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IDENTIFYING INVESTMENT STRATEGIES USING ACCOUNTING INFORMATION FROM STOCK MARKET

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ABSTRACT*. *Various profitability measures have been widely considered as the central measure of evaluation for the security analysis, bonds valuation and other credit and investment analysis in the financial markets (Ahmed et al., 2018; Belas et al., 2019; Dvorsky et al., 2019; Wang, Zhang, 2019; Macerinskiene, Survilaite, 2019). Contrasting to the predictive ability of earnings measure, there is also a perspective of accrual anomaly, which proposes that accruals are negatively correlated to the stock returns because of their low persistence in the earnings of the firm (Sloan, 1996; Ball et al., 2016; Kazemilari et al., 2018). Thus, we have attempted to present a case study and to evaluate whether the investment strategies including cash-based operating profits (cash OP), operating profits (OP) and accruals are pertinent in the Pakistan stock exchange (PSX). We report the impact of accruals is negative on stock returns, however, after controlling for small-sized firms despite having low accruals are not able to outperform high accrual firms. The hedge portfolios constructed by cash-based operating profits after controlling for size earn negative alphas for the three asset pricing models in the small-sized firms, however, these results reverse in the large-sized firms. Also, we can see a similar pattern in operating profitability. Thus, it can be concluded that the accruals, OP and cash OP offer a successful investment strategy for large-cap firms only.

KEYWORDS: cash-based operating profitability, operating profits, accruals, stock returns, asset pricing.

JEL classification: G11, G12, M41.

Introduction

Earnings are widely considered the central measure of evaluation for the security analysis, bonds valuation, and other credit investment analysis in the market (Masood *et al*., 2019; Foerster *et al*., 2017 Lev, 1989). Literature also suggests that the profitability factor drives the stock earnings (Fama, French 2008; Postelnicu, Câlea, 2019). Various profitability measures have always been favoured in the literature of academic and practical research for predicting cross-sectional returns (Ball, Brown, 1968). Novy-Marx (2013) favoured the gross profitability to estimate the true measure of the company's performance; however, operating profitability emerged as the superior measure to estimate the firm's performance when compared with the net and gross profits (Ball *et al*., 2015). Contrasting to the predictive ability of earnings measure there is also a perspective of accrual anomaly which proposes that accruals have a negative relation with stock returns because of their lesser persistence (Richardson *et al*., 2005; Sloan, 1996). Accrual anomaly has gained little attention in earlier studies (Ball, Brown, 1968; Ball *et al*., 2015; Fama, French, 1996; Novy-Marx, 2013). However, recently Ball *et al*. (2016) have shown that the impact of accrual anomaly strengthens when the profitability measures are used in the asset pricing models.

We attempted to contribute to the literature by conducting an extensive study on the Pakistan Stock Exchange (PSX) by comparing three different accounting measures with the widely spread models in asset-pricing, namely capital asset pricing model (CAPM), Fama-French-three-factor (FF3) and Fama-French-five-factor (FF5). We report that accruals negatively impact stock returns in a time series analysis. Firms reporting high accruals tend to show negative returns while firms having low accruals provide high returns. Moreover, including accrual information in the investment strategy would help investors earn higher returns by shorting high accrual portfolios and long low accrual portfolios.

Sloan (1996) hypothesises that "investors fixate on earnings" failing to understand the effect of accruals on the sustainability of earnings and thus mistakenly expect firm's future earnings to be less for the ones having fewer accruals and underweight the stock resulting in positive abnormal returns. Richardson *et al*. (2005) posit that because of its lesser stability, accruals lead to the lesser persistence of earnings but due to the investors' incapability of recognising and anticipating earnings persistence significant mispricing of securities results. Allen *et al*. (2013) hypothesised that accruals represent expected cash inflows and outflows thus they could differ from the realised values and thus needs to be reversed, which would deplete earnings in the subsequent period. Further, since this reversal of estimation error represents the accrual anomaly, it becomes the reason behind the inverse relation between the accruals and expected earnings as well as predicted stock returns for the future. Xie (2001) identified abnormal accruals arising out of the factors other than working capital requirements to fuel sales growth are more prone to the measurement errors and hence more reversals are required. Pae (2005) also stipulates the fact that abnormal accruals are strongly negatively correlated with expected stock returns.

1. Literature Review

Sloan (1996) has proposed a detailed analysis of financial statements by bifurcating the earnings component into cash and accruals to predict expected stock returns. Security analysts also see the future cash flow aggregate more reliable and hence a superior measure to forecast the firm's financial health and to predict the future stock returns for the investors (Brochet *et al*., 2008; Dechow, 1994). The reason follows that the earnings persistence is the function of cash flow persistence. It means that the earnings in which the accruals have the major contribution are likely to have lower persistence than the earnings with a higher contribution of cash flow constituent of income. Even though the accrual component and cash component both together contribute towards the current performance of the firm but the investor has to take care of different implications, which each of these constituents possesses (Dvorský, Petráková, & Polách, 2019; Olbrys, 2019; Paseková *et al*., 2019). Higher earnings attributable to the presence of high accruals in the earnings is not long-lasting and would likely to result in the lesser future earnings (Sloan, 1996). However, this fact is not largely recognised by inexperienced investors (Karkowska, Kravchuk, 2019). They are unable to distinguish the implications of these two distinct parts of the earnings in assessing the future returns and hence overvalue the stock with higher current earnings contributed by high accruals and conversely, they rate the stocks with low prices with the firms having lesser earnings contributed by lesser accruals. This whole argument is based on Sloan's (1996) premise that investors "fixate" on income rather than completely understand the effect of its cash and non-cash constituents in estimating the expected income and hence the shares returns.

The Accrual system of accounting represents the economic benefits in the form of cash inflows and economic obligations in the form of cash outflows to occur in the future (Allen *et al*., 2013). It allows a firm to record its operations for the current time period by making adjustments to cash flows based on their merchandise delivered or services rendered regardless of receiving the cash flows hence the revenue earned can differ from the cash inflows because a portion of the payments could be received in the subsequent or preceding accounting period (Dechow, 1994). Likewise, the cost of inputs and other expenses are also recorded as accruals regardless of the time of making payments. Many researchers have thus favoured the use of cash flows to elucidate about the cash generation by the firm to meet its payment obligation (Charitou, 1997). Chen *et al*. (2013) have also posited that cash flows serve as a driver of price movement as compared to the discount rates at the firm as well as aggregate levels. In an endeavor to find the best explanatory factor that explains the global stock returns Hou *et al*. (2011) have also reported cash flow as the most powerful predictor of stock returns amongst various value growth factors. Charitou and Panagiotides (1999) also posited that the stock prices tend to react more towards the cash flow information because of its reliable nature as compared to its accrual counterpart and asserted that the persistence of cash flows infer the quality of earnings. In this regard, Ball *et al.* (2016) also attempt to show that the cash OP emerges as a better predictor of stock returns than all other measures of profitability including gross profit (Novy-Marx, 2013), operating, and net profit measures (Ball, Brown, 1968).

Moreover, there are several other studies which suspect the persistence of accruals (Sloan, 1996) and find the cash-based earnings measure superior to the accruals measure in the short term (Dechow, 1994) while regarding accruals as less reliable and hence a lesser persistent part of the income (Richardson *et al*., 2004). Dechow (1994) assumes that management typically has discretion over accrual recognition and when they utilise their discretion to manipulate the accruals opportunistically, cashflows would be preferable over earnings. There are various contrasting explanations available in the literature for the lesser persistence of accruals. One of the most commonly found reasons for the lesser persistence of the accruals involve its transitory nature in the measurement of income which elevates the current profits at the cost of future income (Allen *et al*., 2013; Chan *et al*., 2006; Dechow, Dichev, 2002; Dechow *et al*., 2008; Richardson *et al*., 2005). Secondly, accruals are associated with the investments and predict lower returns because it suffers from the diminishing marginal returns and various adjustment costs (Dechow *et al*., 2008; Wu *et al*., 2010). According to Hirshleifer *et al*. (2007), the underlying cause of accrual anomaly is the fluctuations in the macroeconomic variables which affect the operating and reporting profitability. He posits that the crest in the business cycles affects the aggregate demand positively resulting in the greater sales revenue part of which would be manifested in the accruals in the form of augmented receivables. Further, the favourable economic environment provides user-friendly credit policies encouraging consumers to increase the credit purchases thereby increasing the aggregate receivable for the firm. Another reason could be inventory accumulation with an expectation of a rise in aggregate demand of their products by a firm resulting in an increased accrual.

Livnat and Santicchia (2006) presented two reasons of accruals anomaly while emphasising the importance of quarterly statements for the analysis of accruals; they argued that the management makes erroneous judgments about the growth of the firm (Fairfield *et al*., 2003a; 2003b; Wu *et al*., 2010; Zhang, 2007) and by being overly optimistic, they aggregate the inventory for the future sales which in the subsequent years is reversed. Another reason for the accrual anomaly was named as channel stuffing where the firm deliberately forwards more products than required to the retailers on terms of payment on a later date. This process inflates sales which in turn increases the accounts receivables as an asset and overstates the current year’s earnings at the cost of future earnings. Another perspective of accrual lesser persistence hypothesis states that since accruals represent estimates of the future cash flows, they could differ from the realised values and thus needs to be reversed which would deplete earnings in the subsequent period (Allen *et al*., 2013). Further, abnormal accruals usually arise out of the factors other than working capital requirements to fuel sales growth and hence more prone to the measurement errors stipulating the fact that abnormal accruals have a strong negative correlation with the expected stock returns (Xie, 2001). Contrasting to this, there is another perspective that postulates that future profitability varies with the variations in operating assets which affects the accrual persistence (Fairfield *et al*., 2003b). Debating on accruals’ persistence, Wu *et al*. (2010) follow the q-theory of investment to explain that working capital investments which comprise of accruals respond to the discount rates (Cochrane, 1991; Tobin, 1969). Building on this proposition Wu *et al*. (2010) argued that the correlation between the investments and accruals is high for the less reliable accruals. It suggests that the diminishing marginal returns investment made at the optimal level itself explains the negative relation between the accruals (investment in working capital or adjustments in long term capital) and the expected returns.

Following the work of Sloan (1996) that accrual anomaly is the negative predictor of stock returns and expanding and responding to the work of Collin *et al*. (2003) which articulates that institutional investors give an alacritous response to the accrual anomaly, Lev and Nissim (2006) posit that despite the potential benefits discerned in the accrual information, institutions tend to invest lesser in high accrual firms because of their unfavourable characteristics like small market-capitalisation, high market-to-book ratio and lower share prices which make them unappealing investment avenues for the institutions and thus accrual anomaly persists.

2. Data and Methodology

For the data construction, we follow Novy-Marx (2013), Ball *et al*. (2015), and Ball *et al*. (2016) and take the monthly returns of the stock and the annual figures of all items required to calculate the accruals, operating profits (OP) and cash Operating Profits (cash OP) from Thompson Reuters (definitions of variables are provided in *Appendixes*). The dataset of the current research is comprised of all the listed and delisted companies of PSX available on the DataStream of Thomson Reuters for a period starting from July 2001 till December 2016. The delisted companies are also included to avoid survivorship bias. Out of the total 889 companies, we exclude companies that fall under the financial sector for example banks, mutual funds, insurance, leasing, and Modaraba companies in order to analyse the impact of cash and non-cash-based measures on the companies under the non-financial sector. The financial companies are excluded because the computation of operating profitability is different for the financial and non-financial sectors and thus uniformity of computations is maintained by taking the non-financial sector only.

The operating profitability is taken directly from the Thomson Reuters data stream which defines operating income as a Revenue net of all operating expenses (WC01250). This measure will capture the difference between recurring and non-recurring activities of the firm. To convert the operating profitability into its cash-based measure we follow Ball *et al*. (2016), where the accrual items from the balance sheet that are associated with arriving at operating income in the income statement are added or subtracted. Finally, we compute accruals following Sloan (1996) by making changes in balance sheet items. The three variables namely accruals, OP, and cash OP are all deflated by the book value of the assets in a lagged year that is year t-1. [See *Appendix 2* for the detailed computations and formulae for accruals, OP, and cash OP].

To reduce the distortion in the individual assets due to the measurement errors portfolios are constructed to conduct tests in empirical research to gain insights on the data (Ključnikov *et al*., 2016; Belas *et al*., 2018). Portfolios are constructed using the excess returns approach which uses a 6-month treasury rate as a risk-free rate and PSX all-share index is taken as average market returns. Decile portfolios were constructed by single sorting based on accruals, operating profits and cash OP. Both equal and value-weighted portfolios are used for which Market value will be used to capture the effect of size. Further, these portfolios are constructed by using the accounting information, and thus rebalancing of annual information is done.

3. Empirical Findings and Discussion

3.1 Descriptive Statistics

We begin our analysis with the descriptive statistics reported in *Table 1*, *Table 2*, *Table 3* showing the summary statistics of accrual sorted, OP sorted and cash OP sorted portfolios. These results are followed by the risk-adjusted asset pricing models for each of the portfolios. *Table 1* reports the characteristics of the decile accrual sorted portfolios. [See *Appendix 1* for all the tables containing empirical results]. The data for accruals present substantial variation across the portfolios indicating that accruals are a significant criterion for sorting portfolios. The market size shows the inconsistent pattern across the portfolios but indicating a fact that the portfolio with the lowest accrual is attributed to the greater market value of equity shares. The spread between P1 and P10 excess return for value-weighted and equally weighted portfolios was 14.58% and 10.07% respectively which is statistically significant.

Table 1. Performance and characteristics of decile portfolios constructed on the basis of Accruals

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P1-10	t-test
	Full sample period: July 2002 – December 2016											
Avg Accruals	-0.38	-0.17	-0.09	-0.06	-0.03	-0.01	0.00	0.02	0.07	0.20	-0.58	-64.03
EWreturn(%p.a)	25.34	13.62	15.47	20.37	16.11	13.70	28.94	29.07	23.23	15.28	10.07	1.56
VWreturn(p.a)	16.70	13.52	14.20	9.15	8.23	4.47	14.99	22.97	15.04	2.12	14.58	1.79
MV (PKRm)	45486	26211	17420	21048	20707	15441	12914	16218	17787	12596	32891	1.26
CAPM Beta	0.43	0.15	0.28	0.28	0.32	0.27	0.26	0.28	0.21	0.28	0.15	2.70

Notes: Table 1 reports the descriptive statistics of the decile portfolios constructed on the sorting criterion of accruals during the period of July 2002 –December 2016. All shares listed on PSX since July 2001 have been sorted at month t in ascending order according to their accrual values which were then assigned to ten portfolios. P1 represents the decile portfolio with the lowest accruals and P10, on the other hand, represents the portfolio with the highest accruals. The excess returns for all decile portfolios were post ranking returns that are computed at month (t+1). P1-P10 denotes the difference between the characteristics of decile portfolio 10 and decile portfolio 1. EW and VW returns represent the annualised returns computed by taking an average of monthly returns for the equally weighted and value-weighted portfolios respectively. MV represents the mean of a market value corresponding to the shares in each portfolio (in PKR m). CAPM beta measures the sensitivity of the returns of value-weighted portfolios towards the returns of the market portfolio. The t-tests in the last column show the significance of the null hypothesis which states that there is no difference in means of characteristics between portfolios P1 and P10.

Source: own calculations.

Table 2. Performance and characteristics of decile portfolios constructed on the basis of Cash-based Operating Profitability

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P10-1	t-test
	Full sample period: July 2002-Dec 2016											
Average Cash OP	-0.14	-0.02	0.04	0.08	0.12	0.16	0.23	0.29	0.42	0.64	0.78	96.70
EW returns (% p.a)	29.45	24.46	23.42	21.98	13.50	21.78	13.66	18.62	16.28	17.39	-12.06	-1.37
VW returns (% p.a)	13.24	19.31	17.25	10.32	3.92	17.36	6.08	18.85	10.87	12.82	-0.42	-0.04
MV (PKRm)	7033	6721	6811	8294	13048	11377	22352	16833	44255	60212	53179	17.10
CAPM Beta	0.39	0.42	0.29	0.30	0.33	0.22	0.15	0.31	0.30	0.21	-0.17	2.41

Notes: Table 2 reports the descriptive statistics of the decile portfolios constructed on the sorting criterion of cash based operating profitability during the period July 2002 – December 2016. All shares listed on PSX since July 2001 have been sorted at month t in ascending order according to their operating profitability (OP) values which were then assigned to ten portfolios. P1 represents the decile portfolio with the lowest or most negative OP and P10 on the other hand represents portfolio with the highest or most positive OP. The excess returns for all decile portfolios were post ranking returns that are computed at month (t+1). P10-P1 denotes the difference between the characteristics of decile portfolio 10 and decile portfolio 1. EW and VW returns represent the annualised returns computed by taking an average of monthly returns for the equally weighted and value weighted portfolios respectively. MV represents the mean of market value corresponding to the shares in each portfolio (in PKR m). CAPM beta measures the sensitivity of the returns of value weighted portfolios towards the returns of the market portfolio. The t-tests in the last column shows the significance of the null hypothesis which states that there is no difference in means of characteristics between portfolios P10 and P1.

Source: own calculations.

Table 3. Performance and characteristics of decile portfolios constructed on the basis of Operating Profitability

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P10-1	t-test
	Full sample period: July 2002 – December 2016											
Average OP	-0.10	0.00	0.04	0.07	0.10	0.13	0.17	0.23	0.31	0.49	0.60	100.94
EWreturns (% p.a)	30.69	21.91	23.92	23.51	15.24	15.76	17.46	14.26	20.08	16.88	-13.81	-1.51
VWreturns (% p.a)	9.51	18.23	14.06	13.77	10.46	11.33	9.24	13.33	17.67	11.41	1.90	0.18
MV (PKRm)	6733	5867	6406	8986	11324	16886	14964	17404	33117	81350	74618	16.35
CAPM Beta	0.39	0.25	0.34	0.26	0.25	0.27	0.22	0.28	0.25	0.21	-0.17	2.55

Notes: Table 3 reports the descriptive statistics of the decile portfolios constructed on the sorting criterion of operating profitability ratios during the period of July 2002 – December 2016. All shares listed on PSX since July 2001 have been sorted at month t in ascending order according to their operating profitability (OP) values which were then assigned to ten portfolios. P1 in the table above represents the decile portfolio with the lowest or most negative OP and P10 on the other hand represents portfolio with the highest or most positive OP. The excess returns for all decile portfolios were post ranking returns that are computed at month (t+1). P10-P1 denotes the difference between the characteristics of decile portfolio 10 and decile portfolio 1. EW and VW returns represent the annualised returns computed by taking an average of monthly returns for the equally weighted and value weighted portfolios respectively. MV represents the mean of market value corresponding to the shares in each portfolio (in PKR m). CAPM beta measures the sensitivity of the returns of value weighted portfolios towards the returns of the market portfolio. The t-tests in the last column shows the significance of the null hypothesis which states that there is no difference in means of characteristics between portfolios P10 and P1.

Source: own calculations.

Table 2 and *Table 3* show the characteristics of cash OP and OP portfolios respectively. We report the significant variation in both the accounting measures across the decile portfolios indicating that cash OP and OP a meaningful criterion for sorting portfolios. However, the results are not significant. Finally, there is no trend found in CAPM beta corresponding to the portfolio returns for any of the accounting measures. It suggests that the mean-variance framework fails to gauge the risk-adjusted returns instating a need to follow FF 3 and 5-factor models to further explain the risk-adjusted portfolio returns.

3.2 Risk-Adjusted Asset Pricing

Next, we evaluate the time-series performance of the decile accruals sorted, OP sorted and cash OP sorted portfolios using the widely used equity pricing models. Initially, we estimate the Jensen alpha from the CAPM.

$$E(R_p) = \alpha_{Jensen} + \beta_i(E(R_m) - R_f) + \varepsilon_i \quad \text{(i)}$$

Where Rp represents expected portfolio excess returns, α_{Jensen} is the alpha coefficient given by Jensen, R_m denotes average market returns and ε_i represents the zero mean residual.

Next, we estimate the FF 3 factor-alpha.

$$E(Rp_i) = \alpha_{FF3} + \beta_3\left(R_m - R_f\right) + \beta_s SMB + \beta_v HML + \varepsilon_i \quad \text{(ii)}$$

Where E (Rp_i) represents expected portfolio excess returns, α_{FF3} presents the alpha coefficient given by FF 3 factor model, SMB denotes the spread between portfolio reruns of small and big stocks (market capitalization), and HML represents the spread between portfolio reruns of a high and low book to market ratios.

Finally, we compute the FF 5 factor alpha.

$$E(Rp_i) = \alpha_{FF5} + \beta_3\left(R_m - R_f\right) + \beta_s SMB + \beta_v HML + \beta_r RMW + \beta_c CMA + \varepsilon_i \quad \text{(iii)}$$

Where α_{FF5} is the alpha coefficient given by FF 3 factor model, RMW represents the portfolios with robust and weak profitability and CMA shows the portfolio returns with high and low investment returns [See *Appendix 3* for the detailed construction of the model factors].

The intercept in the CAPM model is called the Jensen alpha named after Jensen (1968) and the slope called Beta is the measure of the sensitivity of a particular stock or portfolio return towards the changes in the market return. The Jensen alpha provides value in addition to the return corresponding to the sensitivity risk measured by the beta on the portfolios constructed by similar characteristics. The Jensen alpha must be found not only positive but also statistically significant. Following the argument of Fama and French (1993) which posits that the slopes of regression found under time series provide the liaison between the risk and returns of the stock; however, the intercept known as alpha adds value to the risk and returns measurement of the portfolios [See *Appendix 4* for the construction of portfolio alphas].

Having analysed the descriptive statistics for all the variables, we further applied the three most widely used asset-pricing models to evaluate the time series risk-adjusted returns attributed to the accruals, OP and cash component of operating profitability. We have used the CAPM which uses the beta risk (mean-variance framework), FF3 factor model which captures the size and value and FF5 factor model which takes profits and momentum in addition to the FF3 factors model. The alpha coefficients for all asset-pricing models were calculated for the accruals, OP and cash OP portfolios.

The first investment strategy analyses the effects of accruals in the asset-pricing models, its CAPM alpha, FF3 factor and 5-factor alphas are reported in Table 4. The spread between the lowest and the highest time series CAPM, FF3 factor and FF5 factor alphas of decile equal and value-weight portfolios for the full sample period show positive returns authenticating the previous findings of Sloan (1996) and Ball *et al*. (2016) that accruals are negatively correlated to the stock returns. The CAPM alpha is reported as 13% (t-value = 2.28 and 2.21 for equal and value weight portfolios respectively), the FF3 alphas spread for the ten portfolios is 13% (t-value = 3.07) for equal-weighted and 8% (t-value = 1.72) for the value-weighted portfolio sorts while FF5 alpha shows the spread of 16% (t-value = 4.63) and 7% (t-value = 2.00) for the equal and value weight portfolios respectively. All the results are highly significant inferring that the accruals are a significant risk factor that must be accounted for in the asset-pricing models along with the variables considered under the model specifications used in this analysis. All the empirical results for alphas under CAPM, FF3, and FF5 were further authenticated by using the Wald test to authenticate the performance of asset-pricing models explaining the behaviour of accrual sorted portfolios. The Wald test rejects the hypothesis of joint coefficients to be zero. The results infer that the accrual portfolios yield abnormally lower returns for both equal and value-weighted portfolios and thus should be accounted for as an additional risk measure on PSX.

Table 4. Panel A: Alphas of Accrual portfolios (whole sample period July 2002 – Dec 2016)

	Equal Weighted portfolios			Value Weighted portfolios		
Portfolio	CAPM alpha (% p.a.)	FF3 alpha	FF5 alpha	CAPM alpha (% p.a.)	FF3 alpha	FF5 alpha
P1 (Lowest)	18%	15%	13%	8%	6%	5%
P2	9%	9%	8%	11%	14%	12%
P3	13%	7%	7%	11%	6%	7%
P4	14%	15%	13%	2%	2%	3%
P5	14%	11%	12%	3%	4%	0%
P6	7%	7%	9%	0%	0%	-2%
P7	24%	24%	19%	12%	10%	3%
P8	25%	22%	22%	18%	13%	10%
P9	19%	17%	17%	13%	13%	15%
P10 (Highest)	9%	6%	3%	-2%	-7%	-6%
P1-P10	9%	9%	10%	10%	13%	11%
Chi Square	95.77	117.58	128.29	32.5	39.47	40.43
Prob	0.00	0.00	0.00	0.00	0.00	0.00
			Panel B: t values			
P1 (Lowest)	3.44	3.49	3.51	1.53	1.35	1.21
P2	1.73	2.12	2.03	2.08	3.07	3.09
P3	2.52	1.68	1.77	1.98	1.3	1.78
P4	2.66	3.45	3.37	0.44	0.48	0.84
P5	2.68	2.5	3.19	0.55	0.96	-0.09
P6	1.41	1.66	2.33	-0.08	-0.07	-0.62
P7	4.46	5.65	4.99	2.11	2.34	0.69
P8	4.73	5.29	5.92	3.31	2.86	2.67
P9	3.59	3.91	4.61	2.44	3.04	3.9
P10 (Highest)	1.79	1.42	0.76	-0.33	-1.56	-1.54
P1-P10	1.73	2.07	2.78	1.86	2.91	3.03

Notes: Table 4 reports the performance of the decile equal and value-weighted portfolios sorted on the basis of Accruals for the whole sample period from July 2002 – December 2016. All listed nonfinancial companies on PSX since July 2001 are sorted at month t in ascending order according to their accrual value. P1 is the portfolio with the lowest accrual and P10 with the highest accrual. P1-P10 represents the spread between P10 and P1. The alphas are annualised under all three asset pricing models namely Capital Asset Pricing Model given as CAPM alpha; FF three-factor model given as FF3 alpha and FF 5-factor model given as FF5 alpha. The chi-square statistic refers to the Wald test evaluating the overall significance of the model; p-values are reported below the statistics.

Source: own calculations.

Table 5 and *Table 6* present the results of evaluating these investment strategies by CAPM alpha and FF3 and 5-factor alphas for cash OP and OP respectively. The value weighted spread between the highest and the lowest time series CAPM, FF3 and FF5 alpha of cash OP portfolios for the full sample period is 5% (t-value = 0.68), 5% (t-value = 0.62) and 2% (t-value = 0.41) respectively. Similarly, the spread between the highest and the lowest time series CAPM, FF3 and FF5 alpha of OP portfolios for the full sample period is 11% (t-value = 1.72) which is a significant result however FF3 and 5 factor model gives -3% (t-value = -8.34) and -2% (t-value = -0.49) respectively. These results were also further authenticated by using the Wald test to assess the performance of asset-pricing models. The Wald test rejects the hypothesis of joint coefficients to be zero.

Table 5. Panel A: Alphas of Cash OP portfolios (full sample period July 2002 – Dec 2016)

	Equal Weighted portfolios			**Value Weighted portfolios**		
Portfolio	CAPM alpha (% p.a.)	FF3alpha	FF5alpha	CAPM alpha (% p.a.)	FF3alpha	FF 5alpha
P1 (Lowest)	24%	17%	13%	7%	1%	-6%
P2	20%	20%	18%	13%	13%	9%
P3	18%	16%	20%	13%	9%	15%
P4	16%	13%	14%	4%	0%	-1%
P5	10%	11%	11%	-1%	0%	-1%
P6	17%	16%	16%	14%	12%	13%
P7	11%	10%	7%	5%	5%	0%
P8	13%	9%	7%	14%	7%	8%
P9	13%	9%	6%	6%	3%	3%
P10 (Highest)	13%	11%	7%	10%	9%	8%
P10-P1	-11%	-6%	-6%	3%	8%	14%
Chi Square	83.91	95.59	111.97	27.22	26.15	37.67
Prob.	0	0	0	0	0	0
			Panel B: t values			
P1 (Lowest)	4.3	3.77	3.41	1.11	0.16	-1.54
P2	3.61	4.49	4.7	2.17	2.83	2.15
P3	3.2	3.69	5.23	2.12	1.96	3.65
P4	2.99	2.85	3.61	0.66	0.09	-0.22
P5	1.76	2.6	2.95	-0.23	-0.02	-0.33
P6	3.08	3.6	4.13	2.44	2.59	3.1
P7	2.05	2.27	1.92	0.9	1.16	0.11
P8	2.34	1.97	1.8	2.35	1.5	1.85
P9	2.3	2.03	1.47	0.99	0.72	0.76
P10 (Highest)	2.37	2.56	1.77	1.73	1.85	1.88
P10-P1	-1.92	-1.21	-1.64	0.48	1.69	3.24

Notes: Table 5 reports the performance of the decile equal and value-weighted portfolios sorted on the basis of cash operating profitability for the whole sample period from July 2002 – December 2016. All listed nonfinancial companies on PSX since July 2001 are sorted at month t in ascending order according to their cash operating profitability value. P1 is the portfolio with the lowest cash OP and P10 with the highest cash OP. P10-P1 represents the spread between P10 and P1. The alphas in Panel A are annualised under all three asset pricing models namely Capital Asset Pricing Model given as CAPM alpha; FF three-factor model given as FF3 alpha and FF 5-factor model given as FF5 alpha with t-statistics given in Panel B. The chi-square statistic refers to the Wald test evaluating the overall significance of the model; p-values are reported below the statistic.

Source: own calculations.

Table 6. Panel A: Alphas of Operating Profitability portfolios (whole sample period July 2002 - Dec 2016)

Portfolio	Equal Weighted portfolios			Value Weighted portfolios		
	CAPM alpha (% p.a.)	FF3 alpha	FF 5 alpha	CAPM alpha (% p.a.)	FF3 alpha	FF5 alpha
P1 (Lowest)	25%	18%	18%	3%	-1%	-5%
P2	16%	17%	17%	14%	15%	12%
P3	18%	18%	19%	11%	15%	18%
P4	18%	15%	12%	12%	12%	10%
P5	13%	12%	10%	9%	7%	1%
P6	11%	9%	5%	5%	5%	2%
P7	15%	12%	13%	6%	2%	2%
P8	8%	3%	3%	10%	6%	3%
P9	14%	11%	9%	16%	17%	13%
P10 (Highest)	12%	8%	7%	10%	7%	7%
P10-P1	-14%	-10%	-11%	7%	8%	11%
Chi Square	79.58	89.39	101.28	29.01	43.89	46.24
Prob.	0.00	0.00	0.00	0.00	0.00	0.00
			Panel B: t values			
P1 (Lowest)	4.57	4.15	4.61	0.41	-0.21	-1.11
P2	2.95	3.85	4.37	2.4	3.01	2.92
P3	3.29	4.11	4.8	1.81	3.13	4.16
P4	3.21	3.35	2.99	2.03	2.45	2.38
P5	2.26	2.62	2.64	1.48	1.36	0.2
P6	1.96	2.01	1.34	0.85	0.99	0.51
P7	2.68	2.78	3.41	1.02	0.31	0.43
P8	1.37	0.61	0.69	1.58	1.17	0.81
P9	2.53	2.56	2.22	2.58	3.51	3.14
P10 (Highest)	2.12	1.90	1.77	1.60	1.54	1.59
P10-P1	-2.45	-2.26	-2.84	1.19	1.75	2.69

Notes: Table 6 reports the performance of the decile equal and value-weighted portfolios sorted on the basis of operating profitability for the whole sample period from July 2002 – December 2016. All listed nonfinancial companies on PSX since July 2001 are sorted at month t in ascending order according to their operating profitability value. P1 is the portfolio with the lowest OP and P10 with the highest OP. P10-P1 represents the spread between P10 and P1. The alphas in Panel A are annualised under all three asset pricing models namely Capital Asset Pricing Model given as CAPM alpha; FF three-factor model given as FF3 alpha and FF 5-factor model given as FF5 alpha with t-statistics given in Panel B. The chi-square statistic refers to the Wald test evaluating the overall significance of the model; p-values are reported below the statistics.

Source: own calculations.

3.3 Pricing Two Way Sorted Portfolios Using the Size and the Characteristic Variable

Panel A of *Table 7* reports the average annualised excess returns and the annualised alphas of CAPM, FF3 and FF5 factor models of equally-weighted portfolios constructed by subsequent sorting of size and accruals. The annualised excess returns increase as we move towards the big size and high accruals showing a contradictory pattern to the previous literature. The big-high accrual portfolios earn an excess annualised return of 20.09% (t=2.97) as compared to small-low accruals which earn an average of 18.70% (t=2.57) per annum. The annualised alphas of CAPM, FF3, and FF5 factors also exudes the same pattern, however, the corresponding t-values are not significant and hence we can infer that the asset pricing tests do not price the accruals appropriately. The value-weighted portfolios in panel B also report alike pattern as in panel A.

Table 7. Asset pricing of portfolios sorted by size and accruals

Panel A: Equally-weighted portfolio constructed by accruals								
	Annualised excess returns				t-value			
Size	Low	Medium	High	1-10	Low	Medium	High	1-10
Small	18.70	19.97	28.06	-9.36	2.57	2.92	3.70	-2.39
Big	13.48	15.11	20.09	-6.60	2.09	2.45	2.97	-1.63
	Annualised alphas				t-value			
				CAPM				
Small	13.13	16.48	22.48	-9.35	1.86	2.41	3.1	-2.46
Big	9.68	10.13	16.19	-6.51	1.48	1.67	2.38	-1.56
				Fama French three factor Model				
Small	12.19	16.79	19.58	-7.40	1.54	2.14	2.38	-1.72
Big	20.62	17.16	12.19	8.43	1.95	2.28	1.79	1.23
				Fama French five factor Model				
Small	11.23	17.39	18.33	-7.10	1.29	1.99	2.05	-1.51
Big	21.65	16.16	10.95	10.70	1.79	1.93	1.51	1.68
Panel B: Value-weighted portfolio constructed by accruals								
	Annualised excess returns				t-value			
Size	Low	Medium	High		Low	Medium	High	
Small	12.69	18.08	18.33	-5.63	1.79	2.66	2.43	-1.23
Big	7.29	10.73	14.25	-6.96	1.12	1.63	2.05	-1.50
	Annualised alphas				t-value			
				CAPM				
Small	7.33	14.66	13.71	-6.68	1.04	2.15	1.77	-1.29
Big	4.36	5.61	10.95	-6.60	0.66	0.87	1.55	-1.26
				Fama French three factor Model				
Small	8.71	17.26	12.24	-6.37	1.06	2.23	1.35	-0.65
Big	1.24	5.21	8.72	-6.59	0.16	0.71	1.03	-1.41
				Fama French five factor Model				
Small	11.05	15.41	15.77	-4.72	1.24	1.92	1.68	-0.82
Big	1.74	2.96	7.48	-5.74	0.21	0.38	0.80	-0.98

Notes: Table 7 shows the annualised excess returns and annualised alphas of CAPM, Fama French 3, and 5 Factor models and their associated t statistics for the 6 equal and 6 value-weighted portfolios of 2x3 sorts constructed by two-way subsequent sorting on size and accruals. We have sorted stocks into six portfolios. The stocks are sorted first by size into small and big taking the below and above 50th percentile Market size values respectively. The stocks are then divided into three equal parts by the accrual factor and categorised as low, medium, and high accruals. Hence the portfolios are small-low, small-medium, small high, big-low, big-medium, and big-high accruals. Our sample period is July 2002 – December 2016.

Source: own calculations.

Table 8 shows the average annualised excess returns and annualised alphas of CAPM, FF3 and FF5 factor models of portfolios constructed by subsequent sorting of size and cash OP. Panel A reports that equal-weighted portfolio returns decrease as we move towards the big size and high cash operating profits showing a contrasting pattern to the previous literature. The big-high cash-OP earns an excess annualised return of 16.13% (t=2.84) as compared to small-low cash-OP which earns an average of 28.01% (t=3.27) per annum. The annualised alphas of CAPM, FF3 and FF5 factors, however, show the different patterns; the annualised alphas increase as we move from low to high cash operating profits but these alphas are not statistically significant. The value-weighted portfolios in panel B also report alike pattern as in panel A. The CAPM, FF3 and FF5 factor alphas of small-high cash OP portfolios earn statistically significant annualised alpha of 13.4%, 14.54%, and 14.73% respectively. This infers that the high cash operating profits produce pronounced alphas in the small size firms only.

Table 8. Asset pricing of portfolios sorted by size and cash-based operating profitability

Panel A: Equally-weighted portfolio constructed by cash-based operating profitability								
	Annualised Excess returns				t-value			
Size	Low	Medium	High	10-1	Low	Medium	High	10-1
Small	28.01	21.53	18.30	-9.70	3.27	3.06	2.96	-1.77
Big	14.72	18.37	16.13	1.42	2.01	2.86	2.84	0.32
	Annualised Alphas				t-value			
				CAPM				
Small	22.95	16.71	13.74	-9.21	2.67	2.43	2.26	-1.70
Big	9.7	14.13	12.37	2.67	1.33	2.2	2.19	0.60
				Fama French three factor Model				
Small	20.46	16.23	13.21	-7.25	2.04	2.11	1.86	-1.09
Big	8.87	11.43	9.68	0.81	1.07	1.53	1.44	0.16
				Fama French five factor Model				
Small	20.35	17.44	10.67	-9.68	1.77	2.15	1.38	-1.30
Big	6.45	11.49	7.55	1.10	0.73	1.38	1.03	0.22
Panel B: Value-weighted portfolio constructed by cash-based operating profitability								
	Annualised Excess returns				t-value			
Size	Low	Medium	High	10-1	Low	Medium	High	10-1
Small	12.82	16.12	18.48	5.66	1.60	2.17	2.94	1.06
Big	9.28	12.09	8.89	-0.39	1.27	1.84	1.45	-0.08
	Annualised Alphas				t-value			
				CAPM				
Small	8.18	11.86	13.40	5.21	1.00	1.56	2.14	0.68
Big	4.33	7.79	5.86	1.53	0.59	1.16	0.96	0.45
				Fama French three factor Model				
Small	7.43	12.88	14.54		0.78	1.50	1.97	1.08
Big	2.51	6.31	4.28		0.30	0.79	0.59	0.29
				Fama French five factor Model				
Small	7.71	15.64	14.73	7.02	0.73	1.79	1.84	0.98
Big	0.35	3.54	3.83	3.48	0.04	0.41	0.49	0.56

Notes: Table 8 shows the annualised excess returns and annualised alphas of CAPM, Fama French 3, and 5 Factor models and their associated t statistics for the 6 equal and 6 value-weighted portfolios of 2x3 sorts constructed by two way subsequent sorting on size and cash-based Operating Profits. We have sorted stocks into six portfolios. The stocks are sorted first by size into small and big taking the below and above 50th percentile Market size values respectively. The stocks are then divided into three equal parts by the cash-based operating profitability factor and categorized as low, medium, and high cash operating profits. Hence the portfolios are small-low, small-medium, small high, big-low, big-medium, and big-high cash operating profits. Our sample period is July 2002 – December 2016.

Source: own calculations.

Table 9 Asset pricing of portfolios sorted by size and operating profitability

Equally-weighted portfolio constructed by operating profitability								
	Annualised excess returns				t-value			
Size	Low	Medium	High	10-1	Low	Medium	High	10-1
Small	28.23	21.12	18.53	-9.70	3.00	3.15	3.08	-1.44
Big	15.81	15.28	18.45	2.64	2.09	2.37	3.31	0.56
	Annualised alphas				t-value			
	CAPM							
Small	22.4	17.38	13.67	-8.73	2.44	2.62	2.32	-1.32
Big	11.76	10.47	14.4	2.65	1.54	1.61	2.66	0.56
	Fama French three factor Model							
Small	20.46	16.23	13.21	-7.25	2.04	2.11	1.86	-1.11
Big	11.54	6.99	11.75	0.21	1.31	0.93	1.82	0.04
	Fama French five factor Model							
Small	20.35	17.44	10.67	-9.68	1.77	2.15	1.38	-1.26
Big	9.22	6.37	10.29	1.06	0.98	0.77	1.43	0.19
Value-weighted portfolio constructed by operating profitability								
	Annualised Excess returns				t-value			
Size	Low	Medium	High	10-1	Low	Medium	High	10-1
Small	12.51	19.56	5.30	2.79	1.37	2.69	2.46	0.44
Big	10.77	9.55	9.98	-0.79	1.42	1.45	1.60	-0.14
	Annualised Alphas				t-value			
CAPM								
Small	6.94	16.69	9.95	3.01	0.77	2.27	1.56	0.62
Big	6.65	6.08	6.15	-0.50	0.88	0.90	1.00	-0.17
	Fama French three factor Model							
Small	8.29	18.43	10.12	1.83	0.77	2.24	1.35	0.25
Big	5.58	3.47	4.91	-0.67	0.65	0.43	0.67	-0.11
	Fama French five factor Model							
Small	12.02	18.70	10.68	-1.34	1.05	2.05	1.38	-0.17
Big	2.73	1.84	3.68	0.94	0.30	0.21	0.47	0.15

Notes: Table 9 shows the annualised excess returns and annualised alphas of CAPM, Fama French 3, and 5 Factor models and their associated t statistics for the 6 equal and 6 value-weighted portfolios of 2x3 sorts constructed by two way subsequent sorting on size and Operating Profits. We have sorted stocks into six portfolios. The stocks are sorted first by size into small and big taking the below and above 50th percentile Market size values respectively. The stocks are then divided into three equal parts by the Operating profitability factor and categorised as low, medium, and high operating profits. Hence the portfolios are small-low, small-medium, small high, big-low, big-medium, and big-high operating profits. Our sample period is July 2002 – December 2016.

Source: own calculations.

Table 9 presents the average annualised excess returns and the annualised alphas of CAPM, FF3 and FF5 factor models of portfolios constructed by subsequent sorting of size and OP. Panel A shows similar results as in *Table 8* that the annualised excess returns of equal-weighted portfolios decrease as we move towards the big size however the returns increase when moving towards high operating profits showing a contrasting pattern to the previous literature. The small-low OP portfolios earn an annualised returns of 28.23 (t=3.00) as compared to 18.53 (t=3.08) earned by small-high Op portfolios. The big-high OP earns an excess annualised return of 18.45% (t=3.31) as compared to big-low OP portfolios which earn an average of 15.81% (t=2.09) per annum. The annualised alphas of CAPM, FF3 and FF5 factors show the contradictory results from previous literature. The small-low OP portfolios produce the most pronounced CAPM, FF3 and FF5 factor alphas of 22.4% (t=2.44), 20.36% (t=2.04) and 20.35% (t=1.77) respectively. The excess returns increase from low to high operating profits in small firms but follow a reverse pattern in the big sized firms. The alphas and their corresponding t-values decrease in magnitude and also lose the statistical significance in the high and low OP portfolios. The value-weighted small-medium OP portfolios in panel B shows the most pronounced results of CAPM, FF3, and FF5 factor model alphas. The small-medium OP portfolios earn statistically significant annualised alphas of 16.69%, 18.43% and 18.70% in CAPM, FF3, and FF5 factor models respectively. We can infer that the small-sized firms perform better when they have medium operating profits.

3.4 The Cross-Sectional Return Analysis

The next section reports the variations captured in the cross-section of portfolio returns sorted by accruals, cash OP, and OP. We conduct the standard two-stage Fama Mac-Beth (1973) using information from all portfolios formed from accruals, OP, and cash OP. The first stage of the Fama Mac-Beth (1973) test performs the time series regression and estimates the beta coefficients. The next stage regresses the excess returns on the previously estimated betas. The following asset-pricing models are used to conduct the cross-sectional analysis of returns:

$$R_{p,t} - R_{f,t} = \lambda_0 + \lambda_{MKT}\hat{\beta}_{MKT} + w_{p,t} \quad \text{(iv)}$$

$$R_{p,t} - R_{f,t} = \lambda_0 + \lambda_{MKT}\hat{\beta}_{MKT} + \lambda_{SMB}\hat{\beta}_{SMB} + \lambda_{HML}\hat{\beta}_{HML} + w_{p,t} \quad \text{(v)}$$

$$R_{p,t} - R_{f,t} = \lambda_0 + \lambda_{MKT}\hat{\beta}_{MKT} + \lambda_{SMB}\hat{\beta}_{SMB} + \lambda_{HML}\hat{\beta}_{HML} + \lambda_{RMW}\hat{\beta}_{RMW} + \lambda_{CMA}\hat{\beta}_{CMA} + w_{p,t} \quad \text{(vi)}$$

Where lambdas are the risk premium coefficient on the respective betas. Apart from Fama-French five factors we also use Fama- French three factors and CAPM functional forms. The regressors or factor loadings in the cross-sectional model specified above are subject to error in variables bias because the factor loading is pre-estimated rather being the observed true values and hence to ensure the robustness of the results we also use the Shanken (1992) statistics which calculates the t-statistics by using corrected standard errors.

Table 10 reports the results of the cross-sectional analysis for equal and value-weighted portfolios constructed by accruals for all three asset pricing models. Panel A reports the estimated coefficients of equally-weighted portfolios using rolling window regression. We report that market beta is negative indicating an inverse relationship between the portfolio and average stock returns however these coefficients are insignificant. We further confirm that none of the risk factors could explain the variation in the cross-section of risk-adjusted returns across all three methodological approaches in equally weighted portfolios. Panel B reports the estimated coefficients of value-weighted portfolios using rolling window regression. We report the negative market beta coefficients in all the asset pricing models which persists even after introducing the additional risk factors. These results contradict the basic implication of Capital asset pricing theory. We further report that only factor loading on the profitability risk factor significantly explains the cross-sectional returns of value-weighted accrual portfolios, other risk factors do not possess any explanatory power over the cross-section of portfolio returns. The average R square in both panels increases as we add risk factors, however, the adjusted R square shows the ambiguous results. The constant term in all the models presents the significant and large coefficients signaling towards the model misspecification. We can infer from the results that none of the most commonly used models could sufficiently explain the variations in the cross-section of accrual portfolio returns.

Table 10. Cross-sectional asset pricing tests for accrual portfolios

Panel A: Equally-weighted accrual portfolios								
	λ_0	λ_{MKT}	λ_{SMB}	λ_{HML}	λ_{CMA}	λ_{RMW}	R^2	$Adj\ R^2$
CAPM	0.0130 (2.1328)*** [2.1219]***	-0.0074 (-0.4638) [-0.4618]	-	-	-	-	0.1135	0.0026
FF-3	0.0125 (1.9312)* [1.9285]*	3.6427 (0.0209) [0.0208]	0.0011 (0.1267) [0.1265]	-0.0016 (-0.1121) [-0.1120]	-	-	0.3290	-0.0064
FF-5	0.0060 (0.8638) [0.7290]	0.0137 (0.6174) [0.5270]	-0.0037 (-0.3606) [-0.3082]	-0.0215 (-1.0893) [-0.9251]	0.0068 (0.4981) [0.4243]	0.0045 (0.2990) [0.2550]	0.5811	0.0574
Panel B: Value-weighted accrual portfolios								
	λ_0	λ_{MKT}	λ_{SMB}	λ_{HML}	λ_{CMA}	λ_{RMW}	R^2	$Adj\ R^2$
CAPM	0.0092 (1.8348)* [1.7985]*	-0.0147 (-1.0810) [-1.0639]	-	-	-	-	0.1032	-0.0089
FF-3	0.0132 (2.2191)*** [1.9814]***	-0.0244 (-1.5710) [-1.4259]	0.0052 (0.3886) [0.3488]	0.0212 (1.2898) [1.2898]	-	-	0.3474	0.0211
FF-5	0.0167 (2.1999)*** [1.3917]	-0.0226 (-1.0806) [-0.7023]	0.0182 (1.0302) [0.6575]	0.0280 (1.5123) [0.9712]	0.0337 (1.6598)* [1.0594]	0.0278 (2.9118)*** [1.9532]**	0.5668	0.0252

Notes: Table 10 reports the average risk premium coefficients calculated in the second stage of Fama Mac Beth (1973) regression modelled in Equation iv, v, and vi. The first stage estimates the time series risk premiums by CAPM, Fama French three, and five factors on the portfolio returns constructed by accruals. These estimated factor loadings are then used to compute the monthly rolling window cross-sectional regressions on ten accrual equally weighted and value-weighted portfolios. Fama Mac Beth (1973) t- statistics are reported in parenthesis. Shanken (1992) statistics are also reported in the brackets which represent corrected standard errors to mitigate the error in variables bias. ***, ** and * indicate the significance level at 1%, 5% and 10% respectively. The last two columns report the average R2 and adjusted R2 of the second-stage regression models.

Source: own calculations.

The previous exercise has been repeated for the Cash OP sorted portfolios whose results are reported in *Table 11*. Panel A and B report the equally weighted and value-weighted portfolio coefficients respectively. Table 11 reports that the risk coefficients paint a somewhat similar picture across all asset pricing models as in accrual portfolios. The market excess returns show the negative relationship with both equal and value-weighted portfolio returns which is against CAPM implied relationship, however, all the market beta coefficients are insignificant. We could not find any significant impact of any factor on the equally weighted portfolio returns in the cross-sectional analysis however Panel B shows that the value factor dominates in explaining the cross-sectional variation in the value-weighted returns in both FF3 and FF5 models. All other factors do not significantly explain the variation in the cross-sectional returns. We can infer that the premiums on Cash OP portfolios are explained only by the exposure to the value factor.

Table 11. Cross-sectional asset pricing tests for cash-based operating profit portfolios

	λ_0	λ_{MKT}	λ_{SMB}	λ_{HML}	λ_{CMA}	λ_{RMW}	R^2	$Adj\ R^2$
Panel A: Equally-weighted portfolios								
CAPM	0.0123 (2.2855)*** [2.2784]***	-0.0058 (-0.2833) [-0.2825]	-	-	-	-	0.0234	0.132
FF-3	0.008 -1.4159 [1.1799]	-0.0028 (-0.1265) [-0.1067]	0.0041 -0.4492 [-0.3808]	0.0318 (2.8402)*** [2.4171]***	-	-	0.3701	0.0552
FF-5	0.0125 (1.7388)* [1.3221]	-0.0195 (-0.7616) [-0.5864]	0.009 -0.8385 [0.6468]	0.0392 (3.1325)*** [2.4380]***	0.0075 -0.7066 [0.5500]	0.0017 -0.1377 [0.1074]	0.6117	0.1263
Panel B: Value-weighted portfolios								
CAPM	0.0096 (1.7719)* [1.6966]*	-0.022 (-1.4554) [-1.4034]	-	-	-	-	0.1066	-0.0051
FF-3	0.0044 -0.6374 [0.4781]	-0.0162 (-0.9953) [-0.7714]	-0.0222 (-1.7817)* [-1.3539]	0.0164 -0.9872 [0.7506]	-	-	0.3579	0.0368
FF-5	-0.0079 (-0.9039) [-0.5846]	-0.0065 (-0.3657) [-0.2454]	-0.0269 (-1.6394) [-1.0710]	0.0296 -1.4016 [0.9167]	-0.0178 (-1.1748) [-0.7717]	0.017 -1.2257 [0.8138]	0.5731	0.0394

Notes: Table 11 reports the average risk premium coefficients calculated in the second stage of Fama Mac Beth (1973) regression modelled in equation iv, v, and vi. The first stage estimates the time series risk premiums by CAPM, Fama French three, and five factors on the portfolio returns constructed by Cash-based Operating profits. These estimated factor loadings are then used to compute the monthly rolling window cross-sectional regressions on ten Cash OP equally weighted and value-weighted portfolios. Fama Mac Beth (1973) t- statistics are reported in parenthesis. Shanken (1992) statistics are also reported in the brackets which represent corrected standard errors to mitigate the error in variables bias. ***, ** and * indicate the significance level at 1%, 5%, and 10% respectively. The last two columns report the average R2 and adjusted R2 of the second-stage regression models.

Source: own calculations.

Table 12 reports the cross-sectional analysis for the OP sorted portfolios. Panel A and B report the equal and value-weighted portfolio coefficients respectively. Table 12 also reports somewhat similar results as reported for the accrual and Cash OP portfolios. We again could not find the positive market beta relationship with portfolio returns as implied by CAPM theory although all the market beta coefficients are insignificant. Further, none of the factors in the models used explain the variation in the OP portfolio returns. The increasing value of R squared and the adjusted R square by adding additional risk factors indicate that the FF5 model represents a better model among the three asset pricing models. We can infer from the above results that none of the models could explain cross-sectional premiums on the portfolios constructed by operating profits.

Table 12. Cross-sectional asset pricing tests for operating profit portfolios

Panel A: Equally-weighted accrual portfolios								
	λ_0	λ_{MKT}	λ_{SMB}	λ_{HML}	λ_{CMA}	λ_{RMW}	R^2	$Adj\ R^2$
CAPM	0.0131 (2.1753)*** [2.1674]***	-0.0062 (-0.3689) [-0.3677]	-	-	-	-	0.1389	0.0313
FF-3	0.0136 (1.9688)** [1.8546]*	-0.0064 (-0.4029) [-0.3828]	0.0108 -1.1373 [1.0775]	0.0126 -0.9093 [0.8608]	-	-	0.4067	0.11
FF-5	0.0101 -1.329 [1.0986]	-0.0295 (-1.6978)* [-1.4326]	0.0151 -1.4045 [1.1758]	0.0265 (1.7474)* [1.4616]	0.0083 -0.7004 [0.5870]	0.0032 -0.1811 [0.1510]	0.6307	0.169
Panel B: Value-weighted accrual portfolios								
	λ_0	λ_{MKT}	λ_{SMB}	λ_{HML}	λ_{CMA}	λ_{RMW}	R^2	$Adj\ R^2$
CAPM	0.0102 (1.6829)* [1.6002]	-0.0238 (-1.2980) [-1.2410]	-	-	-	-	0.1586	0.0534
FF-3	0.0128 (1.6963)* [1.5821]	-0.0205 (-0.9461) [-0.8871]	-0.006 (-0.3861) [-0.3610]	0.0027 -0.1673 [0.1567]	-	-	0.3978	0.0967
FF-5	0.0029 -0.2833 [0.2499]	-0.0208 (-0.7007) [-0.6209]	-0.0053 (-0.2784) [-0.2462]	0.0161 -1.0701 [0.9516]	-0.0015 (-0.1081) [-0.0960]	0.0046 -0.3498 [0.3118]	0.6069	0.1154

Notes: Table 12 reports the average risk premium coefficients calculated in the second stage of Fama Mac Beth (1973) regression modelled in equation iv, v, and vi. The first stage estimates the time series risk premiums by CAPM, Fama French three, and five factors on the portfolio returns constructed by operating profits. These estimated factor loadings are then used to compute the monthly rolling window cross-sectional regressions on ten operating profitability equally weighted and value-weighted portfolios. Fama Mac Beth (1973) t- statistics are reported in parenthesis. Shanken (1992) statistics are also reported in the brackets which represent corrected standard errors to mitigate the error in variables bias. ***, ** and * indicate the significance level at 1%, 5% and 10% respectively. The last two columns report the average R2 and adjusted R2 of the second-stage regression models.

Source: own calculations.

Conclusions

The predictive ability of the profit measures have been widely evaluated in the asset pricing models; however, very scarce studies are available which discuss the anomalies arising out of cash and non-cash based accounting information. We report the impact of cash and non-cash components of earnings as an additional risk measure over and above the variables used in CAPM, FF 3, and 5-factor models risk factor for the asset pricing in PSX. Our results for accruals are in line consistent with the previous studies (e.g. Allen *et al*., 2013; Ball *et al*., 2016; Collin *et al*., 2003; Lev, Nissim, 2006; Richardson *et al*., 2005; Sloan, 1996, Xie, 2001) suggesting the negative correlation between the accruals and the predicted stock returns based on the single sorted portfolios. However, the results reverse when the portfolios are constructed after controlling for size. The hedge portfolios constructed by accruals earn a statistically significant positive return, however, when controlled for size, the annualised alphas reverse. We can infer that the small firms despite having low accruals have other unfavourable characteristics due to which these firms are not able to outperform high accrual firms. The hedge portfolios constructed by cash OP after controlling for size earn negative alphas for the three asset pricing models in the small firms, however, these results reverse in the big sized firms. We can also see a similar pattern in OP. All these findings indicate to the point made earlier that the small firms despite having favourable accounting information in terms of profitability are not able to out-perform because of possessing other unfavourable characteristics. In summary, accruals, OP, and Cash OP offer a successful investment strategy for big sized firms only. Investors can earn abnormal returns by longing portfolios with the high OP, Cash OP, and low accruals and shorting the low OP, Cash OP, and high accruals but this strategy is not successful in small-sized firm because of their idiosyncratic unfavourable characteristics.

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INVESTAVIMO STRATEGIJŲ NUSTATYMAS PASITELKIANT AKCIJŲ RINKOS APSKAITOS INFORMACIJĄ

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SANTRAUKA

Mokslininkai yra plačiai aptarę įvairias pelningumo priemones kaip pagrindinę saugumo analizės, obligacijų vertinimo ir kitas kredito bei investicijų analizės finansų rinkose vertinimo priemones (Ahmed *et al.*, 2018; Belas *et al.*, 2019; Dvorsky *et al.*, 2019; Wang, Zhang, 2019; Macerinskiene, Survilaite, 2019). Nuo prognozuojamos uždarbio priemonės kompetencijos skiriasi kaupimo anomalija. Remiantis ja, sukauptos sumos būtų neigiamai koreliuojamos su atsargų grąža dėl jų mažo įmonės pajamų stabilumo (Sloan, 1996; Ball *et al.*, 2016; Kazemilari ir kt., 2018). Taigi, straipsnyje pateikta atvejo analizė ir įvertinta, ar investavimo strategijos, taip pat grynųjų pinigų veiklos pelnas (angl. *cash OP*), veiklos pelnas (angl. *OP*) ir sukauptos sumos yra susijusios Pakistano vertybinių popierių biržoje (angl. *PSX*). Pastebėta, kad sukauptos sumos neigiamai veikia atsargų grąžą, tačiau mažos įmonės, nepaisant mažų sukauptų sumų, negali konkuruoti su dideles sumas sukaupusiomis įmonėmis. Apsaugos rinkiniai yra sudaromi iš grynųjų pinigų veiklos pelno, atlikus dydžio kontrolę, kai trijų mažų įmonių turto kainų modelių alfos yra neigiamos. Tačiau šie rezultatai yra kitokie nei didelių įmonių. Be to, akcentuotinas panašus veiklos pelningumo modelis. Taigi galima daryti išvadą, kad sukauptos sumos, veiklos pelnas ir grynųjų pinigų veiklos pelnas sudaro sėkmingą investavimo strategiją tik didelės apimties įmonėms.

REIKŠMINIAI ŽODŽIAI: grynaisiais pinigais pagrįstas veiklos pelningumas, veiklos pelnas, sukauptos sumos, atsargų grąža, turto kainodara.

Appendixes

Appendix 1. Computation of operating profitability, cash-based operating profitability, and accruals

This section defines the computations of the variables used in the research. The three variables namely accruals, operating profitability, and the cash component of operating profits are all deflated by the book value of the assets in a lagged year that is year t-1.

OPERATING PROFITABILITY

We follow Ball *et al*. (2015) to define the operating profitability:

CASH-BASED OPERATING PROFITABILITY

To convert the operating profitability into its cash-based measure we follow Ball *et al*. (2016), where the accrual items from the balance sheet that are associated with arriving at operating income in the income statement are added or subtracted. We arrive at the cash component of operating profitability as follows:

Where in AR is the change in Accounts receivable, in Inv represents changes in Inventory, in prepaid exp is the changes in Prepaid expenses, in Def Rev represents changes in deferred revenue, in AP is the change in Trade accounts payable and in Acc Exp shows the changes in Accrued expenses. All computations are made on yearly basis.

ACCRUALS

For the computation of accruals, we follow Sloan (1996) and define accruals as:

Table 1A. The definitions of variables with the mnemonics are summarised

Thomson Reuters (Data Stream) Mnemonics	Variables	Definition according to Thomson Reuters
WC01250	Operating profit	It represents the revenue net of all operating expenses.
WC04825	Change in accounts receivable	It represents the increase or decrease in receivable during one fiscal year extracted from the cash flow statements.
WC18196	Change in inventory	It represents the difference of inventories at the beginning and ending which is expensed to the cost of sales.
WC02140	Prepaid expenses	This represents payments already made for the goods or services which will be received in the current year of operations.
WC03262	Deferred revenue	This represents the revenue received but not yet earned during the normal operating cycle.
WC03040	Trade accounts payable	It represents the payment owed to the creditors for the goods delivered during the operating cycle.
WC03069	Accrued expenses	It represents all expenses payable other than accrued payroll, accrued interest, dividends, and income taxes payable.
WC02652	Other assets	It represents all assets except current assets, long-term receivables, investments and property, and plant.
WC03273	Other liabilities	It represents the liabilities other than the short term liabilities, long term debt, deferred taxes, and provision for contingencies.
WC03063	Accrued income taxes	It represents the income tax payable within the operating year.

Source: Thomson Reuters (Data Stream.

Appendix 2. Construction of Mimicking Portfolios for SMB, HML, RMW and CMA Factors

To construct the portfolios for Fama-French three factor model, we followed mimicking portfolio construction used by Fama and French (1993). The size factor data was divided into two sub-groups, small (S) and big (B) market capitalisation firms, by using median as a breakup point and book-to-market equity factor data was divided into three sub-groups, high (H), neutral (N), and low (L) book-to-market equity firms, by using 30th and 70th percentiles as breakup points. The portfolios were made on 2x3 sort; where the *SMB* factor is a simple average of returns on small market capitalisation portfolios minus big market capitalisation portfolios and the *HML* factor is a simple average of returns on high book-to-market equity portfolios minus low book-to-market equity portfolios. On the basis of 2x3 sort of *SMB* and *HML* factors the six portfolios were formed, are as under:

SH = *Portfolio of small market capitalisation firms and high book-to-market equity ratio firms.*
SN = *Portfolio of small market capitalisation firms and neutral book-to-market equity ratio firms.*
SL = *Portfolio of small market capitalisation firms and low book-to-market equity ratio firms.*
BH = *Portfolio of big market capitalisation firms and high book-to-market equity ratio firms.*
BN =*Portfolio of big market capitalisation firms and neutral book-to-market equity ratio firms.*
BL =*Portfolio of big market capitalisation firms and low book-to-market equity ratio firms.*

The construction of portfolios for the Fama-French five-factor model, the study used 2x3 sort, used by Fama and French (2015). The size factor and book-to-market factor data were divided into 2 and 3 categories similarly to the three-factor model. The profitability factor data was divided into three sub-groups, robust (R), neutral (N), and weak (W) operating profitability firms, by using 30th and 70th percentiles as breakup points. Moreover, the investment factor data was also divided into three sub-groups, conservative (C), neutral (N), and aggressive (A), same as the previous factors by using 30th and 70th percentiles as breakup points. Here, the construction of the size factor is different from the three-factor asset pricing model. The size factor (*SMB*) was constructed by subtracting nine portfolios of big stocks from nine portfolios of small stock. On the basis of 2x3 sort, the study formed eighteen portfolios, are as under:

SH = *Portfolio of small market capitalisation firms and high book-to-market equity ratio firms.*
SN = *Portfolio of small market capitalisation firms and neutral book-to-market equity ratio firms.*
SL = *Portfolio of small market capitalisation firms and low book-to-market equity ratio firms.*
BH = *Portfolio of big market capitalisation firms and high book-to-market equity ratio firms.*
BN =*Portfolio of big market capitalisation firms and neutral book-to-market equity ratio firms.*
BL =*Portfolio of big market capitalisation firms and low book-to-market equity ratio firms.*
SR = *Portfolio of small market capitalisation firms and robust profitability firms.*
SN = *Portfolio of small market capitalisation firms and neutral profitability firms.*
SW = *Portfolio of small market capitalisation firms and weak profitability firms.*
BR = *Portfolio of big market capitalisation firms and robust profitability firms.*
BN = *Portfolio of big market capitalisation firms and neutral profitability firms.*
BW = *Portfolio of big market capitalisation firms and weak profitability firms.*
SC = *Portfolio of small market capitalisation firms and conservative investment firms.*
SN = *Portfolio of small market capitalisation firms and neutral investment firms.*
SA = *Portfolio of small market capitalisation firms and aggressive investment firms.*
BC = *Portfolio of big market capitalisation firms and conservative investment firms.*
BN = *Portfolio of big market capitalisation firms and neutral investment firms.*
BA = *Portfolio of big market capitalisation firms and aggressive investment firms*

Construction of Size, Book to Market Value, Profitability and Investment factors are explained as follows.

1 - Size Factor (SMB)

For the three-factor asset pricing model, the study follows Fama-French (1993) mimicking portfolio construction and for a five-factor model, we use 2x3 sort of portfolios constructed by Fama and French (2015). The construction of the *SMB* factor for three-factor asset pricing model is given in the equation as follow:

$$SMB_{i,t} = \frac{(SL+SN+SH)-(BL+BN+SH)}{3}$$

And, the construction of *SMB* factor for five-factor asset pricing model is given in equation as follows:

$$SMB_{(HML)} = \frac{(SL+SN+SH)-(BL+BN+SH)}{3} = \frac{(SL-BL)+(SN-BN)+(SH-BH)}{3}$$

$$SMB_{(RMW)} = \frac{(SR+SN+SW)-(BR+BN+SW)}{3} = \frac{(SR-BR)+(SN-BN)+(SW-BW)}{3}$$

$$SMB_{(CMA)} = \frac{(SC+SN+SA)-(BC+BN+SA)}{3} = \frac{(SC-BC)+(SN-BN)+(SA-BA)}{3}$$

$$SMB_{i,t} = \frac{SMB_{(HML)}+SMB_{(RMW)}+SMB_{(CMA)}}{3}$$

First, for the five-factor asset pricing model, the study has to construct three size factors by taking weighted averages on the basis of book-to-market, profitability and investment factors than construct the final size factor for the model by taking an average of all sub-factors, see Fama and French (2015).

2 - Book to Market Value Factor (HML)

For both three-factor and five-factor model the construction of *HML* factor is the same which is as follows:

$$HML_{i,t} = \frac{(SH+BH)-(SL+BL)}{2}$$

3 - Profitability Factor (RMW)

For construction of portfolios for profitability, the study used 2x3 sort also used by Fama and French (2015). The construction formula is given as follows:

$$RMW_{i,t} = \frac{(SR+BR)-(SW+BW)}{2}$$

4 - Investment Factor (CMA)

The construction of the investment factor is given as follows:

$$CMA_{i,t} = \frac{(SC+BC)-(SA+BA)}{2}$$

Appendix 3. Constructing Alphas for the Portfolios

To estimate the Alpha's of the portfolios the following equation is used:

$$R_i, = \alpha_i + \beta_i F + \varepsilon_{i,t} (t = 1...T, i = 1...N)$$

Where:
R = Excess return on portfolio i in time period t
N = Number of portfolio
T = Time period
F = K * 1 vector of excess return factor portfolio
B = Vector of beta's

This equation assumes that the excess returns of the portfolio are linearly related to its beta's. For the sake of simplicity, the above-mentioned equation is restated as follows:

$$R_{tx} = \alpha_i + \beta_i(f_t) + \varepsilon(t)$$

Where, E(εt) = 0 and Cov ($f\ t, \varepsilon t$) = 0 t = 1……T

Where $Rtx = \begin{bmatrix} R_1 \\ . \\ . \\ R_{10} \end{bmatrix}$ is a 10 × 1 vector containing excess return of the ten deciles portfolios, $\alpha = \begin{bmatrix} \alpha_1 \\ . \\ . \\ \alpha_{10} \end{bmatrix}$ is a 10 × 1 vector containing the intercept of the model and $\beta = \begin{bmatrix} \beta_1 \\ . \\ . \\ \beta_{10} \end{bmatrix}$ is the 10 × 1 vector which measures the sensitiveness of the portfolios to the market portfolio. F is the excess market return and $\varepsilon(t) = \begin{bmatrix} \varepsilon_1 \\ . \\ . \\ \varepsilon_{10} \end{bmatrix}$ is the error matrix. Thus, the equation can be written as follows:

$$Rtx = \begin{bmatrix} R_1 \\ . \\ . \\ R_{10} \end{bmatrix} + \begin{bmatrix} \alpha_1 \\ . \\ . \\ \alpha_{10} \end{bmatrix} + \begin{bmatrix} \beta_1 \\ . \\ . \\ \beta_{10} \end{bmatrix} * [F] + \begin{bmatrix} \varepsilon_1 \\ . \\ . \\ \varepsilon_{10} \end{bmatrix}$$

Where, E(εt) = 0 and Cov ($f\ t, \varepsilon t$) = 0

Replacing α and β with θ the above-mentioned GMM equation will be transformed into the following quadratic equation:

$$g(\theta)^T W_g(\theta), \text{where......g}(\theta) = (\frac{1}{T})\sum_{t=1}^{T} Z_t(\theta)$$

The GMM moment's conditions are defined at the true values of α and β as,

$$Z_t(\theta) = \begin{bmatrix} (R_{tx} - \alpha - \beta_{ft}) \\ (R_{tx} - \alpha - \beta_{ft}) \otimes [f_t] \end{bmatrix}$$