow anomalies compared to the Financial Asset Pricing Model (CAPM) and the Fama and French Three-Factor Asset Pricing Model (FF3FM).

The contributions of our study to the existing literature are as follows: This study is one of the few studies on accrual and cash flow anomalies for Borsa Istanbul. Therefore, this aspect of the study fills an important gap in the literature. Our study is different from the other studies since it uses the FF5FM to explain the cash flow and accrual anomalies, but the other studies use the CAPM and the FF3FM to explain the cash flow and accrual anomalies. Using the FF5FM in explaining the cash flow and accrual anomalies provides evidence about explanation power of the FF5FM on stock returns and comparison of the asset pricing models. Another contribution of the study to the literature is the investigation of cash flow and accrual anomalies together and comprehensively in comparing the asset pricing models.

Turkey is an attractive emerging market for foreign investors but the Turkish economy has a volatile growth and high and persistent inflation. These situations make Turkey unique among other emerging markets. In the past years, Turkey exposed to severe financial crises. As a result, these crises cause the structural changes in Turkish financial markets (Alper, Berument, and Malatyalı 2001; Berument and Dincer, 2004 a, b) and particularly, substantial capital outflows and the volatility of the capital flows affect the Turkish stock market (Özdemir, 2008). On the other hand, Balaban (1995) and Balaban, Candemir, and Kunter (1996) prove the weak-form and semi-strong form efficiency of Borsa Istanbul. Moreover, Özdemir (2008) explores that the Turkish stock market is a weak-form efficient market. Hence, this study with this feature contributes to asset pricing and behavioral finance literature of Turkey which is one of the emerging markets. On the other hand, determining the impact of cash flows and accruals on stock returns by using a combined model which brings together Sloan (1996) model and Fama and French (1993, 2017) model is among the contributions.

Literature Review and Hypothesis Development

Since accruals and cash flows are negatively related, Sloan (1996) argues that creating a high cash flow investment strategy can provide high returns. The author also accepts that accrual and cash flow anomalies coexist. However, there are conflicting views in the literature regarding the coexistence of accrual and cash flow anomalies. Collins and Hribar (2000) prove that the accrual and cash flow anomalies coexist while Pincus et al. (2007) state that the existence of an accrual anomaly does not always mean the presence of cash flow anomaly.

Investigating accrual and cash flow anomalies in the literature from various perspectives for developed and developing countries are available (Koerniadi and Tourani-Rad, 2007; Pincus et al. 2007; Kaserer and Klingler, 2008; Dimitropoulos and Asteriou, 2009; Dopuch, Seethamraju, and Xu 2010; Richardson, Tuna, and Wysocki 2010; Khanchel El Mehdi, 2011; Clinch, Fuller, Govendir, and Wells, 2012; Sehgal et al. 2012; Vivattanachang and Supattarakul, 2013).

There are three views in the literature for the evaluation of accrual and cash flow anomalies (Mashruwala et al. 2006; Özkan and Kayalı, 2015). The first opinion explains that the accrual and cash flow are related to analysts, institutional investors, and insiders, the second opinion claims that the cash flow and accrual anomalies are related to the other anomalies, and the third opinion brings an alternative perspective to the accrual and cash flow anomalies.

Desai, Rajgopal, and Vennkatachalam

(2004) investigate whether the accrual anomaly is a stock market phenomenon, and accrual and cash flow anomalies disappear with the control of the value effect. Collins and Hribar (2000) state that accrual anomaly and post-earning announcements are separated from each other. Xie (2001), Richardson et al. (2005), and Papanastasopoulos (2017) study the pricing errors of the accrual and cash flow. Mashruwala et al. (2006) and Lev and Nissim (2006) analyze why the accrual and cash flow anomalies have not been arbitraged away. Finally, Pincus et al. (2007), Kaserer and Klingler (2008), and Fan and Yu (2013) examine the accrual and cash flow anomalies with an international scope.

Barberis, Huang, and Santos (2001) and Ahmed, Nainar, and Zhang (2006) show that the market underestimates the persistence of cash flows and the cash flow anomaly is stronger than the accrual anomaly. A trading strategy based on both the accruals and cash flows can earn higher excess returns than one based on accruals alone. Shivakumar (2006) also argues that cash flows are positively related to future returns more than accruals. Chan, Chan, Jegadeesh, and Lakonishok (2006) explain that manipulation of earning leads to accruals mispricing.

The earning includes both accruals and cash flow terms, but when the magnitude of the accrual component of earning is higher than the magnitude of the cash flow component, the persistence of the earning decreases. Therefore, in this study, we examine the persistence of earning and its components and the first hypothesis in our study is given below.

H_1: On the persistence of earning, the size of the accrual component of the earning decreases and the size of the cash flow component of the earning increases for Borsa Istanbul.

Within the test of H_1, in line with Freeman, Ohlson, and Penman (1982) and Sloan (1996), we express the relationship between current earning performance and future earning performance in our study as follows.

$$\text{Earning}_{t+1} = \alpha_0 + \alpha_1 \text{Earning}_t + \upsilon_{t+1} \quad (1)$$

We obtain the earning of Equation (1) by dividing operating profit to average assets. The α_1 measures the persistence of return rate on assets. However, the H_1 estimation in Equation (1) is not correct since Equation (1) contains the sum of accrual and cash flow components earning. In this way, this specification converts into the following form under H_1.

$$\text{Earning}_{t+1} = \delta_0 + \delta_1 \text{Accruals}_t + \delta_2 \text{Cash Flows}_t + \upsilon_{t+1} \quad (2)$$

In Equation (2), $\delta_1 < \delta_2$. Compared to cash flows, smaller coefficients of accruals mean less persistence of the accrual component of earning.

In this study, to measure the persistence of earning and its components over the 2005-2017 period for Borsa Istanbul, we estimate regressions for one-year-ahead earning on current earning and one-year-ahead earning on current accruals and current cash flows. Thus, we test the second hypothesis which is given below.

H_2: Stock prices are successful in reflecting the accrual which has low persistence and the cash flow which has high persistence for Borsa Istanbul.

Mishkin (1983) develops the functioning of H_2 tests to examine the hypothesis of rational expectations as nonlinear regression estimation and we use it in this study. This operation begins with the basic demonstration of market efficiency where excess returns are equal to zero.

$$B(\text{Return}_{t+1} - \text{Return}_{t+1} | \theta_t) = 0 \quad (3)$$

In Equation (3), θ_t is the set of information in the market at the end of the period t, $B(....|\theta_t)$ is objective conditional expectation above $|\theta_t$, the first Return_{t+1} is the return on assets held in the period t+1, and the second Return_{t+1} is the subjective normal expected return of the market for the period t+1. The model in Equation (3) ensures the condition of market efficiency with the model in Equation (4).

$$(\text{Return}_{t+1} - \text{Return}_{t+1} | \theta_t) = (X_{t+1} - X^e_{t+1}) + \varepsilon_{t+1} \quad (4)$$

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In Equation (4), $B(\varepsilon_{t+1}|\emptyset_t) = 0$ is the error term, X_t is related to the price of assets held in period t, $t[i.e., X^e_{t+1}=E(X_{t+1}|\emptyset_t)]$ is the rational estimation of X_{t+1} in the period t, and β is the value multiplier. The inference emphasized by this model of market efficiency is the unobservable changes in X_{t+1} which may only be related to $(\text{Return}_{t+1} - \text{Return}_{t+1}|\theta_t)$. In the present context of the model, X is the earning performance and β is the earning effect coefficient.

We estimate a new model using two specifications of earning estimation equations in Equation (1) and Equation (2). The following system is formed by the combination of earning in Equation (1) and rational pricing models in Equation (4).

$$\text{Earning}_{t+1} = \alpha_0+\alpha_1\text{Earning}_t+\upsilon_{t+1} \quad (5)$$

$$(\text{Earning}_{t+1}-\text{Earning}_{t+1}|\theta_t) = \beta(\text{Earning}_{t+1} - \alpha_0- \alpha_1^*\text{Earning}_t)+\varepsilon_{t+1} \quad (6)$$

Market efficiency includes $\alpha_1^* = a_1$ constraint. This nonlinear constraint is accurately the basis for the persistence of earning to estimate stock returns. When Equation (2) and Equation (4) come together, the following notation produces:

$$\text{Earning}_{t+1} = \delta_0+\delta_1\text{Accruals}_t+\delta_2\text{Cash Flows}_t +\upsilon_{t+1} \quad (7)$$

$$(\text{Return}_{t+1} - \text{Return}_{t+1}|\theta_t) = \beta(\text{Earning}_{t+1}- \delta_0 - \delta_1^*\text{Accruals}_t- \delta_2^*\text{Cash Flows}_t+\varepsilon_{t+1} \quad (8)$$

Market efficiency again requires constraints $\delta_1^* = \delta_1$and $\delta_2^* = \delta_2$. Specifically, the test of H_1 shows $\delta_1 < \delta_2$ and therefore market efficiency requires $\delta_1^* < \delta_2^*$. We estimate the two systems using nonlinear equal-weighted iterations. Expected return ($\overline{Return_{t+1}}$) is measured with portfolio returns. Mishkin (1983) test for the market efficiency with the likelihood ratio statistic which is $\chi^2(q)$ asymptotically is as follows:

$$2*n*\log(SSR^c/SSR^u) \quad (9)$$

In Equation (9), q of the likelihood ratio statistic represents required constraints for market efficiency, n represents the number of observations, SSR^c is the sum of the residuals obtained from the restricted equal-weighted system, and SSR^u represents the sum of the residuals obtained from the unrestricted equal-weighted system.

The CAPM asserted by Treynor (1961), Sharpe (1964), Lintner (1965), Mossin (1966), and Black (1972) is the guiding asset pricing model for finance literature. The CAPM is the foundation of asset pricing literature, but several seminal empirical studies show some problems for the CAPM (Cox and Britten, 2019). Then, Fama and French (1993) develop the FF3FM with size and value factors. But, Fama and French (2016) prove troublesome for the FF3FM again and add the investment and profitability factors to the FF3FM in forming the FF5FM. Fama and French (2017) test the FF5FM to international stock returns and find that its performance is better than the FF3FM. To compare the performance of asset pricing models in explaining accrual and cash flow, we test for Borsa Istanbul the third, fourth, and fifth hypotheses which are given below:

H_3: Accrual and cash flow explain abnormal return, using CAPM as an approach to estimate expected return.

H_4: Accrual and cash flow explain abnormal return, using FF3FM as an approach to estimate expected return.

H_5: Accrual and cash flow explain abnormal return, using FF5FM as an approach to estimate expected return.

The mathematical description of CAPM is given below:

$$R_{pt}-R_{ft} = a+\beta_m(R_{mt}-R_{ft})+e_{it} \quad (10)$$

In equation (10), R_{pt} is the return of stocks, R_{ft} is the return of the risk-free asset, R_{mt} is the return of the market portfolio, $R_{mt}-R_{ft}$is the excess return of the market, $R_{pt}-R_{ft}$ is the excess return of portfolio, β_m is the beta coefficient, a is the constant term, and e_{it} is the error term. Mathematically, the FF3FM and FF5FM are given below, respectively:

$$R_{pt}-R_{ft} = a+\beta_m(R_{mt}-R_{ft})+\beta_s(SMB_t)+\beta_h(HML_t) +\varepsilon_t \quad (11)$$

$$R_{pt}-R_{ft}= a+\beta_m(R_{mt}-R_{ft})+\beta_s(SMB_t)+\beta_h(HML_t) +\beta_r(RMW_t)+\beta_c(CMA_t)+\varepsilon_t \quad (12)$$

Equations in (11) and (12) contain risk factors such as SMB, HML, RMW, and CMA for the FF3FM and FF5FM. Moreover, SMB is the size factor, HML is the value factor, RMW is the profitability factor and finally, CMA is the investment factor for the asset pricing models.

Methodology

This study covers the firms operated in BIST 100 index of Borsa Istanbul between 2005-2017 time period. Since the financial sector firms have different characteristics, we exclude the financial sector firms. We collect the price, balance sheet, and income statement data of the firms from Borsa Istanbul and the Public Disclosure Platform. Following Özkan and Kayalı (2015), we choose the starting year of study as 2005 since the application of international financial reporting standards begins for Turkey in 2005.

To prevent the calculation of the stock returns before the balance sheet data is announced, we calculate the Return t+1 for twelve months using the buy-and-hold method. We obtain the accruals data using the balance sheet approach (Sloan, 1996) and it is the change in non-cash current assets less the change in current liabilities excluding the change in short-term debt and the change in taxes payable, minus depreciation and amortization expense (Dechow et al., 2008; Hirshleifer, Hou, Teoh, and Zhang, 2009; Kang, Liu, and Qı, 2010). We measure cash flows by minusing the accruals from the earning. For cross-sectional comparison, in line with Sloan (1996), Collins and Hribar (2000), and Allen, Larson, and Sloan (2013), we divide earning, cash flows, and accruals to the average assets[1].

In determining size factor, we use the logarithmic market value of June month in t year. We calculate the logarithmic book to market ratio by dividing the book value in December month of t year to the market value of t year. In measuring return on equity (ROE) for the profitability risk factor, we divide net profit to equity for December month of t year. The investment variable is the annual growth of total assets from period t-1 to t. In measuring the market return, we use BIST 100 index. We follow Çebi (2012) and use the interbank money market overnight interest rate data as proxy interest rate data.

In this study, we apply Miskhin (1983) test to examine the market efficiency as a nonlinear regression for the test of H_2. The goals of Fama and French (2015) and Cox and Britten (2019) are to describe the best but imperfect model for the portfolios returns. Thus, we aim to determine the best but imperfect asset pricing model and compare the asset pricing models with nine metrics used by Fama and French (2015) and Cox and Britten (2019). In comparing asset pricing models, the metrics used in the study are the coefficient of alpha, the GRS test statistic of Gibbons, Ross, and Shanken (1989), the average adjusted R-square (R^2), the probability values of F test, the β coefficient of factors for the portfolio, the average absolute value of alpha $A(|\alpha|)$, the dispersion of the intercepts relative to the dispersion of test portfolio average excess returns $\frac{A(|\alpha|)}{A(|\gamma|)}$, the average square of absolute intercepts to its deviations $(\frac{A(|\alpha|)^2}{A(|\gamma|)^2})$, and the average square standard error of alpha (As^2) divided by the square average absolute intercept $(\frac{As^2}{A(|\alpha|)^2})$.

The Mishkin test does not provide information about the economic significance for the existence of accrual and cash flow anomalies. Therefore, we use asset pricing models to obtain information about the economic significance of accrual and cash flow anomalies. Thus, we apply the CAPM, the FF3FM, and the FF5FM to detect whether there are accrual and cash flow anomalies in Borsa Istanbul.

To determine the presence of accrual and cash flow anomalies, we apply the CAPM, the FF3FM, and the FF5FM. In line with Özkan and Kayalı (2015), we sort the accruals into five portfolios according to their size of accrual as P1, P2, P3, P4, and P5. While P1 portfolio

[1] We calculate the average assets by using (Total Assets$_t$+Total Assets$_{t-1}$)/2 formula.

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is the portfolio of firms whose accruals are the lowest 20% percentiles and P5 portfolio is the portfolio of firms whose accruals are the highest 20% percentiles. Moreover, we sort cash flows into five portfolios as P1, P2, P3, P4, and P5. P1 portfolio is the portfolio of firms whose cash flows are the lowest 20% percentiles and P5 portfolio is the portfolio of firms whose cash flows are the highest 20% percentiles. In the cash flow and accrual portfolios, we use the value-weighted returns.

In this study, when we apply the CAPM, the FF3FM, and the FF5FM to detect cash flow and accrual anomalies, we form SMB and HML portfolios by following Sehgal et al. (2012). Sehgal et al. (2012) form two portfolios based on the median value in determining the accrual and cash flow anomalies. To create SMB factor, we sort the stocks into two groups as large and small based on the market value in each sample year. We rank the market values of the firms and sort the stocks as large and small portfolios. To form HML factor, we calculate book to market ratio for all firms in December of year t and rank the firms based on the book to market ratio from big to small, and then take the firms into large and small portfolios.

We create the four intersection portfolios as S/L, SH, B/L, and B/H by using size and book to market ratio. S/L includes the stocks with small market value and low book to market ratio, S/H includes the stocks with small market value and high book to market ratio, B/L includes the stocks with a large market value and low book to market ratio, and B/H includes the stocks with high market value and high book to market ratio. In line with Fama and French (1992, 1993), we measure SMB factor as (S/L+S/H)/2-(B/L+B/H)/2 and HML factor as ((S/L+B/L)/2-(S/H-B/H))/2.

In creating the FF5FM, we use RMW and CMA factors in addition to SMB, HML, and market risk premium factors. We create RMW and CMA portfolios following Sehgal et al. (2012). In measuring RMW factor, we calculate ROE value and rank the stocks according to ROE value in each year. Then, we take the stocks into robust and weak portfolios. When we measure the CMA factor, we rank the sample stocks according to the investment variable in each year and take the stocks into aggressive and conservative portfolios.

Finally, to create the intersection portfolios for RMW and CMA factors, we use size groups for investment and ROE portfolios. These four intersection portfolios are S/R, S/W, B/R, B/W, S/C, S/A, B/C, and B/A. S/R includes the small market value and robust stock portfolio, S/W includes the small market value and weak stock portfolio, B/R includes the big market value and robust stock portfolio, B/W includes the big market value and weak stock portfolio, S/C includes the small market value and conservative stock portfolio, S/A includes the small market value and aggressive stock portfolio, B/C includes the big market value and conservative stock portfolio, and B/A includes the big market value and aggressive stock portfolio. Moreover, we create four intersection portfolios with RMW and CMA risk factors as follows: RMW= (SR+BR)/2-(SW+BW)/2 and CMA=(SC+BC)/2-(SA+BA)/2. We calculate value-weighted portfolio returns for the period from July month of t+1 year to December month of t+1 year and reestablish the portfolios in June month.

In the CAPM, FF3FM, and FF5FM, it is required that the coefficients of the variables in Equation (10), Equation (11), and Equation (12) are significant. Also, the α coefficient must be zero or close to zero or statistically insignificant (Korkmaz et al., 2010) for validity and avoiding asset pricing problems in the models. On the other hand, we apply the GRS F Test proposed by Gibbons, Ross, and Shanken (1989) to determine whether there is an asset pricing error or not. The GRS F test provides an examination of the significance of all alpha values in the predicted regression models. The mathematical representation of the GRS F test is reported below:

$$J = \frac{T-N-k}{N}(1-\mu_k^1\Omega^{-1}\mu_k^{-1})^{-1}\hat{\alpha}\Sigma^{`1}\,\dot{\alpha} \qquad (13)$$

In Equation (13), T is the number of observations, N is the number of portfolios, k is the number of factors, μ_k is the factor averages and

Table 1. The Average Values of Earning and Its Components for Accrual Portfolios

Earning and Components	Accrual Portfolios				
	P1	P2	P3	P4	P5
Accruals	-0.073	0.005	0.038	0.082	0.275
Cash Flows	0.127	0.185	0.009	0.008	-0.202
Earning	0.054	0.193	0.048	0.09	0.073

Table 2. The Average Values of Earning and Its Components for Cash Flow Portfolios

Earning and Components	Cash Flow Portfolios				
	P1	P2	P3	P4	P5
Accruals	0.238	0.07	0.032	0.025	0.055
Cash Flows	-0.282	-0.046	0.005	0.046	0.277
Earning	-0.044	0.024	0.038	0.07	0.332

Table 3. Regression Estimations on Persistence of Earning and Its Components

Panel A. $Earning_{t+1}= \alpha_0+\alpha_1 Earning_t+\varepsilon_{t+1}$					
α_0	α_1	$t(\alpha_0)$	$t(\alpha_1)$	R^2	
-0.17	0.72	-3.1*	11.65*	0.18	
Panel B. $Earning_{t+1}=\delta_0+\delta_1 Accruals_t+\delta_2 Cash\ Flows_t+\varepsilon_{t+1}$					
δ_0	δ_1	δ_2	$t(\delta_0)$	$t(\delta_1)$	$t(\delta_2)$	R^2
0.13	0.12	0.23	2.70**	2.32**	4.72*	0.04
F Test $(\delta_1=\delta_2)$=6.2*, *Sign Test*= 6.36*					

* and ** indicate statistically significance at 1% and 5% levels.

k vector, Ω is the alpha coefficients, and Σ is the covariance of error terms.

Results and Discussion

In this part of the study, we estimate regressions analysis to investigate the persistence of the earning and its components and whether the investors correctly estimate the earning and its components. We examine the average values of portfolios formed by the accrual and cash flow and give them in Table 1 and Table 2.

According to the findings in Table 1, in line with the literature (Sehgal et al., 2012; Özkan and Kayalı, 2015; Ball, Gerakos, Linnainmaa, and Valeri, 2016), the average values of accruals for the P5 and P1 portfolios are 0.275 and 0.073, respectively. On the other hand, the earning is positively related to accruals, supporting previous studies (Dechow et al., 2008). The average earning value for the P1 portfolio is 0.05 and for the P5 portfolio is 0.07. On the other hand, the average value of cash flows is -0.202 for the P5 portfolio and 0.127 for the P1 portfolio.

According to the results in Table 2, as expressed by Sehgal et al. (2012), the accruals and cash flows are negatively related while earning and cash flows are positively related. The average earning value is -0.04 for the P1 portfolio and 0.33 for the P5 portfolio. The average accruals are 0.238 for the P1 portfolio and 0.05 for the P5 portfolio. The average value of cash flows is -0.282 for the P1 portfolio and 0.277 for the P5 portfolio.

The Tests of H_1 and H_2

In this section, we give the tests of H_1 and H_2. The estimation results for the test of H_1 are in Table 3 and for the test of H_2 are in Table 4.

In Panel A of Table 3, the coefficient of a_1 is 0.72. This finding supports previous studies (Sloan, 1996; Sehgal et al., 2012) and shows that earning persistence is high and earning performance slowly returns to average. Also, the a_1 coefficient with 0.72 indicates that we cannot reject the null hypothesis about earning performance and earning performance does not follow a random walk.

According to the findings in Panel B of Table 3, we cannot reject the alternative hypothesis that the persistence of the cash flow variable is higher than the accrual variable. This finding derives from δ_1 (0.12) < δ_2 (0.23) and it indicates that cash flows are lower priced. In addition, the findings of Panel B show that the

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Table 4. Mishkin Tests for Evaluating Market Efficiency

Panel A.

$$Earning_{t+1} = \alpha_0 + \alpha_1 Earning_t + \upsilon_{t+1}$$
$$Excessive\ Return_{t+1} = \beta(Earning_{t+1} - \delta_0 - \delta_1^* Earning_t) + \varepsilon_{t+1}$$

Coefficient	Estimation	Asymptotic Standart Error
δ_1	0.472*	0.04
δ_1^*	1.202*	0.369
β	0.11*	0.016
Null Hypothesis	LR Test Statistic	Probability
$\delta_1=\delta_1^*$	χ_1^2=0.36	0.55

Panel B.

$$Earning_{t+1} = \delta_0 + \delta_1 Accruals_t + \delta_2 Cash\ Flows_t + \varepsilon_{t+1}$$
$$Excessive\ Return_{t+1} = \beta(Earning_{t+1} - \delta_0 - \delta_1^* Accruals_t - \delta_2^* Cash\ Flows_t) + \varepsilon_{t+1}$$

Coefficient	Estimation	Asymptotic Standart Error
α_1	0.32**	0.05
α_1^*	0.55***	0.96
α_2	0.45*	0.04
α_2^*	0.43*	0.34
β	0.04*	0.43

Market Efficiency Tests

Null Hypothesis	LR Test Statistic	Probability
$\alpha_1=\alpha_1^*$	χ_1^2=5.34	0.07
$\alpha_2=\alpha_2^*$	χ_1^2=22.27	0.00
$\alpha_1=\alpha_1^*$ ve $\alpha_2=\alpha_2^*$	χ_2^2=20.29	0.00

*, **, and *** indicate statically significance at 1%, 5%, and 10% levels.

coefficients of accruals and cash flows are different from zero and each other. This evidence suggests that cash flows and accruals return to average and the power of the cash flows is higher than the accrual in estimating the earning. The F Test and Sign Test results of Panel B provide evidence that we can reject the null hypothesis, which claims that the coefficients of the cash flows and accruals are equal to each other and rationally priced, in line with Sloan (1996), Dopuch et al. (2010), and Khancel El Mehdi (2011). Moreover, Table 3 indicates that H_1 is valid.

Table 4 provides nonlinear regression estimations of earning and its components as Miskhin (1983) test to examine the market efficiency for the test of H_2. We find that the difference between the coefficients δ_1=0.47 and δ_1^*=1.2 of Panel A is statistically insignificant with the LR test statistic (χ_1^2=0.36). This finding shows that the null hypothesis for market efficiency cannot be rejected and stock prices contain information about earning performance in line with Sloan (1996) and Dechow et al. (2008). Panel B of Table 4 presents the perceptions of market participants for accruals and cash flows. The coefficient of accruals (α_1^*=0.55) is higher than the coefficient of persistence of accruals (α_1=0.32). We can reject the null hypothesis due to the LR test statistic (χ_1^2 =5.34). These findings prove that Borsa Istanbul significantly prices the accruals higher as expressed by Sloan (1996), Dopuch et al. (2010), Clinch et al. (2012), and Khanchel El Mehdi (2011). On the other hand, the coefficient value of cash flows (α_2^*=0.43) is smaller than the persistence coefficient of cash flows (α_2=0.45). The LR test statistic (χ_1^2=22.27) indicates that the null hypothesis can be rejected. Finally, the LR test statistic (χ_2^2=20.29) rejects the hypothesis ($\alpha_1=\alpha_1^*$ and $\alpha_2=\alpha_2^*$), which argues that the earning components are rationally priced. In fact, in line with Sloan's (1996) findings, unlike the linear regression equation in Table 4, the coefficient of accruals (α_1^*=0.55) is higher than the coefficient of cash flows (α_2^*=0.43). These findings point out that investors cannot distinguish between cash flows and accruals and the earning fixation hypothesis is valid. In brief, Panel B rejects the market efficiency. In this way, we see that H_2 is rejected from Table 4.

Table 5. The CAPM Findings for Portfolios Sorted by The Cash Flows

Coefficients	P1	P2	P3	P4	P5
t(m)	5.72*	9.02*	18.97*	6.34*	3.57*
t(α)	0.07	-0.10	-0.77	-0.08	0.28
m	0.90	1.15	1.29	1.52	1.64
α	0.00	-0.01	-0.03	-0.01	0.18
Diagnostic Tests for Models	=0.77 Durbin Watson=2.27 F Statistic=32.77* Autocorrelationt=2.74[0.12] Heteroscedasticity=1.69[0.23]	=0.89 Durbin Watson=1.76 F Statistic=81.45* Autocorrelationt=0.06[0.8] Heteroscedasticity=1.66[0.24]	=0.97 Durbin Watson=2.26 F Statistic=360* Autocorrelation=0.31[0.74] Heteroscedasticity=0.54[0.47]	=0.8 Durbin Watson=2.74 F Statistic=40.23* Autocorrelation=0.00[0.96] Heteroscedasticity=1.65[0.24]	=0.56 Durbin Watson=2.06 F Statistic=12.8* Autocorrelation =3.14[0.09] Heteroscedasticity=0.27[0.61]

GRS F Test=1.15[0.17], * indicates statically significance at 1% level, and values in [] represent probability.

Table 6. The FF3FM Findings for Portfolios Sorted by The Cash Flows

Coefficients	P1	P2	P3	P4	P5
t(h)	-0.09	-0.25	0.93	0.63	-0.35
t(s)	-0.20	-0.44	0.77	0.41	-1.52
t(m)	5.31*	9.03*	18.60*	6.57*	4.04*
t(α)	0.03	-0.07	-0.63	-0.01	0.63
h	-0.03	-0.70	0.12	0.31	-0.78
s	-0.07	-0.13	0.10	0.20	-0.89
m	0.93	1.03	1.16	1.59	1.63
α	0.00	-0.01	-0.02	-0.00	0.13
Diognastic Test for Models	=0.78. Durbin Watson=1.67 F Statistic=9.51* Autocorrelation=3.56[0.09] Heteroscedasticity=0.05[0.98]	=0.91 Durbin Watson=2.08 F Statistic=27.4* Autocorrelation=2.13[0.19] Heteroscedasticity=1.14[0.38]	=0.97 Durbin Watson=2.31 F Statistic =119.99* Autocorrelation=0.67[0.54] Heteroscedasticity=1.89[0.2]	=0;85 Durbin Watson=2.41 F Statistic =14.77* Autocorrelation= 3.01[0.12] Heteroscedasticity=0.35[0.79]	=0.69 Durbin Watson=1.99 F Statistic=5.91* Autocorrelation=4.05[0.08] Heteroscedasticity=0.09[0.99]

GRS F Test=0.09[0.33], * indicates statically significance at 1% levels, and values in [] represent probability

The Tests of H_3, H_4, *and* H_5

Mishkin's test results of Table 5 show that accruals and cash flows are incorrectly priced. After we apply the Mishkin test, we examine the CAPM, the FF3FM, and the FF5FM in determining the sensitivity of stock returns to accrual and cash flow strategies to assess cash flow and accrual anomalies. In the study, we report the estimation results of H_3, H_4, and H_5 tests in Table 5, Table 6, Table 7, Table 8, Table 9, and Table 10.

When we analyze the findings of the CAPM for portfolios sorted by the cash flows in Table 5, we can see that the probability values of the F test have statistical significance for all models. Autocorrelation and heteroscedasticity tests in the models for each portfolio indicate that there are no autocorrelation and heteroscedasticity problems. R^2 fluctuates between 0.56 and 0.97. Also, we find that the α coefficients are statistically insignificant and nearly equal to zero (except for the P5 portfolio). In addition to α coefficient, the GRS F test results show that the alpha coefficient is equal to zero. These findings are proof that there is no asset pricing error for the five models. All m coefficients are statistically significant for the five models and indicate that market risk is a significance descriptive factor for portfolio returns sorted by cash flows. Moreover, we find that high cash flow portfolios provide high excess returns compared to low cash flow portfolios. Indeed, these findings are similar to Sloan (1996) and Dechow et al. (2008). Finally, if we summarize the results, we can say that the cash flow as a risk factor can be explained by the CAPM.

When we analyze the FF3FM empirical findings for portfolios sorted by the cash flows in Table 6, we can see that the probability values of the F test have statistical significance. In our models, autocorrelation and heteroscedasticity tests predict that there are no autocorrelation and heteroscedasticity problems. R^2 fluctuates between 0.69 and 0.97. Also, the α coefficients are nearly equal to zero (except for P5 portfolio) and statistically insignificant. In addition to the α coefficients, GRS F test results show that the alpha coefficient is equal to zero. These findings are proof that there are no asset pricing errors for the five models. The FF3FM for portfolios sorted by the cash flows in Table 6 shows that

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Table 7. The FF5FM Findings for Portfolios Sorted by The Cash Flows

Coefficients	P1	P2	P3	P4	P5
t(c)	-0.35	-1.01	-2.66**	-0.72	-2.48**
t(r)	-1.87	-0.43	0.35	-1.24	-2.9*
t(h)	-0.12	0.41	1.8	0.88	-2.88**
t(s)	-0.16	0.34	1.69	0.77	-2.95**
t(m)	5.07*	4.73*	13.9*	5.55**	4.51*
t(α)	-0.29	0.96	4.04**	1.48	0.08
c	-0.1	-0.39	-0.31	-0.28	-1.22
r	-0.53	-0.16	0.04	-0.49	-1.46
h	-0.04	0.18	0.24	0.39	-1.61
s	-0.05	0.15	0.22	0.33	-1.61
m	0.89	1.15	1.02	0.38	1.41
α	-0.04	0.19	0.25	0.3	0.02
Diognastic Tests for models	=0.90 Durbin Watson=1.87 F Statistic=12.69* Autocorrelation= 0.34[0.74] Heteroscedasticity=0.55[0.72]	=0.89 Durbin Watson=1.07 F Statistic =11.78 Autocorrelation=1.25[0.26] Heteroscedasticity=4.07[0.05]	=0.99 Durbin Watson= 1.53 F Statistic= 92.28* Autocorrelation=0.15[0.86] Heteroscedasticity=0.26[0.94]	=0.91 Durbin Watson=2.21 F Statistic=14.99** Autocorrelation= 3.1[0.13] Heteroscedasticity=0.37[0.55]	=0.85 Durbin Watson= 2.73 F Statistic=7.94* Autocorrelation=2.68[0.29] Heteroscedasticity=1.36[0.34]

GRS F Test=1.5[0.39], *, **, and *** indicate statically significance at 1%, 5%, and 10% levels, and values in [] represent probability.

Table 8. The CAPM Findings for Portfolios Sorted by The Accruals

Coefficients	P1	P2	P3	P4	P5
t(m)	4.56*	2.13***	1.36	1.52	4.59*
t(α)	0.3	-0.06	0.15	0.12	-0.21
m	0.8	0.79	0.77	0.7	0.69
α	0.03	-0.02	0.1	0.03	-0.02
	=0.68	=0.31	=0.16	=0.19	=0.67
Diognstic Tests for Models	Durbin Watson=3.09 F Statistic =20.8* Autocorrelation=4.1[0.06] Heteroscedasticity=0.9[0.36]	Durbin Watson=2.44 F Statistic=4.52** Autocorrelation= 0.06[0.8] Heteroscedasticity=1.66[0.24]	Durbin Watson=3.45 F Statistic=1.86 Autocorrelation=3.14[0.05] Heteroscedasticity=0.56[0.45]	Durbin Watson=2.23 F Statistic=2.3 Autocorrelation=3.27[0.09] Heteroscedasticity=0.34[0.56]	Durbin Watson=2.41 F Statistic=21.11* Autocorrelation=0.77[0.49] Heteroscedasticity=0.81[0.39]

GRS F Test=1.6[0.27], *, ** and *** indicate statically significance at 1%, 5%, and 10% levels, and values in [] represent probability.

SMB and HML risk factors are not successful in explaining stock returns. This finding is proof that the FF3FM has not explanatory feature for the cash flows on Turkish capital markets. Also, the coefficients of m variable show that high cash flow portfolios provide high excess returns compared to low cash flow portfolios. These results support the findings of Sehgal et al. (2012) and Ball et al. (2016). We can say that excess returns of the FF3FM do not have explanatory power over the average portfolio returns in line with the findings of Ball et al. (2016).

When we look at the empirical findings of the FF5FM for portfolios sorted by the cash flows in Table 7, we can see that the probability values of the F test have statistical significance (except for the P2 portfolio). For each portfolio, autocorrelation and heteroscedasticity tests predict that there are no autocorrelation and heteroscedasticity problems. R^2 fluctuates between 0.85 and 0.99. The α coefficients for the P1 and P5 portfolios are nearly equal to zero and statistically insignificant. In addition to the α coefficients, the GRS F test results show that the alpha coefficient is equal to zero. These findings are proof that there are no asset pricing errors for the five models.

The findings of the FF5FM for portfolios sorted by the cash flows in Table 7 show that SMB, HML, RMW, and CMA risk factors are not successful in explaining stock returns except for the P5 portfolio. The coefficients of the P5 portfolio are significant for the model and indicate that market risk premium, SMB, HML, RMW, and CMA risk factors are statically significance factors for portfolio returns sorted by the cash flows. On the other hand, the m coefficient of the P1 portfolio is higher than the m coefficient of the P5 portfolio and this finding indicates that a high cash flow portfolio provides excess returns compared to a low cash flow portfolio. But, generally, Table 7 findings are evidence that the FF5FM has no explanatory power for the cash flows on Turkish capital markets and cash flows cannot be analyzed within the framework of the FF5FM. Finally,

Table 9. The FF3FM Findings for Portfolios Sorted by The Accruals

Coefficients	P1	P2	P3	P4	P5
t(h)	-0.67	-0.11	-0.81	-0.29	1.47
t(s)	-0.77	-0.15	-0.43	-0.32	1.51
t(m)	4.38*	1.94***	1.13	1.40	4.37*
t(α)	0.19	-0.08	0.10	0.05	0.03
h	-0.23	-0.19	-1.24	-0.23	0.55
s	-0.26	-0.18	-0.67	-0.25	0.57
m	1.08	0.78	0.73	0.69	0.63
α	0.02	-0.003	0.05	0.01	0.00
Diognastic Tests for Models	=0.71 Durbin Watson=3.2 F Statistic=6.48** Autocorrelationt=5.48[0.05] Heteroscedasticity=0.12[0.99]	=0.32 Durbin Watson=2.48 F Statistic=1.25 Autocorrelation=0.68[0.54] Heteroscedasticity=0.04[0.998]	=0.54 Durbin Watson=2.04 F Statistic=3.13*** Autocorrelation=0.04[0.95] Heteroscedasticity=0.6[0.63]	=0.2 Durbin Watson=2.11 F Statistic=0.67 Autocorrelation=3[0.13] Heteroscedasticity=0.5[0.69]	=0.75 Durbin Watson=2.25 F Statistic=8.04* Autocorrelation=0.18[0.84] Heteroscedasticity=0.2[0.88]

GRS F Test=0.18[0.12], *, **, and ***indicate statically significance at 1%. 5%, and 10% levels, and values in [] represent probability.

we see that cash flow is a capital market risk factor that does not use the FF5FM in Borsa Istanbul.

When we analyze the empirical findings of the CAPM for the portfolios sorted by the accruals in Table 8, the probability values of the F test prove that the models are statistically significant (except for the P3 and P4 portfolios). The autocorrelation and heteroscedasticity tests provide evidence that there are no autocorrelation and heteroscedasticity problems. R^2 fluctuates between 0.16 and 0.68. The α coefficients of time-series regressions are almost equal to zero (except for the P3 portfolio) and statistically insignificant. In addition to the α coefficient, GRS F test results show that the alpha coefficient is equal to zero. These findings are proof that there is no asset pricing error for the five models.

The CAPM results of Table 8 show that the m coefficients are significant (except for the P3 and P4 portfolios). The m coefficient of the P1 portfolio is higher than the m coefficient of the P5 portfolio. These findings are opposite to the findings of Sloan (1996) and Dechow et al. (2008), and Sehgal et al. (2012). As a result, we can see that accrual is a capital market risk factor which uses the CAPM and high accrual portfolios provide low excess returns compared to low accrual portfolios. In summary, Table 8 is evidence that the accrual risk factor can be explained by the CAPM.

When we examine the FF3FM empirical findings for portfolios sorted by accruals in Table 9, the probability values of the F test indicate that the five models are statistically significant (except for the P2 and the P4 portfolios). Autocorrelation and heteroscedasticity tests for all five models indicate that there are no shortages of autocorrelation and heteroscedasticity. R^2 fluctuates between 0.2 and 0.75. The α coefficients are almost equal to zero and statistically insignificant. In addition to the α coefficients, the GRS F test results are equal to zero. These findings are proof that there are no asset pricing errors for the five models.

The findings in Table 9 show that the FF3FM is not successful in explaining the sorted portfolio returns. Thus, we find that SMB and HML factors are not significant risk factors in explaining portfolio returns sorted by the accruals. But, in contrast with this situation, the m coefficient of the P1 portfolio is higher than the m coefficient of the P5 portfolio. This finding is evidence that high accrual portfolios provide low excess returns compared to low accrual portfolios.

The value and size risk factors added to the FF3FM of Table 9 reduce the significance of the model, as Ball et al. (2016) argue. This finding is proof that the excess returns are not statistically significant for Turkey and the accrual risk factor cannot be explained by the FF3FM. The effect of accruals on stock returns seems to be lost in the SMB and HML factors. These results are in line with the findings of Pincus et al. (2007) and Sehgal et al. (2012).

When we analyze the FF5FM empirical findings for portfolios sorted by the accruals in Table 10, we can see that the probability values of the F test show that the models have statistical significance for the P1, P3, and P5 port-

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Table 10. The FF5FM Findings for Portfolios Sorted by The Accruals

Coefficients	P1	P2	P3	P4	P5
t(c)	-1.01	0.42	-1.99***	0.70	-1.34
t(r)	0.43	-0.43	2.07***	-0.87	0.98
t(h)	-0.41	0.05	-0.80	-0.45	1.55
t(s)	-0.98	-0.02	-0.72	-0.45	1.52
t(m)	4.73*	1.48	1.48	1.61	2.99**
t(α)	-0.13	-0.50	2.84**	-0.17	0.07
c	-0.17	0.54	-0.25	0.62	-0.55
r	0.01	-0.53	2.71	-0.78	0.41
h	-0.26	0.07	-1.16	-0.45	0.72
s	-0.31	-0.02	-1.01	-0.44	0.70
m	0.75	1.14	0.87	0.89	0.78
α	-0.01	-0.32	1.90	-0.08	0.01
Diognastic Tests for Models	=0.87 Durbin Watson=2.96 F Statistic=9.59* Autocorrelation t=0.69[0.64] Heteroscedasticity=1.39[0.32]	=0.32 Durbin Watson=2.14 F Statistic=0.65 Autocorrelation=0.07[0.92] Heteroscedasticity=0.04[0.99]	=0.73; Durbin Watson=2.16 F Statistic=3.88*** Autocorrelation=0.43[0.67] Heteroscedasticity=1.37[0.33]	=0.36 Durbin Watson=1.85 F Statistic=0.78 Autocorrelation=0.84[0.48] Heteroscedasticity=0.2[0.94]	=0.8 Durbin Watson=1.4 F Statistic =5.44** Autocorrelation=0.27[0.77] Heteroscedasticity=1.1[0.43]

GRS F Test=1.65[0.36], *, ** and *** show statically significance at 1%, 5%, and 10% levels and values in [] represent probability.

Table 11. Comparison of the Models for the Cash Flow Portfolios

Models	$A(\|\alpha\|)$	$\frac{A(\|\alpha\|)}{A(\|\gamma\|)}$	$\frac{A(\|\alpha\|)^2}{A(\|\gamma\|)^2}$	$\frac{As^2}{A(\|\alpha\|)^2}$	Adjusted R^2	GRS Test
CAPM	0.17	2.05	3.03	0.68	0.77	1.13[0.3]
FF3FM	0.17	2.78	6.53	0.72	0.76	0.76[0.4]
FF5FM	0.47	2.96	1.52	0.70	0.30	1.09[0.4]

Values in [] represent probability.

folios. In our models for each portfolio, autocorrelation and heteroscedasticity tests predict no autocorrelation and heteroscedasticity problems. R^2 fluctuates between 0.32 and 0.87. The α coefficients for the P1, P4, and P5 portfolios are nearly equal to zero and statistically insignificant. In addition to the α coefficients except for the P2 and the P3 portfolios, the GRS F test results show that the alpha coefficient is equal to zero. These findings show that there are no asset pricing errors.

The findings of the FF5FM for portfolios sorted by the accruals in Table 10 show that SMB, HML, RMW, and CMA risk factors cannot successfully explain the stock returns except for the P5 portfolio. This finding is evidence that the FF5FM has no explanatory power for the accruals on Turkish capital markets and accruals cannot be analyzed with the FF5FM.

Briefly, Table 5 and Table 8 provide evidence that we cannot reject H_3, Table 6 and Table 9 provide evidence that we can reject H_4, and Table 7 and Table 10 provide evidence that we can reject H_5. According to the findings of accruals and cash low anomalies in Table 5-Table 10 show that the CAPM is the best performing model compared to the FF3FM and the FF5FM for accrual and cash flow anomalies. The FF3FM is the next best performing model, but the FF5FM is the bad performing model in examining the accruals and cash flow anomalies for Borsa Istanbul. We continue to compare the asset pricing models in determining the accruals and cash flow anomalies, and Table 11 and Table 12 show asset pricing model comparison test findings.

When we look at Table 11, we can see that CAPM has an alpha of 0.17 and performs better than FF3FM and FF5FM for cash flow portfolios. The next best performer is FF3FM and the bad performer is FF5FM for cash flow anomaly. The dispersion of the intercepts $\frac{A(|\alpha|)^2}{A(|\gamma|)^2}$ indicates that FF5M has the best performance with a figure of 1.52 in Table 11. For $(\frac{As^2}{A(|\alpha|)^2})$ metric, FF3FM is the best performing model and FF5FM follows it with a statistic of 0.72.

Table 12 provides that CAPM is the best performer for accrual portfolios with the alpha statistic of 0.33, but this finding changes in $\frac{A(|\alpha|)^2}{A(|\gamma|)^2}$ metric. The dispersion of intercepts is evidence that FF5FM is the best performer with a figure

Table 12. Comparison of the Models for the Accruals Portfolios

Models	$A(\|\alpha\|)$	$\frac{A(\|\alpha\|)}{A(\|\gamma\|)}$	$\frac{A(\|\alpha\|)^2}{A(\|\gamma\|)^2}$	$\frac{A(\|s\|)^2}{A(\|\alpha\|)^2}$	Adjusted R^2	GRS Test
CAPM	0.33	0.91	1.52	0.36	0.48	0.6[0.45]
FF3FM	0.35	0.97	1.6	0.42	0.39	1.19[0.29]
FF5FM	0.47	1.81	1.41	0.40	0.30	1.66[0.23]

Values in [] represent probability.

of 1.41 and it is followed by the CAPM with a statistic of 1.52. When we analyze ($\frac{As^2}{A(|\alpha|)^2}$), we see that FF3FM is the best performer model for accruals portfolios with a figure of 0.42. Finally, GRS test statistics in Table 11 and Table 12 are evidence that all alphas are jointly zero. But, for cash flow portfolios, CAPM is the bad performer model having the highest GRS test statistic. Also, CAPM is the best performer model for accrual portfolios due to the lowest GRS test statistic.

Conclusion

Sloan (1996) states that the effects of cash flow and accruals on earning persistence are different. Thus, naive or irrational investors cannot distinguish between cash flows and accruals, although their contribution to earning is different. This leads to mispricing of cash flows and accruals.

The purpose of this study is to examine the existence of accrual and cash flow anomalies on Turkish capital markets for the years 2005-2017. In this context, we examine the persistence of earning and its components with linear regression analysis and we find that the persistence of the cash flow component of the earning is higher than the persistence of the accrual component of the earning. Then, we investigate nonlinear regression estimations using Mishkin test. According to the findings, we determine that the investors of Turkish capital market misprice the accruals and cash flows, and we reject the efficient market hypothesis. Another finding obtained from Mishkin test results is that stock prices accurately reflect the persistence of earning.

In the scope of the study, we test the CAPM, the FF3FM, and the FF5FM under five portfolios sorted by the cash flows and accruals to examine the existence of accrual and cash flow anomalies. The CAPM findings show that higher accruals provide lower returns and higher cash flows provide higher returns. The low return of high accrual portfolios and high return of high cash flow portfolios indicate that the CAPM is a valid model for Turkish capital markets in explaining accrual and cash flow anomalies. On the other hand, the FF3FM and the FF5FM are not valid and successful models for explaining accrual and cash flow anomalies for Turkish capital markets. Thus, we conclude that the CAPM is the best performing model in explaining cash flows and accruals for Borsa Istanbul.

The main conclusions from the performance comparison tests provide that the CAPM is the lowest average absolute alpha values compared to other models. It is clear that the CAPM shows the strongest performance for accrual and cash flow anomalies. We can state that the accrual and cash flow information can be used to generate excess returns in evaluating investment strategies of portfolio managers of Turkish capital markets.

Briefly, our findings prove that Turkish capital market investors do not accurately price the accruals and cash flows, and we can see that the efficiency market hypothesis is not valid for Turkey. On the other hand, we find that CAPM is a successful model for explaining accrual and cash flow anomalies. Moreover, we identify that the FF3FM and FF5FM are less successful models in explaining accrual and cash flow anomalies compared to CAPM. As a result, we determine that CAPM continues to be an important model in explaining asset prices. In this way, our study findings shed light on Turkish capital markets investors, competent authorities, analysts, and finance professionals.

In future studies, the sample can be enlarged to all the firms operating in Borsa Istanbul, and

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financial sector firms can be analyzed by using a separate model. On the other hand, the existence of accrual and cash flow anomalies can be investigated with different standard and alternative asset pricing models in the next studies.

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