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Pricing the accrual effect in an emerging market

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ABSTRACT

Empirical finding that the stocks with low accruals return higher than the stocks with high accruals is one of the most prominent market anomalies documented in financial economics literature. Evidence from developed markets suggests that the Capital Asset Pricing Model (CAPM), three-factor (3 F) model with the factors of excess market return ($r_m - r_f$), size (SMB) and value (HML) and five-factor (5 F) model with additional earnings-based profitability (RMW) and investment (CMA) factors cannot deflate the accrual effect. Recent evidence from the U.S. market suggests that accrual effect loses power when it is conditioned against a cash-based operating profitability factor. This paper investigates the accrual effect and its pricing for the stocks listed on Borsa Istanbul (BIST). Portfolio analysis reveals a significant accrual effect among the profitable stocks that gain strength when conditioned against CAPM. However, the 3 F model can deflate the accrual effect and different profitability factors, including cash-based operating profitability factor, and investment factor cannot improve its pricing or economic performance in an emerging market.

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Factor models; market anomalies; emerging markets; accrual anomaly; profitability factor; asset pricing

1. Introduction

The accrual component of earnings is non-cash adjustment by accountants to transform cash-profits into accounting earnings (Ball, Gerakos, Linnainmaa, & Nikolaev, 2016). According to Sloan (1996), the accrual component of earnings is less persistent than the cash component of earnings. However, investors fail to anticipate this and stocks with low accruals tend to have higher future returns. The negative relationship between accruals and expected returns (ERs) is one of the most prominent market anomalies documented (see Ammann, Odoni, & Oesch, 2012; Ball et al., 2016; Fama & French, 2016; Sloan, 1996). Empirical evidence suggests that the Capital Asset Pricing Model (CAPM), three-factor model (3 F) of Fama and French (1993) and models with earnings-based profitability factors, including the five-factor model (5 F) of Fama and French (2015) with an operating profitability factor and gross profitability factor of Novy-Marx (2013) cannot deflate the accrual effect of the U.S. market. Evidence from developed European markets are consistent (see Ammann et al., 2012). In contrast, Ball et al. (2016) show that a cash-based operating profitability

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(operating profitability net of accruals) factor can deflate the accrual effect and it performs better than factors constructed based on accruals and operating profitability. This finding implies that a cash component of earnings is more informative related with the accrual effect compared to earnings that also contain accruals. This paper tests this evidence in an emerging market setting.

This study extends the current literature by testing different factor models against the accrual effect of Borsa Istanbul (BIST) stocks documented by Ozkan and Kayali (2015). To this aim, the 3 F and 5 F models of Fama and French (1993, 2015) were augmented with different profitability factors, constructed by considering operating profitability, accruals and cash-based operating profitability, and tested against returns on portfolios sorted by size and accruals from July 2006 to December 2015. The analysis was conducted separately for the entire sample and for a sub-sample of profitable firms.

Ozkan and Kayali (2015) document a negative relationship between total accruals (difference between net income and net cash flows from operations) and average returns of profitable firms in BIST during 2006 to 2012. They document an annual premium of 18.58% on an investment strategy that finances a portfolio of low accrual stocks with a portfolio of high accrual stocks. However, they did not condition this return against a benchmark model, such as CAPM. Therefore, we are not sure whether the accrual effect they document is anomalous according to a benchmark pricing model or not. Papanastasopoulos, Tsalas, and Thomakos (2016) investigate an accrual effect in the Greek stock market. They fail to document a significant relationship between traditional accruals and average returns and percent accruals and average returns in portfolio samples during 1987 to 2011. Like Ozkan and Kayali (2015), they did not evaluate their findings against a benchmark model. The initial step in this paper is to fill this gap. The second step then deals with the pricing of the accrual effect and performance evaluation of the factor models.

This study is different from the existing studies in several aspects. According to the findings of Ozkan and Kayali (2015), the accrual effect of BIST is limited to stocks that persistently report positive profits from 2005 to 2010. Different from them, a sub-sample of profitable firms was determined based on the profitability of firms on a yearly basis. This means that each year firms with positive operating profitability were included into the sub-sample and firms with negative operating profitability were excluded. The rigid investment assumption of Ozkan and Kayali (2015) that investors construct active portfolios by allocating capital into stocks that persistently report positive profits over the course of a five years period may be too unrealistic. In addition, unlike Ozkan and Kayali (2015), the current paper deals with the pricing of the accrual effect and tests the pricing performances of eight different factor models. This paper also extends their sampling period for almost four years.

The current analysis also differs from the analysis of Ball et al. (2016) in several important respects. First, in their study Ball et al. (2016) do not consider profitable firms separately. It is important to examine the accrual effect for stocks with positive earnings separately, since real world investors would not be interested in different components of earnings for the firms with a negative operating profitability record when forming investment portfolios. The reason is that negative operating profitability entails negative cash flows. Therefore, the accrual effect is expected to gain power

among the profitable firms. Secondly, the current paper examines the performances of both the 3F and 5F as base pricing models. In their study Ball et al. (2016) use the 3F as a base model and augment it with different profitability factors. The 5F model includes an additional factor that is constructed by considering the growth rate of total assets (CMA). The CMA factor must be informative about the accrual effect since accruals also reflect the growth effect in net operating assets (see Fairfield, Whisenant, & Yohn, 2003), a component of total growth effect.

Finally, unlike the developed markets with plenty of evidence (Ammann et al., 2012; Ball et al., 2016; Fama & French, 1993, 2015, 2016; Sloan, 1996), market anomalies and pricing literature from emerging markets are scarce. Specifically, there is very little evidence related to the accrual anomaly and almost no evidence related to its pricing. In this sense, current analysis provides out-of-sample evidence for the accrual effect and its pricing from a contextual setting that can be characterised by relatively lower liquidity and higher transaction costs compared to the developed markets. In addition, corporate cross-holdings, board controlling families and concentrated shareholdings with dual class ownership rights where one class has superior voting and monitoring ability are common characteristics of BIST firms (Yurtoglu, 2000). In financial markets that are organised like BIST, market anomalies are expected to intensify.

Following the introduction, section 2 describes the models, pricing statistics and methods. Section 3 provides details related with the construction of the sample, data and variables. Section 4 describes and presents summary statistics for the test portfolios and factors. Section 5 reports pricing statistics. Section 6 reports the results from cross-sectional regressions. Finally, Section 7 is the conclusion.

2. Models, pricing statistics and methods

This paper adopts portfolio analysis to test whether accruals can predict future returns in BIST or not. An alternative methodology is to adopt cross-sectional regressions but stock level data in emerging markets can be extremely volatile and cross-sectional regressions are highly sensitive to outliers. A value-weighted portfolio analysis would provide a clearer picture of investor experience in emerging markets with volatile stock data (Fama & French, 1998). First, ten decile portfolios were constructed by allocating stocks with the lowest accrual in the first decile and the highest accruals in the tenth decile. Accounting information was lagged by six months and matched with returns to avoid look-ahead bias. Hedge portfolios were represented by monthly differences between the first and tenth deciles to test whether the low accrual portfolio return was higher than the high accrual portfolio. Then, returns on these portfolios were conditioned against CAPM to test whether a market portfolio of CAPM can capture average returns or not. Initially, all the stocks were considered. Later, the entire analysis was replicated for a sub-sample consisting only of the stocks with positive operating profitability. To construct the sub-sample, stocks with negative operating profitability were excluded from the investment portfolios in the beginning of each portfolio formation year.

Secondly, 12 investment portfolios were constructed from three size (i.e., market capitalisation) groups and four accrual groups. These 12 portfolios were used to test models. Time-series performances of eight different combinations on two different base models (i.e., the 3 F and 5 F) were examined with the Generalized Methods of Movements (GMM) estimation approach. Coefficients were adjusted according to Newey and West (1987) to address heteroscedasticity and autocorrelation problems. Models were respectively augmented with an accrual-based factor, an operating profitability based factor, and a cash-based profitability factor. Construction of these factors is explained in Section 4.1. The base 3 F equation is as follows:

$$r_i - r_f = \alpha_i + b_i(r_m - r_f) + s_iSMB + h_iHML + e_{i,t} \quad (1)$$

where α_i is intercept, b and s are factor loadings, and $r_m - r_f$, SMB and HML are factors. The $r_m - r_f$ represents the excess returns of the market portfolio, SMB (small minus big) represents the average returns of a portfolio consisting of small stocks minus average returns of a portfolio consisting of big stocks and HML (high minus low) represents the average returns of a portfolio consisting of stocks with a high B/M ratio minus average returns of a portfolio consisting of stocks with a low B/M ratio. The base 5 F equation is as follows:

$$r_i - r_f = \alpha_i + b_i(r_m - r_f) + s_iSMB + h_iHML + r_iRMW + c_iCMA + e_{i,t} \quad (2)$$

where α is intercept, b , s , h , r and c are factor loadings, and $r_m - r_f$, SMB, HML, RMW and CMA are factors. RMW (robust minus weak) represents the average returns of a portfolio consisting of profitable stocks minus average returns of a portfolio consisting of unprofitable stocks and CMA (conservative minus aggressive) represents the average returns of a portfolio consisting of low investment stocks minus average returns of a portfolio consisting of high investment stocks.

According to Fama and French (1993), factor loadings and R^2 of time-series models provide evidence related to how well factors capture the co-variation among stock returns. Additionally, intercepts provide metrics related to the multivariate ability of models in capturing average returns. Leaning towards Huberman and Kandel (1987), pricing equations that can fully explain average stock returns must extract insignificant intercepts that are close to zero. Because such equations span the properties of the tangency portfolio, such a portfolio is mean-variance efficient.

To test these predictions four different statistics related to the model parameters were calculated, and these are: 1) absolute value of average intercepts ($A. |\alpha_i|$), the lower the statistics the better the pricing performance; 2) Fama and French (2016) ratio of absolute value of average intercepts to average excess returns on 12 size-accruals portfolios ($A. |\alpha_i|/A. |\bar{r}_i|$), ratio measures intercept dispersion relative to the dispersion of portfolio excess returns, the lower the ratio the better the pricing performance; 3) average adjusted coefficient of determination ($A. (R^2)$), the higher the value the better the model performance; and 4) Gibbons, Ross, and Shanken (1989) (GRS) statistics to test the joint insignificance of intercepts.

Formally, GRS tests the null hypothesis that $H_0 = \alpha_1 = \alpha_2 = \dots = \alpha_i = 0$. The GRS test provides evidence related to the mean-variance efficiency of factors. The GRS

equation takes the following form:

$$GRS = \left(\frac{T}{N}\right) \left(\frac{T-N-K}{T-K-1}\right) \left[\frac{\alpha^T \hat{\Sigma}^{-1} \hat{\alpha}}{1 + \hat{\mu}^T \hat{V}^{-1} \hat{\mu}} \right] \quad (3)$$

where T is the number of observations, N is the number of portfolios, K is the number of pricing factors, $\hat{\alpha}$ is a vector of regression intercepts, $\hat{\Sigma}$ is the covariance matrix of residuals and \hat{V} is the sample covariance matrix of factors. To conclude that a combination of factors is mean-variance efficient the GRS statistics must be insignificant.

As a final step, cross-sectional regressions of Fama and MacBeth (1973) were applied to test the importance of each factor. This methodology provides a way to test whether bearing a factor risk is priced or not. Therefore, factors that can extract significant average factor loading in the cross-sectional regression can be said to be important determinants of average accrual returns in BIST.

3. Data and variables

3.1. Sample and data

Sample starts with all BIST firms. As per Ball et al. (2016), the final sample excluded negative book equity firms, financial firms and firms without profitability, market value of equity and book value of equity data. Monthly stock returns were obtained from BIST databases, financial reports were obtained from Public Disclosure Platform and monthly risk-free rates were obtained from the Turkish Government Statistical Institute representing monthly government bill rates. Fundamental firm data covers the period from December 2004 to December 2015. However, 2004 data was used only to calculate profitability and investment variables. Accordingly, empirical analysis is from July 2006 to December 2015. Earlier periods were eliminated due to application of inflationary accounting in 2004 since inflationary accounting may discord variables under investigation.

3.2. Variables

This study follows Fama and French (2015) to calculate the market value of equity (ME - shares outstanding times price at the end of June, t) and book-to-equity ratio (ratio of book value of equity at fiscal year ending in $t-1$ to market value of equity at December $t-1$), Cooper, Gulen, and Schill (2008) to calculate asset growth (percent change in total book assets from $t-2$ to $t-1$), Sloan (1996) to calculate accruals and Ball et al. (2016) to calculate operating profitability and cash-based operating profitability. Profitability variables and accruals were deflated by total book assets of time t and missing values were replaced by zeros.

As per Sloan (1996), the calculation of accruals takes the following form:

$$\begin{aligned} \text{Accruals} = & (\Delta \text{ current assets} - \Delta \text{ cash and cash equivalents}) \\ & - (\Delta \text{ current liabilities} - \Delta \text{ debt included in current liabilities} \\ & - \Delta \text{ income taxes payable}) - \text{Depreciation and amortisation.} \end{aligned}$$

As per Ball et al. (2016), operating profitability was calculated by deducting general and administrative expenses, net of research and development expenditures, from gross profits (i.e., revenue – cost of goods sold).

Finally, cash-based operating profitability was calculated following Ball et al. (2016). Unlike earnings before extraordinary items and free cash flows, cash-based operating profitability is free from accounts payables and interest and taxes, which are the components of accruals. Its calculation takes the following form:

$$\begin{aligned} \text{Cash-based operating profitability} = & \text{Operating profitability} \\ & - \Delta \text{ accounts receivable} - \Delta \text{ inventory} - \Delta \text{ prepaid expenses} \\ & + \Delta \text{ deferred revenue} + \Delta \text{ trade accounts payable} + \Delta \text{ Accrued expenses.} \end{aligned}$$

where Δ represents yearly unit change from t-2 to t-1.

4. Summary statistics for factors and test portfolios

4.1. Factors

To construct the factors, 2x3 methodology of Fama and French (2015) was adopted. For instance, to construct factor SMB, all the stocks were ranked based on their market capitalisation and divided into two size groups as small (S) and big (B) (sample breakpoint: 50th percentile of June t, market capitalization). Then, all the stocks were sorted independently based on their book-to-market ratio and divided into three groups as low (L), medium (M) and high (H) (sample breakpoints: 30th and 70th percentiles). From these individual sets, six intersection portfolios (SL, SM, SH, BL, BM, and BH) were formed. Ultimately, monthly SMB premium was calculated as the deduction of average value-weighted (VW) returns of big portfolios (BL, BM and BH) from average VW returns of small portfolios (SL, SM and SB). HML factor was computed in a similar way, by the deduction of average VW returns of low book-to-market portfolios (SL and BL) from average VW returns of high book-to-market portfolios (SH and BH). Calculations of RMWs and CMA factors are like the calculation of factor HML with the only difference that book-to-market portfolios were replaced by operating profitability, cash-based operating profitability, accruals and asset growth portfolios, respectively. For example, RMWs were represented by the monthly differences between the returns of a portfolio of stocks with robust profits minus weak profits, by considering either the operating profitability (RMW_{OP}) or cash-based operating profitability (RMW_{CASH}). Accrual based profitability factor ($\text{RMW}_{\text{ACCRUAL}}$) was computed as the monthly differences between the returns of a portfolio of stocks with low accrual stocks minus high accrual stocks. Factor CMA

was computed as the monthly differences between the returns of a portfolio of stocks with conservative (low) investment minus aggressive (high) investment. Finally, market portfolio ($r_m - r_f$) was computed as the monthly VW excess returns of a portfolio consisting of all stocks. Market portfolio, like others, was rebalanced annually at the end of each June.

Table 1 reports average annualised returns, average annualised SDs and t-values, that were adjusted according to Newey and West (1987), for three traditional factors (i.e., $r_m - r_f$, SMB and HML), three profitability factors (i.e., RMW_{CASH} , RMW_{OP} , and $RMW_{ACCRUAL}$) and an investment factor (i.e., CMA). Among the profitability factors, only the $RMW_{ACCRUAL}$ factor has a significant and positive (4.83%) premium with a t-value of 3.59. The RMW_{OP} and RMW_{CASH} factors have negative returns during July 2006 to December 2015. Average annualised loss of factor RMW_{CASH} is -3.12 percent and average annualised loss of factor RMW_{OP} is -0.56 percent. Accordingly, firms with low accruals are expected to have higher future returns than firms with high accruals, whereas cash-based operating profitability and operating profitability based factors are not priced. According to these results, it can be argued that investors in BIST may not understand different implications of accruals and cash-flows. They should have priced higher cash-profits which are expected to translate into higher growth rate of dividends. On the other hand, $r_m - r_f$, SMB, HML and CMA factors' premiums are positive yet they are not significant. Specifically, low market premium (0.37 percent, annually) indicates low risk aversion of BIST investors, possibly investors in BIST are well diversified, while part of the insignificance of factor premiums can be explained by high return variability, which is a major problem in emerging markets.

4.2. Test portfolios

In this section, portfolio samples analysis is conducted to test whether accruals can predict future returns or not. Table 2 reports annualised SDs, annualised VW average returns (r) in excess of risk-free rate, CAPM intercepts and t-values that were adjusted according to Newey and West (1987) for portfolio 1 (p1), portfolio 10 (p10) and hedge portfolio. Panel A constructs decile portfolios using entire stocks. Panel B constructs decile portfolios using only the stocks with positive operating profitability at the beginning of each portfolio construction year. At the end of each June all the stocks were sorted based on their accruals and allocated into 10 decile portfolios from low, p1, to high, p10. Hedge portfolios are represented by the differences between the annual returns of a portfolio of stocks with low accruals (p1) and annual

Table 1. Annualised factor returns.

	Factors						
	$r_m - r_f$	SMB	HML	RMW_{CASH}	RMW_{OP}	$RMW_{ACCRUAL}$	CMA
Annualized mean	0.37	2.52	5.32	-3.12	-0.56	4.83	1.33
Annualized SD	27.8	16.5	24.5	15.3	16.2	14.6	17.5
t-value	0.06	0.43	1.06	-0.70	-0.16	3.59	0.42

Notes: Descriptions of variables are provided in Section 3.2 and descriptions of factors are provided in Section 4.1. Sampling period is from July 2006 to December 2015. Coefficients are adjusted according to Newey and West (1987).

Table 2. Test portfolios.

Panel A: All stocks			
		Accruals	
Portfolio	SD	r	CAPM's α
1 (low)	38.6	2.71 (0.27)	2.28(0.36)
10 (High)	29.9	-5.74(-0.91)	-6.07(-2.11)*
Hedge (1-10)	20.2	8.45(1.83)	8.35(1.94)*
Panel B: Stocks with positive operating profitability			
1 (low)	38.7	4.76 (0.49)	4.31(0.80)
10 (High)	25.4	-7.97 (-1.75)	-8.24(-4.35)***
Hedge (1-10)	23.3	12.73(2.16)*	12.55(2.67)**

Notes: Descriptions of variables are provided in Section 3.2, descriptions of factors are provided in Section 4.1 and descriptions of test portfolios are provided in Section 4.2. Sampling period is from July 2006 to December 2015. Coefficients are adjusted according to Newey and West (1987). ***, ** and * indicates statistical significance at 1%, 5% and 10% levels, respectively.

returns on a portfolio of stocks with high accruals (p10). Portfolios were rebalanced annually. The sample spans from July 2006 to December 2015.

Consistent with the findings of Ozkan and Kayali (2015), results in Table 2 indicate a significant and higher accrual premium for the portfolios that were constructed by only considering the stocks with positive operating profitability (Panel B of Table 2). For example, when all the stocks were considered (i.e., Panel A), excess annualised average premium of the hedge portfolio is 8.45 percent and it is not significant (t-stat. = 1.83). This hedge premium increased more than percent and gained significance (t-stat. = 2.16) when portfolios were constructed by considering only the stocks with positive operating profitability in Panel B, indicating that accruals can significantly predict future returns among profitable stocks. In addition, the CAPM justifies the existence of the accrual effect. When the returns on portfolios were conditioned against the market portfolio of CAPM, it produces significant alpha estimates. In Panel A, hedge portfolio earns a CAPM intercept of 8.35 percent, annually, and this intercept is significant at the 10 percent level. In Panel B, the hedge portfolio of profitable firms earns a higher CAPM intercept, 12.73% annually, and it is significant at the 5 percent level ($p = 0.0275$). Accordingly, CAPM also highlights a significant and stronger accrual effect among profitable stocks. This finding is not surprising since investors are not expected to price accrual components of stocks with negative earnings. Economically speaking, investors who wish to follow investment strategies based on accruals in BIST would be better off by excluding stocks with negative operating profitability from their active portfolios. On a theoretical basis, results obtained from conditioning CAPM against average hedge premiums indicates that the market portfolio is not mean-variance efficient, it cannot price the accrual effect alone. Accordingly, the model should be augmented with additional factors that could incorporate the information contained in portfolios sorted by accruals. The following section deals with the pricing of the accrual effect by using eight different factor models and 12 pricing portfolios that were constructed from size and accruals.

4.3. Pricing portfolios

To test the pricing performances of models, 12 size-accrual portfolios were constructed. At the end of each June all the stocks were sorted independently based on

Table 3. Summary statistics for 12 size-accrual portfolios.

Panel A: All stocks									
Size	<i>r</i>				<i>SD</i>				
	Accruals				Accruals				
	Low	2	3	High	Low	2	3	High	
Small	0.40	0.34	0.48	0.34	9.62	11.1	11.1	11.5	
2	-0.09	0.78	0.47	0.49	9.63	10.1	11.4	9.96	
Big	0.21	0.22	-0.27	-0.17	9.16	9.11	9.40	10.7	
Panel B: Stocks with positive operating profitability									
Small	1.19	0.57	0.06	0.57	10.3	11.7	11.1	11.7	
2	0.07	0.92	0.42	0.41	10.2	10.2	11.5	10.2	
Big	0.23	0.23	-0.26	-0.19	9.19	9.14	9.38	10.7	

Notes: Descriptions of variables are provided in Section 3.2 and descriptions of pricing portfolios are provided in Section 4.3. Sampling period is from July 2006 to December 2015. Coefficients are adjusted according to Newey and West (1987).

their size and accrual values and then allocated into 12 intersection portfolios based on three size groups (sample breakpoints: 30th and 70th percentiles) and four accrual groups (sample breakpoints: 25th, 50th and 75th percentiles). Portfolios were rebalanced annually. Fama and French (1993, 2015) use 25 portfolios to test their asset pricing models. However, in the current analysis the number of stocks is rather low compared with the studies of developed markets.

Table 3 reports monthly VW average excess returns and SDs of returns for 12 size-accrual portfolios. Panel A constructs portfolios using entire stocks, Panel B constructs same portfolios using only the stocks with positive operating profitability. Results in Table 3 confirms the results of Table 2 such as: the accrual effect is more pronounced among the stocks with positive operating profitability. For example, in Panel A of Table 3 average returns decrease with accruals only in size quintile 3 and the relationship is not monotonical. Returns decreases from 0.21 percent for the portfolio of low accrual big stocks to -0.17 percent for the portfolio of high accrual big stock. The difference is 38 basis points, monthly. In panel B, average returns of stocks with positive operating profitability decrease with accruals, but not monotonically, both in size quintiles 1 and 3. In size quintile 1, returns decreases from 1.19 percent for the portfolio of low accrual small stocks to 0.57 percent for the portfolio of high accrual small stock. The difference is 62 basis points, monthly. In size quintile 3, returns decreases from 0.23 percent for the portfolio of low accrual big stocks to -0.19 percent for the portfolio of high accrual big stocks. The difference is 42 basis points, monthly. Results obtained here confirms prior predictions of this paper, such as: accrual effect is stronger among profitable firms. This result is not surprising since investors would not be interested in different components of earnings for the firms with negative operating profitability, because negative operating profitability entails negative cash flows. Based on these results, pricing of portfolios consisting of all stocks was omitted. The following section deals with the pricing of the portfolios consisting of profitable stocks.

5. Pricing the accrual effect

This section presents the pricing performances of eight different GMM models against the returns of 12 size-accrual portfolios that were constructed by considering

only the stocks with positive operating profitability. Model coefficients were adjusted according to Newey and West (1987) to overcome the problems of heteroscedasticity and autocorrelation. The estimation period spans from July 2006 to December 2015.

Panel A of Table 4 reports monthly intercepts and t-values from the 3F, 5F and their augmented versions. According to the results, all the intercept estimates are insignificant with t-values ranging from 0.04 to 1.47, in absolute terms. All models

Table 4. Asset pricing results.

Panel A: Intercepts									
Size	Monthly intercepts				3F	t-values			
	Accruals					Accruals			
	Low	2	3	High		Low	2	3	High
Small	0.59	0.02	-0.54	-0.05		0.93	0.06	-1.21	-0.09
2	-0.38	0.52	0.23	-0.04		-0.99	1.30	0.56	-0.09
Big	0.14	0.14	-0.47	-0.27		0.42	0.40	-1.33	-0.56
3F plus cash-based operating profitability factor									
Small	0.62	0.07	-0.57	-0.02		0.97	0.17	-1.35	-0.33
2	-0.38	0.47	0.16	-0.07		-0.98	1.17	0.44	-0.16
Big	0.18	0.18	-0.49	-0.41		0.56	0.54	-1.43	-0.98
3F plus operating profitability factor									
Small	0.58	0.02	-0.53	-0.05		0.94	0.04	-1.25	-0.10
2	-0.28	0.53	0.25	-0.04		-0.98	1.31	0.65	-0.09
Big	0.14	0.13	-0.46	-0.25		0.42	0.42	-1.31	-0.58
3F plus accrual factor									
Small	0.59	0.08	-0.36	0.10		0.91	0.21	-0.90	0.18
2	-0.38	0.60	0.26	0.12		-0.97	1.46	0.61	0.29
Big	-0.09	0.11	-0.40	0.27		-0.28	0.31	-1.14	0.69
3F plus operating profitability factor plus accrual factor									
Small	0.58	0.07	-0.36	0.09		0.91	0.19	0.90	0.16
2	-0.38	0.61	0.28	0.13		-0.97	1.46	0.71	0.29
Big	-0.10	0.10	-0.40	0.29		-0.28	0.31	-1.11	0.82
5F with cash-based operating profitability factor									
Small	0.62	0.07	-0.58	-0.04		0.96	0.17	-1.36	-0.08
2	-0.39	0.46	0.17	-0.08		-0.98	1.15	0.49	-0.19
Big	0.17	0.18	-0.49	-0.40		0.54	0.56	-1.41	-0.98
5F with operating profitability factor									
Small	0.58	0.02	-0.53	-0.05		0.94	0.04	-1.25	-0.11
2	-0.38	0.53	0.25	-0.04		-0.97	1.29	0.69	-0.09
Big	0.14	0.13	-0.46	-0.26		0.44	0.43	-1.29	-0.60
5F with operating profitability factor plus accrual factor									
Small	0.58	0.08	-0.34	0.12		0.92	0.21	0.87	0.25
2	-0.38	0.61	0.27	0.14		-0.94	1.47	0.72	0.34
Big	-0.09	0.09	-0.40	0.28		-0.26	0.29	-1.10	0.79

Panel B: Performance statistics

	GRS	A. $ \alpha_i $	A. $ \alpha_i $ A. $ \bar{r}_i $	A. (R^2)
3F	0.74	0.28	0.79	0.80
3F plus RMW_{CASH}	0.82	0.30	0.85	0.81
3F plus RMW_{OP}	0.74	0.28	0.79	0.80
3F plus $RMW_{ACCRUAL}$	0.72	0.28	0.79	0.82
3F plus RMW_{OP} plus $RMW_{ACCRUAL}$	0.72	0.28	0.79	0.82
5F with RMW_{CASH}	0.81	0.30	0.85	0.81
5F with RMW_{OP}	0.73	0.28	0.79	0.81
5F with RMW_{OP} plus $RMW_{ACCRUAL}$	0.71	0.28	0.79	0.82

Notes: Descriptions of test statistics are provided in section 2. Descriptions of variables are provided in Section 3.2, descriptions of factors are provided in Section 4.1 and description of pricing portfolios are provided in section 4.3. Sampling period is from July 2006 to December 2015. Coefficients are adjusted according to Newey and West (1987).

can significantly deflate the returns of eight out of 12 portfolios. For example, models can deflate monthly average premium on the portfolio of small stocks with low accruals, at least 57 to 61 basis points. In only four out of 12 portfolios models produce intercept estimates that are larger than the portfolio premiums, in absolute terms. Yet, in all the cases intercepts remained insignificant. In contrast to the prior evidence from developed markets, current findings suggest that all the models can deflate accrual returns in BIST. Accordingly, tested models may span the properties of the tangency portfolio. However, the aim is to identify a model that can capture average returns better, a model that can produce lower average intercepts. In this manner, the performance of the 3 F model is better than those of others.

According to the results in Panel A of Table 4, the 3 F model performs better than the models that were augmented with the RMW_{CASH} factor, particularly among small and big quintiles where the accrual effect is more pronounced. The base 3 F produces lower intercepts in eight out of 12 portfolios compared to the 3 F that is augmented with a RMW_{CASH} factor. Therefore, in contrast to the findings of Ball et al. (2016) the accrual anomaly not weakened when it is conditioned on the RMW_{CASH} factor in an emerging market setting. These results provide support to the findings in Table 1 and may imply that a cash component of earnings is not informative related with the accrual effect. Therefore, the RMW_{CASH} factor may be irrelevant for the pricing of the accrual effect in BIST. In addition, it may also be irrelevant for the mean-variance characteristics of the tangency portfolio.

Similarly, the RMW_{OP} factor cannot improve the pricing performance of the base 3 F. The 3 F models with/without the RMW_{OP} factor produces equivalent intercept estimates. For instance, models with the RMW_{OP} factor perform slightly better than the base 3 F model in six out of 12 portfolios. However, the RMW_{OP} factor leads to a very small reduction in intercept estimates, only 1 to 2 points, in five portfolios. For the other portfolios, the performance of the base 3 F model is equivalent to or better than the 3 F that is augmented with the RMW_{OP} factor. These results also support the findings of Table 1 and may mean that a factor that is constructed by considering operating profitability, that includes both accruals and cash components of earnings, cannot improve the pricing performance of the base 3 F model. Accordingly, the RMW_{OP} may also be irrelevant for the pricing of the accrual effect in BIST.

The 3 F was also augmented with an accrual-based factor and tested against the returns on 12 size-accrual portfolios. According to the results, the 3 F with $RMW_{ACCRUAL}$ factor produces lower intercepts, in absolute terms, compared to the base 3 F model, only in four out of 12 portfolios. In contrast, the base 3 F model produces lower intercepts in six out of 12 portfolios, whereas in three out of 12 cases models produce exactly equal intercept estimates. These results are interesting and may demonstrate that the information contents of market, SMB and HML factors may also incorporate the information content of the $RMW_{ACCRUAL}$ factor. Accordingly, inclusion of the $RMW_{ACCRUAL}$ factor to the pricing equation is questionable since it cannot improve the performance of the pricing equation either, at least during the sampling period.

The 3 F was augmented with both RMW_{OP} and $RMW_{ACCRUAL}$ factors. The augmented model produces lower intercepts, in absolute terms, compared to the base 3 F

model, only in five out of 12 size-accrual portfolios, while the base 3 F produces lower intercepts, in absolute terms, in seven out of 12 portfolios. The net effect is that when evaluated together, the RMW_{OP} and $RMW_{ACCRUAL}$ factors cannot improve the pricing performance of the base 3 F model in BIST. This finding confirms the above findings such as profitability factors constructed based on earnings and its components cannot improve the pricing performance and mean-variance efficiency of the base 3 F model against the accrual effect in BIST.

Finally, the base 5 F model and its augmented versions were tested against 12 size-accrual portfolios. According to the results, neither the 5 F nor its augmented versions can improve the performance of the base 3 F model. For instance, when 5 F with RMW_{CASH} is conditioned against pricing portfolios, it produces intercept estimates that are lower than that of the base 3 F model only in three out of 12 portfolios. Performances of 5 F with RMW_{OP} and 5 F with both RMW_{OP} and $RMW_{ACCRUAL}$ factors are similar. Models can slightly outperform the base 3 F model only in five out of 12 portfolios. For the rest, 3 F outperforms the augmented models. These findings further indicate the irrelevance of the profitability factors. Additionally, findings from conditioning 5 F models against the returns of 12 size-accrual portfolios indicate the irrelevance of the CMA factor. In other words, the CMA factor cannot improve the pricing performance and mean-variance efficiency of the base 3 F model in an emerging market setting.

The above findings indicate that the profitability and investment factors cannot improve the performance of the base 3 F model against 12 size-accrual portfolios. To test the theoretical and economic significance of the models this paper adopts several test statistics. Initially, GRS statistics were examined to test the mean-variance efficiency of different combinations of factors. According to Huberman and Kandel (1987), models with the features of the tangency portfolio must extract jointly insignificant intercepts when conditioned against returns on risky assets/portfolios. Accordingly, the GRS test provides a way to test the theoretical compatibility of the models. However, it cannot tell which model is better, it only tests the mean-variance efficiency of factors. Therefore, several other statistics were also adopted to measure the economic significance of each model, such as: absolute average intercepts, ratio of intercept dispersions, and adjusted coefficient of determination were also reported.

Findings in Panel B support the results of Panel A. First, all the GRS statistics are lower than the critical values indicating the joint insignificance of the intercept estimates. In other words, $H_0 = \alpha_1 = \alpha_2 = \dots = \alpha_i = 0$ cannot be rejected. Accordingly, accrual related returns pose no problem for the tested models. Secondly, average adjusted R^2 values of all models are higher than 80%, indicating that models can capture at least 80% of the co-variation in portfolio returns. Thirdly, models that were augmented with the RMW_{CASH} factor produce higher GRS statistics, higher absolute average intercepts (A. $|\alpha_i|$), 0.30 versus 0.28, and left a larger portion of intercept dispersion unexplained (A. $|\alpha_i|/A. |\bar{r}_i|$), 0.85 versus 0.79, compared to the other models. Therefore, models with a cash-based profitability factor are the worst performing models. Finally, consistent with the above findings, pricing performance of the base 3 F model cannot be improved by the inclusion of profitability and investment based factors since absolute value of average alphas (0.28) and alpha dispersion ratios (0.79) for the base 3 F model is better than models that were augmented with the

RMW_{CASH} and indistinguishable from models that were augmented with RMW_{OP} and/or RMW_{ACCRUAL} and/or CMA factors.

Consequently, the 3 F model can deflate the accrual related returns in BIST, it can pass the GRS test and its economic performance cannot be improved by addition of operating profitability, cash-based operating profitability, accrual and investment based factors. Findings reported here confirm the findings of Table 1, such as: bearing profitability and investment factors in BIST is not priced. Therefore, inclusion of these factors to the pricing equation is questionable and interested parties should not bear the cost of constructing them for the pricing of the accrual effect in BIST. The following section examines the cross-sectional ability of factors in capturing the accrual effect.

6. Cross-sectional regressions

Results presented in Table 4 suggest that the operating profitability, cash-based operating profitability, accrual and investment based factors cannot improve the pricing performance of the base 3 F model with $r_m - r_f$, SMB and HML factors. This section tests the cross-sectional ability of models in capturing average returns.

Table 5 presents average factor loadings, t-values that were adjusted according to Newey and West (1987), and average adjusted R^2 values from Fama and MacBeth (1973) regressions of monthly excess returns on 12 size-accrual portfolios. Results confirm the findings of Tables 1 and 4, such as: the RMW_{OP}, RMW_{CBOP} and CMA factors cannot produce significant slopes in the cross-sectional regressions, indicating that they cannot capture the cross-section of average returns. In contrast, the RMW_{ACCRUAL} factor is only significant when it is augmented with the 3 F model, while the base 3 F model captures co-variation in returns better than the 3 F model with the RMW_{ACCRUAL} factor since the base 3 F model has higher goodness-of-fit ($R^2 = 0.38$) value. On the other hand, the $r_m - r_f$ and SMB factors can extract significant slopes in all the eight models. Accordingly, they are important for the pricing of the accrual effect. Finally, the HML factor is only significant in three out of eight models. However,

Table 5. Cross-sectional regressions results.

Models	$r_m - r_f$	SMB	HML	RMW _{CASH}	RMW _{OP}	CMA	RMW _{ACCRUAL}	A. R^2
3F	-2.70 (-4.77)	0.57 (4.38)	-0.28 (-1.19)					0.38
3F + RMW _{CASH}	-2.63 (-5.47)	0.59 (6.30)	-0.45 (-2.54)	0.52 (1.72)				0.35
3F + RMW _{OP}	-2.51 (-4.83)	0.65 (5.76)	-0.68 (-2.91)		0.63 (1.56)			0.37
3F + RMW _{ACCRUAL}	-2.43 (-3.94)	0.54 (4.76)	-0.19 (-0.71)				0.45 (3.77)	0.31
3F + RMW _{OP} + RMW _{ACCRUAL}	-2.61 (-4.03)	0.68 (3.89)	-0.79 (-1.76)		0.73 (1.29)		0.27 (1.54)	0.27
5F with RMW _{CASH}	-2.56 (-4.15)	0.59 (5.87)	-0.39 (-1.14)	0.53 (1.51)		-0.31 (-0.43)		0.24
5F with RMW _{OP}	-2.43 (-3.85)	0.66 (4.74)	-0.64 (-2.23)		0.66 (1.33)	-0.21 (-0.41)		0.27
5F with RMW _{OP} + RMW _{ACCRUAL}	-2.51 (-2.38)	0.67 (3.55)	-0.71 (-0.94)		0.71 (1.34)	-0.17 (-0.23)	0.27 (1.38)	0.13

Notes: Description of variables is provided in Section 3.2 and description of factors is provided in Section 4.1. Sampling period is from July 2006 to December 2015. Numbers in parentheses are t -statistics adjusted according to Newey and West (1987).

it cannot be replaced by other factors since it loads significantly and positively against the returns of size quintile 1 portfolios and significantly deflates their returns.

Consequently, the 3 F model performs well in capturing the cross-section of stock returns in BIST during July 2006 to December 2015. The augmented versions of the model that include profitability, both earnings-based and cash-based, accrual and investment related factors cannot improve its performance. Accordingly, their inclusion is not necessary. The evidence presented in this paper is inconsistent with the evidence of Ball et al. (2016). The performance of the 3 F model cannot be improved by a cash-based operating profitability factor in an emerging market setting.

7. Conclusion

Almost two decades of empirical evidence from developed markets suggests that traditional and recent factor models cannot deflate the accrual effect. However, recent evidence shows that accrual anomaly loses power when it is conditioned against a cash-based operating profitability factor. This study investigates the accrual effect for an emerging market (i.e. BIST) and tests the performances of traditional and recent factor models, that were augmented with different profitability factors, against the accrual effect of BIST stocks from July 2006 to December 2015.

Initially, univariate portfolio analysis was performed to test whether accruals can predict future returns or not. Consistent with the findings of Ozkan and Kayali (2015), results of this paper suggest a significant accrual effect among the stocks with positive operating profitability. A short-long portfolio strategy based on portfolio with low accrual stocks offers a significant premium of 12.73 percent, annually. This premium gain power when it is conditioned against CAPM, indicating that the market portfolio alone cannot explain the accrual effect of BIST stocks.

Accordingly, CAPM augmented with additional factors and eight different factor models was evaluated against monthly excess returns of 12 size-accrual portfolios. These models are the 3 F with $r_m - r_f$, SMB and HML factors, the 5 F with additional RMW and CMA factors and augmented versions of the 3 F and 5 F with factors constructed based on operating profitability, cash-based operating profitability and accruals. In contrast to the prior findings from developed markets, all the tested models can deflate the accrual effect in BIST. Interestingly, the base 3 F model of Fama and French (1993) is the best performing model. Its performance cannot be improved by profitability and investment factors. This finding can be explained by the fact that factors constructed based on profitability and investment variables are not priced in BIST. Results obtained from Fama and MacBeth (1973) cross-sectional regressions support these findings, such as; profitability and investment factors cannot capture the cross-section of average returns.

Consequently, the 3 F model can explain the accrual effect of BIST stocks and profitability based factors, both earnings-based, accruals-based and cash-based, cannot improve its pricing performance. The same is true for an investment-based factor. It is possible that different factor calculations, different sampling periods and different accrual measure could yield different findings. On the other hand, a liquidity factor may improve the performance of the model since the accrual effect is stronger among the small stocks decile that can be characterised as illiquid. This issue is left for future

research. Nevertheless, implications of this paper are clear; there exists a significant accrual effect in BIST among the stocks with positive operating profitability and interested parties should not bear the cost of constructing recently offered factors when evaluating portfolio performance, estimating cost of capital and pricing the accrual effect in BIST since the traditional 3 F model can perform these tasks as well as, or even better than, the recently offered models.

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