QUALITY INVESTING IN CEE EMERGING MARKETS

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Abstract. Using sorting, cross-sectional tests, regression, and tests of a monotonic relation, the study examines the return patterns related to seven distinct quality characteristics: accruals, bid-ask spread, balance sheet liquidity, profitability, leverage, payout ratio and turnover. The investigation of more than 1.300 stocks from 11 Central and Eastern European countries for the period 2002–2014 documents a strong gross-profitability premium and an inverted liquidity premium. Profitable and not heavily leveraged companies provide a partial hedge against market distress. Finally, the paper proposes quality spreads as a forecasting tool and shows that they have predictive abilities over quality premiums related to leverage, profitability and bid-ask spread.

Keywords: cross-section of stock returns, quality investing, CEE stock market, Central and Eastern Europe, gross profitability premium, liquidity premium, leverage, bid-ask spread, accruals.

JEL Classification: G11, G12, G14, G15.

1. Introduction

Are good companies also good investments? This question is probably one of the most fundamental puzzles in the whole theory of investing. The concept of quality investing is not a new idea for the investment community. Stock market participants have been always seeking for liquid companies in decent financial shape and with promising growth perspectives. However, contrary to value, size or momentum, the "quality" characteristic had to wait until the last few years to be introduced into asset pricing studies.

What exactly is the "quality" in terms of stock market companies? The definitions set out in the literature vary. Investors can take into account credit ratings, corporate governance, ethical issues or general financial strength (Damodaran 2004). An interesting intellectual exercise related to this issue is performed by Asness *et al*.

(2014) who deconstructed the classical Gordon's growth model which can be simply rewritten as:

$$\frac{P}{B} = \frac{E/P \times D/E}{r - g},$$ (1)

where E are earnings, B is book value, D is dividend, P is price, r is the required rate of return and g is growth. This equation could be interpreted in the following way (Daniel, Titman 2013):

$$Value = \frac{Profitability \times Payout}{(-Safety) - Growth}.$$ (2)

In other words, the concept of quality can be divided into four grand areas (Asness *et al.* 2014):
1. Profitability which can be measured, for example, with gross profits, margins, earnings, accruals and cash flows, etc.
2. Payout, which is the fraction of profits distributed to shareholders. The high payout ratios are sometimes positively regarded because they diminish agency problems as cash holdings are reduced with dividends and share repurchases (Jensen 1986).
3. Growth which expresses company's perspectives and is usually measured as a change in some vital fundamental variables, like profits or margins.
4. Safety which can be related to a wide range of market-based (e.g. turnover, bid-ask spread, idiosyncratic volatility, beta) or fundamental (e.g. leverage, balance sheet liquidity) variables.

It seems rational to assume that, holding all else equal, investors should be willing to pay higher prices for the companies with higher quality characteristics and the higher prices should imply lower expected returns. To put it simply, the higher is the quality, the lower are the returns. In his paper of 1994 Michael Clayman revises the performance of excellent and "unexcellent" companies. He uses the criteria described in a popular book by Tom Peters (1988). He finds that unexcellent companies, which are in much worse shape measured, for example, by ROA, ROE, or profit margin, perform significantly better when. Cooper *et al*. (2008) provide evidence that rapid asset growth predicts poor performance. Damodaran (2004) notices that stocks with lower credit ratings usually yield higher returns. Plenty of studies confirm the negative relation between stock liquidity and expected returns (Liu 2006; Korajczyk, Sadka 2008; Amihud 2002). Finally, there is quite a lot of literature, dating back to Bhandari (1988), which documents the positive relation between indebtedness and market returns.

However, a considerable scope of recent literature shows that the quality is not fully priced. In other words, the quality stocks historically delivered positive and statistically significant risk-adjusted returns due to the limited pricing. This unintuitive phenomenon was recently confirmed by many studies and referred to many ways of understand-

ing the quality. Altman (1968), Ohlson (1980), and Campbell *et al.* (2008) show the underperformance of firms with high-credit. George and Hwang (2010), and Penman *et al.* (2007) find evidence that companies with low leverage deliver high risk-adjusted returns. Hahn and Lee (2009) confirm these results by investigating the impact of debt capacity. Mohanram (2005) finds that growing firms perform better than companies with poor growth. A large number of studies document that firms with low accruals have higher risk-adjusted returns than firms with high accruals (Sloan 1996; Richardson *et al.* 2005). Finally, Palazzo (2012) finds that the higher are the balance sheet cash levels, the better is the performance.

Nevertheless, probably the most prominent quality characteristic recently studied is the profitability. Haugen and Baker (1996), Griffin and Lemon (2002), and Fama and French (2006, 2008, 2014) find that companies' profitability is positively correlated with future returns. Chen *et al.* (2011) form portfolios based on past ROA (return on assets) and observe that high ROA companies perform substantially better than other firms. They not only find significant risk-adjusted alpha to the most profitable companies, but also discover that the "ROA factor" might explain a bunch of other market asset-pricing anomalies. Another step further is made by Novy-Marx (2013), who concentrates on the gross margin ratio (gross profitability). He finds that this factor is so powerful that it might explain almost all existing asset-pricing anomalies.

The profitability of the "quality strategy" is also confirmed on the country-level instead of stock-level. Zaremba (2014a) finds that stock markets have quality too and that the more profitable and less indebted stock market is as a whole, the better it performs.

An interesting synthesis of the studies pictured above is performed by Asness *et al.* (2014) who integrates a wide array of quality characteristics into a single indicator. The authors show that the strategy of taking long positions in high quality companies and shorting the low quality stocks significantly outperform the market.

Although the quality factor is heavily explored in the recent financial literature, it is still not clear why it actually works. Fama and French (2013) and Cohen *et al.* (2002) provide the decomposition of a book to market ratio (B/M) which indicates that if two companies have equal B/M and expected book value growth rates, the company with a higher expected ROE must also have a higher expected return. Wang and Yu (2013) link the profitability premium with option theories. They suggest that the low-profitability companies are actually less-risky, because they can abandon their projects. Consequently, as they are less risky, the returns are also lower. Finally, there are some explanations that are related to theories from the field of behavioural finance. Cohen *et al.* (2002) theorize that the quality premium may stem from investors' underreacting to changes in expected ROEs and the reason why they underreact might be some institutional constraints.

This paper aims to contribute to the existing literature in three ways. First, it provides fresh out of sample evidence on the quality premium. This study is the first which

focus on the role of quality in CEE stock markets and one of the first studies which investigate emerging markets in general. Research was carried out on seven distinct quality characteristics: accruals, bid-ask spread, cash-to-assets ratio, profitability, leverage, payout, and turnover ratio. Sizeable positive risk-adjusted returns to a gross-profitability strategy were documented. Furthermore, contrary to observations of Amihud and Mendelson (1986), or Amihud (2002), it was found that the liquidity is positively related to stock returns. The better the stock liquidity and the tighter the bid-ask spreads are, the higher are the alphas.

Second, it was examined whether investors following the quality-driven strategies could benefit from a "flight to quality" in times of market distress. It seems that the profitable and not heavily leveraged companies provide a partial hedge against such distress. On the contrary, the factors related to bid-ask spread, turnover ratio, and cash-to-assets ratio are rather procyclical, so they appear to be a perverse hedge against variations in risk indicators.

Finally, the foreseeability of the quality premiums was investigated. The concept of quality spreads which are similar in construction to the value spread proposed by Cohen *et al*. (2003) and investigated further by Liu and Zhang (2006), and Michou (2009) was introduced. It was proved that the size of the quality spread is positively related to the future returns of portfolios from sorts on cash-to-asset ratio, profitability and bid-ask spreads, but the R^2 was rather low.

The findings in this paper have implications for three distinct areas. First, they might be important to international investors who pursue factor strategies with regional focus, both in terms of strategic and tactical asset allocation. Second, the quality-related asset pricing factors might be implemented in testing portfolio performance. Third, it seems reasonable to consider the quality factor as the component of the cost of capital for corporate investment and budgeting decisions.

The rest of the paper is organized as follows. Section 2 describes the data and research methods used. The findings are presented in Section 4 and the last section brings the conclusions.

2. Research methods and data sources

The paper examines three hypothesis. First, it was tested whether the quality is a valid determinant of cross-sectional variation in CEE emerging markets stock returns. The focus was placed on seven distinct quality indicators: accruals, bid-ask spread, cash-to-assets ratio, profitability, leverage, payout, and turnover ratio. Precise definitions of quality characteristics are described in the Appendix. Second, it was investigated whether investors exhibit "flight to quality" in the sense that the quality stocks perform well in times of market distress. Finally, it was researched whether it is possible to forecast the returns to quality on the basis of "quality" spread, which I defined as the dispersion of quality

between top and bottom quality stocks. Thus, I built value-weighted portfolios from sorts of stocks' characteristics and evaluated their performance with multifactor asset pricing models. Additionally, I also built ad-hoc asset pricing factors related to quality characteristics and regressed their returns and intercepts from asset-pricing models of quality spreads and market distress proxies.

2.1. Playing field

This research was based on international stock returns and accounting data obtained from Bloomberg. Both listed and delisted companies were considered in order to avoid any form of survivorship bias. Also monthly time-series were implemented as they provide the sufficient number of observations (147) to ensure the power of conducted tests and allow the avoidance of excessive exposure to micro-structure issues (De Moor, Sercu 2013a). I analyzed returns adjusted for corporate actions (splits, reverse splits, issuance rights etc.) and cash distributions to investors (dividends). The sample period runs from April 2002 to June 2014. The late start date in April 2002 was chosen in order to avoid a small sample bias and cover a broad range of companies. The initial sample includes 1307 stocks from 11 Central and Eastern European countries. However, in line with other studies on asset pricing, I screened the data with two crucial filters. First, I winsorised the return data by discarding stocks which delivered 2.5% of the highest single-month returns and 2.5% of the most extreme negative returns (both groups overlap to some extent). This method, aimed at eliminating miscalculated returns from a database, is employed for example by Rouwenhorst (1999), or Chui *et al*. (2010). Second, in order to screen out any invalid data, I removed the stocks top percentile and the bottom percentile of stock with extreme quality characteristics. The elimination of observations with suspiciously extreme values is an approach taken for instance by Lewellen (2011) or Novy-Marx (2013). The initial sample consists of companies from Bulgaria (128), Croatia (153), Czech Republic (14), Estonia (16), Hungary (39), Latvia (24), Lithuania (28), Poland (648), Romania (188), Slovakia (25), and Slovenia (44). The precise definition of CEE countries may vary, so I followed the OECD glossary[1]. A company is included in the sample in month t as it is when it is possible to compute its size at the end of month $t–1$, return in month t, and an appropriate quality indicator at the end of month. The exact sample size varies slightly for the different quality indicators and its time-series average equals 526 for accruals, 695 for bid-ask spread, 694 for cash-to-assets ratio, 385 for profitability, 692 for leverage, 765 for payout and 765 for turnover. My initial computations and market data are collected in local currencies, however, I agree with Liew and Vassalou (2000), and Bali *et al*. (2013), that comparisons using different currency units could be misleading. This is especially true in the CEE developing countries, where inflation and risk-free rates are sometimes very high and differ significantly across markets. Therefore, I follow the approach of Liu *et al*. (2011), Bekaert *et al*. (2007), or Brown *et al*. (2008), and denominate all data

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[1] http://stats.oecd.org/glossary/detail.asp?ID=303 (accessed 25 August 2014).

in euro to obtain polled international results. In order to be consistent with the euro approach, excess returns are computed over the one month Euribor rate in this study.

2.2. Quality portfolios and asset pricing models

In this paper the performance of portfolios of various quality was investigate. Thus, in each month $t–1$, I ranked all stocks against their quality indicators (accruals, bid-ask spread, cash-to-assets ratio, profitability, leverage, payout, turnover). Next, five subgroups were formed. For each indicator I defined the 20th, 40th, 60th and 80th percentiles as breakpoints and, thus, obtained five subgroups. Finally, I value-weighted the stocks in the respective groups to obtain portfolios.

I tested the abnormal returns of the formed portfolios against the four-factor model originally introduced by Carhart (1997), of which corresponding regression equation is:

$$R_{i,t} = \alpha_i + R_{f,t} + \beta_{rm,i}\left(R_{m,t} - R_{f,t}\right) + \beta_{SMB,i} \cdot SBM_t + \beta_{HML,i} \cdot HML_t + \beta_{WML,i} \cdot WML_t + \varepsilon_{i,t},$$
(3)

where $R_{i,t}$, $R_{m,t}$ and $R_{f,t}$ are returns on the analyzed asset i, market portfolio and risk-free returns at time t. $\beta_{rm,i}$, $\beta_{SMB,i}$, $\beta_{HML,i}$, $\beta_{WML,i}$, and α_i ere the estimated parameters of the model. $\beta_{rm,i}$ is analogous to the CAPM beta (Sharpe 1964; Lintner 1965; Mossin 1966), but it is not equal to it. $\beta_{SMB,i}$, $\beta_{HML,i}$, $\beta_{WML,i}$ are exposed to SMB_t (small minus big) and HML_t (high minus low), and WML_t risk factors, which denote returns from zero-cost arbitrage portfolios. SMB_t is the difference in returns on diversified portfolios of small and large caps at time t, while HML_t is in general difference in returns on portfolios of stocks with diversified value (high B/V) and growth (low B/V). The WML_t (winners minus losers) denotes the difference between returns on diversified winner and loser portfolios over the previous year. In other words, SMB, HML, and WML are returns on zero-cost long/short portfolios formed based on size, value, and momentum characteristics. The validity of the model for the CEE market w tested by Zaremba (2014b). Also the input data on factors for current and future models come from Adam Zaremba's website.

Finally, in order to test whether the intercepts are statistically different from zero in a group of portfolios, I evaluated them with the popular GRS test statistic suggested by Gibbons *et al*. (1989). The test statistic is defined as:

$$GRS = \left(\frac{T}{N}\right)\left(\frac{T-N-L}{T-L-1}\right)\hat{\alpha}'\hat{\Sigma}^{-1}\hat{\alpha}\left[1 + E_T\left(f\right)'\hat{\Omega}^{-1}E_T\left(f\right)\right]^{-1} \sim F_{N,T-N-K},$$
(4)

where T is the length of the time-series (sample size), N is the number of portfolios to be explained in the examined group and L denotes the number of explanatory factors. $E_T\left(f\right)$ is the vector of expected returns to asset pricing factors, $\hat{\Omega}$ is the covariance matrix of the asset pricing factors, $\hat{\alpha}$ is the vector of regression intercepts and $\hat{\Sigma}$ is a residual covariance matrix in the sample. The test's critical values are obtained from Fisher's distribution with N and T-N-L degrees of freedom.

I performed the battery of robustness checks. First, some studies suggest that various market anomalies may be influenced by the January effect which is defined as the tendency of stocks to perform better in January than in the remaining months of the year. The issue is investigated for example by Horowitz *et al*. (2000) for size, Davis (1994) for value, Loughran (1997) for both or Yao (2012) for momentum effect. In order to test this seasonality I filtered out observations corresponding to Januaries and repeated the analysis without them. Second, analogously to numerous studies on asset pricing, I also computed the equally-weighted portfolios. I did not continue with analysis as this weighting scheme may distort the results (Fama, French 1998, Lewellen 2011) and results of implicit returns on rebalancing (Willenbrock 2011). Third, I also tested whether the results hold not only for EUR, but for USD and JPY as well. I detected no significant differences.

Additionally, following the approach of Waszczuk (2013), I carried out a monotonic relation (MR) test introduced by Patton and Timmermann (2010). The test, which should be regarded as supplementary to my basic research, investigates the complete cross-sectional pattern of excess returns and examines whether they are systematically increasing along with changes in the quality characteristics[2]. The MR test uses a bootstrap approach in which the monthly excess returns are randomly drawn with replacements from the original time-series sample. I performed 30,000 random draws, eectively generating 30,000 time-series of excess returns for each of the investigated portfolios. Next, one should calculate the mean excess returns for each drawn time-series of returns and demean them by subtracting the original portfolios' time-series averages. Finally, the null hypothesis was examined and proved that there is flat pattern across the quality-sorted portfolios (no cross-sectional differences) against the alternative hypothesis that there is an increasing monotonicity related to the dividend yields. In order to do this, one should compute the return differences between adjacent portfolios: $\Delta_i = r_{t,i} - r_{t,i-1}$. The basic hypothesis is:

$$H_0 : \Delta = 0 \quad vs \quad H_1 : \min_{i=1,2...,n} \Delta_i > 0 \,. \tag{5}$$

The test statistic is given by:

$$J_T = \min_{i=1,2...,n} \Delta_i \,, \tag{6}$$

for the original sample. In order to obtain the p-value, it is sufficient to simply count the number of cases in which $J_T < J_T^b$, where J_T^b is computed analogously to J_T, but for the demeaned bootstrap draws, and then divided by the number of bootstraps (30.000). Finally, it is important to mention that, when using the MR test, I introduced a minor innovation. The test is usually performed for the raw returns. I performed it for intercepts, so I drew the factor returns along with portfolios' excess returns, and regressed the portfolio against the factors in order to obtain intercepts. Lastly, before examining

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[2] The precise testing procedure is described in a paper by Patton and Timmerman (2010).

the null hypothesis, I subtracted the intercepts from the initial samples. The rest of the procedure was identical with the standard MR test.

In the end, I was also interested in examining whether there are any interactions between the quality and market capitalization of investigated companies. To this end, I formed double-sorted portfolios from stocks sorted on the quality characteristics and size. The computation procedure was consistent with similar studies of asset pricing (Fama, French 2012). At the end of each month *t–1*, all stocks were sorted against size and quality. I defined the 20th, 40th, 60th and 80th percentiles as the size breakpoints. The five quality breakpoints were defined in the same way as for the single-sorted portfolios. The intersection of the independent 5×5 size sorts and quality produced 25 portfolios. Finally, I value-weighted the sorts to obtain portfolios which were evaluated in a similar fashion to single sorted portfolios.

An established observation in the financial literature is that results of cross-sectional asset pricing tests could be seriously impacted and distorted by anomalous behavior of tiny stocks (Fama, French 2008; De Moor, Sercu 2013b; Waszczuk 2013). This is especially true when it comes to the CEE market which is heavily populated with micro-caps. Zaremba (2014b) notices that in June 2014 the capitalization of over 50% of stock companies in CEE countries was 10 million euro or less and for almost 20% it was even smaller than 2 million euro. I tried to address this problem in two ways. First, besides the 5×5 double sorts on value, size and momentum, I additionally tested the 4×5 sort. The 5×5 results included all five size quintiles, while the 4×5 results excluded micro-cap portfolios (the quintiles of the smallest stocks). Second, following the suggestions of De Moor, Sercu (2013a), I used the cross-sectional model which accounted for the risk of micro-cap companies. Specifically, I implemented the model proposed by Zaremba (2014b), which replaces the small-minus-big (SMB) factor in the Carhart four-factor model (1997) with the micro-minus-rest factor (MMR). The MMR factor returns are returns on a zero-cost portfolio which is long in the quintile of the smallest stocks and short in the equal-average of the remaining quintile portfolios. In other words, the additional model had the following form:

$$R_{i,t} = \alpha_i + R_{f,t} + \beta_{rm,i}\left(R_{m,t} - R_{f,t}\right) + \beta_{MMR,i} \cdot MMR_t + \beta_{HML,i} \cdot HML_t + \beta_{WML,i} \cdot WML_t + \varepsilon_{i,t}.$$

(7)

All regression models discussed in this paper are estimated using OLS and tested in a parametric way.

2.3. Performance under market distress

In order to test the performance of quality stocks during market distress and the predictive abilities of the quality spread, I formed ad-hoc asset pricing factors in the first place. Their computation procedure was consistent with similar studies of asset pricing (e.g. Fama, French 1993; Asness, Frazzini 2013). The explanatory factor returns were

constructed from 2×3 sorts on size and quality At the end of each month *t*, all the stocks were sorted on size and quality. Big stocks and small stocks were defined as those with the market value above and below median in a given month *t*, correspondingly. The quality breakpoints in the 2×3 sorts were the 30th and 70th percentiles of the given quality characteristics for all the stocks at time *t*. The intersection of the independent 2×3 sorts on size and quality produced six portfolios, SJ, SN, SQ, BJ, BN, and BQ, where S and B indicated small or big and J, N, and Q indicated junk, neutral, and quality[3] stocks (bottom 30%, middle 40%, and top 30% of a given quality indicator), respectively. Next, the monthly value-weighted returns for all the 6 portfolios were computed. Finally, the given quality factor was the difference between the equal-weighted average of returns on the quality portfolios (BQ, SQ) and the equal-weighted average of returns on the junk portfolios (BJ, SJ).

In order to test the performance of quality stocks during market distress, I followed the approach of Asness *et al*. (2014) and ran a regression of four-factor model intercepts. However, contrary to Asness *et al*. (2014), I used five distinct distress indicators instead of the market risk only. The regression equation had the following form:

$$\ln\left(1+\alpha_{i,t}\right)=\beta_{0,i}+\beta_{1,i}\ln\left(\frac{x_{j,t}}{x_{j,t-1}}\right)+\varepsilon_{i,t} \,, \tag{8}$$

where $\alpha_{i,t}$ are *t*-month alphas from a four-factor asset pricing model described in the equation (3) of a zero-cost quality factor portfolio *i*, $\beta_{0,i}$ and $\beta_{1,i}$ are estimated model parameters, $\varepsilon_{i,t}$ is a zero mean disturbance term and $x_{j,t}$ is a value of a proxy of market distress (a crisis proxy) *j* in period *t*. To examine the resilience of the results, beside the Mkt-Rf returns, I used four different crisis proxies. To be consistent with the euro-convention, all the proxies were expressed in euros and referred to the Eurozone. As the representation of general financial market liquidity, I employed 3-month EUR TED spread, which is the difference between the 3-month Euribor rate and the yield on Eurozone benchmark 3-month treasury bills. The expected market volatility was represented by the Euro Stoxx 50 Volatility Index, a popular measure of the implied volatility of index options. BBB spreads of Eurozone 10-year corporate bonds over 10-year benchmark treasury bonds were proxies for the credit risk. Finally, the term-spread risk was the difference between yields of 10- and 2-year benchmark Eurozone treasury bonds[4].

2.4. Predictions with quality spreads

Finally, I tested the predictive properties of quality spreads. I followed the methods of studies on value spread-based forecasting (e.g. Liu, Zhang 2006) and used the regression equation proposed by Fama and French (1989):

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[3] I follow the names by Asness *et al.* (2014).

[4] For the credit, liquidity, term, and volatility risk, I use a following functional form of the equation (8): $\ln\left(1+\alpha_{i,t}\right)=\beta_{0,i}+\beta_{1,i}\ln\left(1+x_{j,t}-x_{j,t-1}\right)+\varepsilon_{i,t}$. The difference stems from the nature of distress proxies.

$$r_{t+\tau} = \alpha_\tau + \beta_\tau S_{t-1} + \varepsilon_{t+\tau}, \tag{9}$$

where S_t is one of the spreads at the end of month t-1, $r_{t+\tau}$ is the return on a given quality factor from t to $t+\tau$, and τ denotes different horizons including one-month and one-quarter holding period. In order to compute the quality spread, I employed the standard approach of construction of value spreads (Cohen *et al.* 2003; Liu, Zhang 2006; Michou 2009). I defined the quality stocks as companies with the quality characteristic above the 70th percentile and junk stocks as firms with the quality characteristic below the 30th percentile for the all the stocks at time *t*. Next, I computed value-weighted averages of the investigated characteristics within the quality and junk subsamples. Finally, I computed the quality spread defined as:

$$S_{i,t} = \ln\left(\overline{Q}_{Q,j,t}\right) - \ln\left(\overline{Q}_{J,j,t}\right), \tag{10}$$

where $S_{i,t}$ is the spread for a quality indicator *i*, and $\overline{Q}_{Q,j,t}$ and $\overline{Q}_{J,j,t}$ are the mean quality characteristics *i* for the quality and junk companies respectively.

3. Results and discussion

This section presents and discusses the performance of quality-sorted portfolios and reports their behaviour during market distress and predictive properties of the quality spread.

The Table 1 presents the basic statistics of monthly excess returns on portfolios from single-sorts on the quality indicators. Not all the cases confirm the patterns reported in the literature. Regarding the accruals anomaly, no specific relation between the accruals and the average returns was visible. The outcomes did not follow the results of Sloan (1996) or Richardson *et al.* (2005) from the developed markets, who show that low accruals coincide with high returns. When it comes to bid-ask spread, which basically is a typical proxy for liquidity or transaction cost, my results vividly contradicted the previous observations of Amihud and Mandelson (1986), or Ali *et al.* (2003). In my sample the greater and narrower was the bid-ask spread, the higher was the return, and the difference between the top and bottom portfolios equalled 1.55 percentage points on a monthly basis. These outcomes differed also from Lischewski and Voronkova (2012), Amihud *et al.* (2013), and Waszczuk (2013), who observe no significant return pattern related to liquidity in the individual stock markets from the CEE region which they studied. Furthermore, the least liquid stocks were also the smallest in terms of stock-market capitalization, so the negative illiquidity premium could be even bigger when corrected with the size effect. The reason of the discrepancies between this and earlier research may stem from different definitions of the bid-ask spread. This research, contrary to the previous studies, is based on bid and ask prices observable after an end of a trading session. It is possible, that this measure of spread is strongly influenced by some microstructural issues and this phenomenon should be a subject of further studies. Nonetheless, even if the outcomes of this study are not a result of pure illiquidity and transaction costs, they are still interesting as the spread in this paper seems to have some forecasting capabilities.

Table 1. Monthly excess returns on quintile portfolios sorted on quality indicators

	Bottom	2	3	4	Top	T-B
Accruals						
Mean	0.86	0.94	1.54	0.71	0.59	−0.27
Standard deviation	8.23	7.72	7.17	6.79	6.69	5.89
Sharpe ratio	0.10	0.12	0.22	0.10	0.09	−0.05
Mean market capitalization	145	315	386	550	300	
Bid-ask						
Mean	−0.56	0.67	0.49	0.75	0.99	1.55
Standard deviation	5.54	5.66	6.77	6.89	7.22	6.81
Sharpe ratio	−0.10	0.12	0.07	0.11	0.14	0.23
Mean market capitalization	27	98	186	296	737	
Cash-to-assets						
Mean	0.59	0.44	0.96	0.93	1.11	0.52
Standard deviation	6.27	6.36	7.28	6.91	7.21	5.43
Sharpe ratio	0.09	0.07	0.13	0.13	0.15	0.10
Mean market capitalization	76	252	480	445	251	
Profitability						
Mean	0.25	0.42	1.09	1.20	0.96	0.71
Standard deviation	8.30	8.09	7.53	7.32	5.90	6.19
Sharpe ratio	0.03	0.05	0.14	0.16	0.16	0.11
Mean market capitalization	105	229	514	254	180	
Leverage						
Mean	0.88	0.88	0.90	0.91	0.52	−0.36
Standard deviation	7.95	6.91	7.00	5.73	5.66	5.43
Sharpe ratio	0.11	0.13	0.13	0.16	0.09	−0.07
Mean market capitalization	560	241	327	252	121	
Payout						
Mean	0.87	1.00	1.71	1.07	1.24	0.37
Standard deviation	6.21	9.84	8.16	8.57	8.63	6.50
Sharpe ratio	0.14	0.10	0.21	0.12	0.14	0.06
Mean market capitalization	232	364	357	707	541	
Turnover						
Mean	0.47	0.77	0.52	0.90	1.08	0.61
Standard deviation	4.82	5.85	6.77	7.65	7.01	5.90
Sharpe ratio	0.10	0.13	0.08	0.12	0.15	0.10
Mean market capitalization	92	138	157	286	538	

"T-B" is the return on a portfolio invested long in top stocks and short in bottom stocks. Means and stand. dev. are expressed in %, capitalization is expressed in million euro.

In terms of the balance-sheet liquidity measured with the cash-to-assets ratio, my results showed slightly better returns for liquid companies. Thus, the observations were generally in line with the evidence of Palazzo (2012). Similarly, the gross-profitability ratio revealed similar pattern, as it is reported by Novy-Marx (2013) for the developed countries. Moreover, the companies with the high gross profit-to-assets ratio had not only higher returns, but also were characterized by lower risk measured with standard deviation. The stocks with higher payout ratio appear to deliver slightly higher returns than stocks with low payout. Finally, the behaviour of portfolios from sorts on turnover ratio follow the liquidity story revealed by the bid-ask spread, but with lower magnitude. Again, the higher is the trading volume in the last month, the higher are the excess returns, and again the less liquid are stocks are also the smallest ones.

When the four-factor model was applied (Table 2), not all the previous patterns turned out to be statistically significant. I observed no significant relation when it comes to accruals. Next, the variations of intercepts from the four-factor model of portfolios from sorts on bid-ask spread was even higher than in the case of raw excess returns. The bottom portfolio had alpha of –1.76%, and the top portfolio had alpha of 0.45%. The difference between the monthly intercepts of the portfolio of stocks with the narrowest and the widest was equal to 2.21 percentage points and the GRS test was rejected. The acid-test-based portfolios showed no significant return pattern. When it comes to the gross profitability ratio, the model rejected the zero hypothesis of no relation between the profitability and excess returns. The GRS test was rejected and the returns

Table 2. Monthly intercepts from the four-factor model to explain monthly excess returns on portfolios from quality indicators

	Bottom	2	3	4	Top	T-B	GRS	p-val.	MR
Accruals	0.49	0.07	0.39	–0.14	–0.28	–0.76	0.56	72.9	63.12
	(1.19)	*(0.22)*	*(1.22)*	*(–0.55)*	*(–0.86)*	*(–1.39)*			
Bid-ask spread	–1.76	–0.37	–0.81	–0.29	0.45	2.21	4.88	0.0	55.01
	(–4.09)	*(–1.03)*	*(–2.79)*	*(–1.42)*	*(2.88)*	*(4.63)*			
Cash-to-assets	–0.60	–0.25	0.37	0.18	–0.05	0.55	1.13	34.5	21.18
	(–1.56)	*(–1.01)*	*(1.60)*	*(0.89)*	*(–0.17)*	*(1.11)*			
Profitability	–0.57	–0.36	0.31	0.36	0.58	1.15	2.71	2.3	0.67
	(–1.38)	*(–1.14)*	*(1.25)*	*(1.02)*	*(1.80)*	*(2.11)*			
Leverage	0.44	–0.08	–0.10	0.15	–0.50	–0.94	2.23	5.5	82.28
	(2.19)	*(–0.32)*	*(–0.41)*	*(0.63)*	*(–1.61)*	*(–2.24)*			
Payout	0.05	–0.33	–0.46	–0.19	0.22	0.17	0.68	64.1	16.25
	(1.07)	*(–0.53)*	*(–0.86)*	*(–0.31)*	*(0.35)*	*(0.27)*			
Turnover	–0.68	–0.87	–0.36	0.39	0.26	0.94	2.27	5.1	10.74
	(–2.09)	*(–2.03)*	*(–1.22)*	*(1.49)*	*(1.52)*	*(2.40)*			

"T-B" is the return on a portfolio invested long in top stocks and short in bottom stocks. Intercepts and p-values are expressed in %. MR is the Monotonic Relation t-stat. Numbers in brackets denote statistical significance. GRS is the Gibbons, Ross and Shanken (1989) test statistic.

on zero-cost long/short portfolio were positive and significant. The alphas of leverage-sorted portfolios confirmed the pattern observed by Bhandari (1988). The performance of zero-cost portfolio and the GRS test confirmed that the less indebted firms had lower returns than the more leveraged companies. Furthermore, I detected no significant relation between the payout ratio and the intercepts. Finally, the performance of turnover sorted portfolios to a large extent followed the bid-ask spread pattern and the abnormal returns on zero-cost portfolio were positive and statistically significant.

Some interesting insight in the Table 2 was also provided by the outcomes of MR tests. It turned out that the profitability was the only case in which the zero hypothesis of no monotonic relation was rejected. In all other cases the distribution of intercepts was uneven and the alpha was not growing along with the basic characteristic. In other words, the rejected GRS test might have been simply the result of anomalous behaviour of a few extreme portfolios, rather than the monotonically increasing return along with greater magnitude of the underlying systematic factor. Such thesis was only supported in the case of profitability.

The performance of the ad-hoc asset pricing factors was depicted in the Table 3. Only three factors turned out to be statistically significant when the four-factor model was applied. Astonishingly, one of them was the cash-to-assets ratio, which had been rejected in the previous test. The reason might be that this anomaly was strong among the small stocks (this issue is investigated later). However, the reason why the factor excess returns and alphas were not statistically significant might simply stem from the relatively short time-series investigated rather than from weaker factor performance than in other markets. For example, Novy-Marx (2013) reported the average excess returns and four-factor model's intercepts for gross profitability factor in USA in years 1973–2010 of 0.27 and 0.35, respectively. In other words, in this case the mere size of the abnormal return was basically almost exactly the same, but the time-series s markedly shorter.

Table 3. Ad-hoc asset pricing factors related to quality

	Accruals	Bid-ask	Cash-to-assets	Profitability	Leverage	Payout	Turnover
Mean	0.41	0.92	0.52	0.27	0.22	–0.15	0.47
	(1.49)	*(2.00)*	*(1.82)*	*(0.68)*	*(0.63)*	*(–0.46)*	*(1.05)*
4F intercept	0.18	1.24	0.66	0.32	0.19	–0.32	1.10
	(0.58)	*(3.42)*	*(2.16)*	*(0.75)*	*(0.51)*	*(–0.80)*	*(2.80)*
Standard deviation	3.30	5.55	3.49	4.86	4.34	4.06	5.50
Sharpe ratio	0.12	0.17	0.15	0.06	0.05	–0.04	0.09
Corr. with QMJ	0.04	–0.46	–0.29	0.30	0.31	0.13	–0.50
	(0.40)	*(–5.82)*	*(–3.42)*	*(3.60)*	*(3.62)*	*(1.53)*	*(–6.53)*

Monthly intercepts and means are expressed in %.

The Table 3 reports also the correlation of excess returns on the ad-hoc factors from the CEE stock market with the global quality-minus-junk (QMJ) factor of Asness *et al*. (2014)[5]. The profitability and leverage factors were characterized by positive and significant correlation coefficients, suggesting some market integration. However, in the cases of liquidity indicators (turnover ratio, bid-ask spread), the correlations were negative, so once again I found evidence that these factors behave significantly different in the CEE than in the developed markets.

The Table 4 provides additional insights on the performance of the quality sorted portfolios across various size categories. The evidence on this issue in existing literature is relatively scarce (for example the flagship paper of Asness *et al*. (2014) do not investigate this issue at all). One of the exceptions was the research of Novy-Marx (2013), which showed that the profitability premium was marginally higher among the small-caps. In the case below the quality indicators might be basically divided in the four groups.

Table 4. Excess returns on portfolios from 5×5 sorts on portfolios from sorts on quality and size

	Mean						Mean				
	Bottom	2	3	4	Top	Bottom	2	3	4	Top
	Accruals						*Bid-ask spread*				
Small	2.53	1.50	2.00	3.12	2.43	4.36	3.21	2.88	3.52	6.02
2	1.51	1.16	2.81	1.79	2.03	−0.77	2.03	1.67	1.12	1.67
3	−0.19	0.27	0.73	1.54	0.86	−0.99	0.87	1.51	1.64	1.15
4	1.75	1.02	0.94	0.97	0.96	−1.13	−0.18	1.02	1.06	1.23
Big	0.56	1.04	1.57	0.65	0.65	−0.57	0.75	0.42	0.70	0.95
	Cash-to-assets						*Profitability*				
Small	3.53	3.33	3.27	3.68	2.82	2.08	2.93	2.21	1.43	2.37
2	0.62	1.41	1.55	1.70	2.90	−0.34	1.65	2.66	2.74	1.17
3	0.40	1.49	1.13	1.21	1.01	0.80	1.32	1.40	1.47	1.11
4	1.17	0.20	0.72	0.91	1.04	0.73	1.25	1.46	0.33	1.43
Big	0.17	0.34	1.00	0.91	1.16	0.20	0.33	1.03	1.28	0.87
	Leverage						*Payout*				
Small	3.71	2.45	2.70	2.97	3.81	3.89	0.93	4.98	3.94	3.48
2	0.80	1.74	1.82	2.16	0.94	1.47	1.17	−0.33	1.86	0.31
3	0.24	1.30	1.06	0.30	0.93	1.08	1.14	−0.17	1.82	2.78
4	0.30	0.71	0.40	1.12	0.93	0.80	0.74	0.73	1.03	1.87
Big	0.87	0.79	0.92	0.83	0.31	0.84	0.53	1.62	0.56	0.77
	Turnover										
Small	4.05	2.43	3.92	2.80	4.38					
2	1.23	0.79	1.96	1.55	1.25					
3	0.94	0.22	1.15	1.28	1.35					
4	0.41	0.20	0.92	1.39	0.98					
Big	0.40	0.36	0.43	0.88	1.06					

Monthly means are expressed in %.

5 The data on returns on QMJ comes from Lasse's H. Pedersen website: http://www.lhpedersen.com/data (accessed 25 September 2014).

First, the characteristics which revealed no significant return pattern in the Table 2 (accruals, cash-to-assets and payout) still showed rather uneven and inconclusive outcomes. Second, the bid-spreads and profitability effects appeared to be equally strong across all the sizes. Third, the turnover ratio seemed to perform slightly better among the large-caps. Finally, the leverage factor was probably the most curious case of all. The abnormal negative returns of low-leveraged companies could be largely the phenomenon of big-firms. Actually, across the smaller companies the phenomenon was reverted and the least leveraged portfolios performed better than the most leveraged ones in the case of each size quintile.

Table 5. Summary to explain excess returns on portfolios from sorts on size and quality

	5x5					4x5				
	GRS	p-value	|α|	R²	s(α)	GRS	p-value	|α|	R²	s(α)
Accruals										
4F (SMB)	1.24	22.24	0.64	55.62	0.81	0.93	55.06	0.47	60.59	0.62
4F (MMR)	1.11	33.86	0.66	50.02	0.85	1.27	21.08	0.62	54.64	0.83
Bid-ask										
4F (SMB)	3.98	0.00	1.19	56.11	1.66	3.04	0.01	0.79	60.35	0.98
4F (MMR)	2.25	0.19	0.83	50.61	1.15	2.19	0.50	0.71	52.90	0.91
Cash-to-assets										
4F (SMB)	2.29	0.16	0.69	60.90	0.94	1.26	21.84	0.39	66.38	0.46
4F (MMR)	1.46	9.37	0.61	53.37	0.76	1.37	14.81	0.53	58.70	0.67
Profitability										
4F (SMB)	1.67	3.64	0.82	56.13	0.83	1.40	13.33	0.62	60.62	0.65
4F (MMR)	1.28	18.65	0.62	52.68	0.70	1.64	5.35	0.61	57.01	0.73
Leverage										
4F (SMB)	2.40	0.09	0.70	60.44	0.91	1.26	21.70	0.45	66.34	0.51
4F (MMR)	1.40	11.89	0.57	52.97	0.75	1.33	17.29	0.51	58.71	0.57
Payout										
4F (SMB)	2.91	0.01	1.13	39.72	1.75	0.79	72.44	0.75	44.07	1.01
4F (MMR)	1.10	35.27	1.23	36.93	1.82	0.69	82.84	0.87	40.16	1.19
Turnover										
4F (SMB)	3.93	0.00	0.84	62.37	1.20	1.87	2.05	0.51	67.11	0.59
4F (MMR)	1.92	1.07	0.52	57.11	0.63	1.95	1.41	0.53	60.02	0.63

GRS is the Gibbons, Ross and Shanken (1989) test statistic, |α| is the average absolute intercept, R² is the average R² and s(α) is the standard deviation of the intercepts. The p-values, intercepts, R-squared and standard deviations of the intercepts are expressed in %.

The summary explaining the excess return on the double-sorted portfolios is depicted in the Table 5. Basically, the standard four-factor model which employs the SMB risk did not cope well with explaining the anomalous behaviour of portfolios from double sorts on size and quality. All indicators with the exception of accruals were rejected. Nevertheless, this is mostly the result of anomalous behaviour of the smallest stocks. After accounting

for their abnormal returns (either by neglecting the tiniest stocks or by using the MMR-based model), the landscape changed significantly. In almost all the cases of 5×5 portfolios the GRS test statistics and the average absolute intercepts dropped significantly. Actually, only two quality indicators – bid-ask spreads and turnover ratio – were not rejected. Three following characteristics – cash-to-assets ratio, leverage and profitability – are at the brink of being rejected (either in 4×5 or 5×5 configuration). The remaining two cases – accruals and payout – are well explained by the asset pricing model.

When analysing the information in the Table 5, it was very important to remember that the distinct size quintiles were not of equal economic significance. Actually, the performance of the quintile of the smallest stocks could be only marginally important for some group of individual investors. Due to the illiquidity considerations, these companies might be completely beyond the scope of financial institutions. As the result, from the practical point of view, the figures reported in the Table 2 were rather more important for stock market participants. The outcomes set out in the Table 5 should be generally regarded as supplemental.

Next, I moved to the investigation of return patterns of quality-sorted stocks during market distress (Table 6). The initial research in this field conducted by Asness *et al*. (2014) suggested that the quality stocks provided some hedge against tension in financial market. However, this analysis focused only on aggregate QMJ factor and its relation to Mkt-Rf factor. The outcomes in the Table 5 are more detailed. First, it seemed that not all zero-cost portfolios were counter-cyclical. Only the stocks from sorts on profitability and leverage offered some cushion against the market distress. They were characterized by negative and significant betas against market risk and positive and significant betas against changes in volatility and credit spreads. It appeared that during periods of market distress investors preferred low-leveraged stock with high gross-margins. The additional demand provided an extra cushion against stock market downturns.

Table 6. Coefficients of regressions with market distress proxies

	Accruals	Bid-ask spread	Cash-to-assets	Profitability	Leverage	Payout	Turnover
Mkt-Rf	0.01	0.58	0.20	–0.24	–0.29	–0.06	0.49
	(0.14)	(11.52)	(5.02)	(–4.12)	(–5.51)	(–1.14)	(8.74)
Volatility	–0.08	–0.37	–0.15	0.16	0.28	0.01	–0.46
	(–1.66)	(–4.79)	(–3.01)	(2.12)	(4.28)	(0.11)	(–6.27)
Term spread	0.89	–6.73	–1.60	3.00	2.18	–1.91	–4.67
	(0.52)	(–2.41)	(–0.88)	(1.17)	(0.93)	(–0.90)	(–1.65)
Credit-spread	0.55	–6.67	–1.68	3.71	3.91	–0.17	–4.53
	(0.53)	(–4.02)	(–1.52)	(2.40)	(2.78)	(–0.13)	(–2.64)
TED	0.90	–5.54	–1.29	–0.79	0.23	–0.72	–3.97
	(0.62)	(–2.30)	(–0.82)	(–0.36)	(0.12)	(–0.39)	(–1.63)

Numbers in brackets denote statistical significance.

On the other hand, no "flight-to-quality" behaviour was detected in the case of liquidity sorted stock. It appeared that in the tranquil periods the market winners are the most liquid stocks while the companies with the largest spreads or the lowest turnover ratios were market laggards. Return on these portfolios were positively correlated with the stock market and negatively with the volatility, credit, term or liquidity indicators. The reason might be for example additional demand during bull market generated by market newcomers and funds preferring rather liquid stocks or lack of integration of the small-caps with the large-caps. Nonetheless, the full explanation of this "anomaly" is beyond the scope of this paper and should be examined in further research.

Interestingly, the cash-to-asset ratio followed the pattern presented by liquidity indicators. The cash-rich companies delivered better returns during bull markets than during bear markets. The regression coefficient was negative and also statistically significant for the VIX index. In the cases of the TED, term and credit spreads the coefficients were also negative, but not significant. There could be a few explanations why firms with a lot of cash in the balance sheet outperform during the bull market. For example, it might be due to overoptimistic reaction to prospects of new investments finance by excess cash or overreaction to potential cash distributions to investors. However, again, the further investigation is beyond the scope of this study.

Lastly, the Table 7 shows the predictive abilities of quality spreads. The spreads based on three characteristics (bid-ask spread, cash-to-assets ratio, and profitability) seemed to have predictive properties for the monthly alphas and two of them (cash-to-assets ratio and profitability) appear to be useful also for quarterly horizons. The regression coefficients were statistically significant at 95% level and their signs were consistent with economic interpretation.

Table 7. Predictive regressions with quality spreads

	Monthly forecasts				*Quarterly forecasts*			
	B_0	B_1	F-stat	R^2	B_0	B_1	F-stat	R^2
Accruals	0.01	–0.10	1.32	0.90	0.04	–0.28	1.43	2.95
	(1.23)	(–1.15)			(1.30)	(–1.20)		
Bid-ask	0.00	0.05	4.23	2.84	0.01	0.12	2.17	4.42
	(0.22)	(2.06)			(0.66)	(1.47)		
Cash-to-assets	–0.02	0.24	3.99	2.68	–0.08	0.77	4.34	8.46
	(–1.58)	(2.00)			(–1.68)	(2.08)		
Profitability	–0.07	0.17	7.78	5.09	–0.20	0.50	5.07	9.74
	(–2.68)	(2.79)			(–2.16)	(2.25)		
Leverage	–0.25	0.06	0.88	0.60	–0.62	0.15	0.77	1.61
	(–0.93)	(0.94)			(–0.87)	(0.88)		
Payout	0.00	0.00	0.32	0.22	0.00	–0.01	0.35	0.74
	(0.07)	(–0.57)			(0.12)	(–0.59)		
Turnover	0.03	0.00	0.92	0.63	0.09	–0.01	0.67	1.40
	(1.46)	(–0.96)			(1.21)	(–0.82)		

R-squared is expressed in %.

Nonetheless, the R^2 were relatively low. The quality spreads could only explain 2.68–5.09% of time-series variation in the monthly alphas. However, this value grew to 8.46–9.74% for quarterly returns. Although these values were still relatively low, two issues should be considered when assessing the predictive abilities. First, these R^2 were actually higher than in the case of research on similar spreads. For example, Liu and Zhang (2006) found out that the R^2 of regressions with value spreads and book-to-market spreads do not exceed 3% for monthly time-series and 7% for quarterly time-series. Second, the R^2 usually rose with the forecasting horizon as it was in the case of the value spread investigated by Liu and Zhang (2006). Alas, there were no long-enough time-series in the CEE stock market which would be sufficient to perform a reliable study of forecasting over longer horizons[6].

4. Conclusions

This paper is the first one that investigates the quality premium in the CEE markets. It documents sizeable positive risk-adjusted returns to the gross-profitability strategy. Furthermore, I find that the liquidity is positively related to stock returns. The higher is the stock liquidity and the narrower is the bid-ask spreads, the higher are the alphas. Additionally, the profitable and not heavily leveraged companies provide partial hedge against distress. Finally, the paper shows that it is possible to forecast the performance of quality stocks based on the quality spreads which are introduced in this paper, but R^2 is rather low.

The findings imply some conclusions for investors, asset managers and fund pickers. First, it seems sensible for portfolio managers to implement some quality strategies (or introduce products based on them, like ETFs or index funds) in the CEE markets. Second, when evaluating the performance of portfolios of CEE stocks, either for investment decisions or for academic research, one should consider the influence of some quality effects. Ignoring their impact could seriously distort the results of the analysis.

The research findings have a few important limitations. First, I do not account for limited liquidity and transaction costs which tend to be higher in emerging markets, especially across small and tiny companies. Second, I do not take into account any investment and capital flow restrictions within the investigated countries. However, these are rather marginal, as all countries in my sample are EU members. Third, the period I study (2002–2014) may be regarded as relatively short and additionally unique as it covers the times of the Global Financial Crisis. Nonetheless, longer time-series for the CEE markets are hardly available.

Further research on the issues discussed in this paper could be pursued in several directions. First, this research builds the paradigm for future studies on pricing models

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[6] Actually, I experimented with the forecasts over 1-year horizon and arrived with double-digit R^2, but the regression coefficients were far from statistical significance and, thus, inconclusive.

and could be applicable to the CEE countries, while simultaneously considering their specific features. Second, some interactions and synergy effects between the quality factors (and the traditional factors) should be examined. Third, the impact of transaction costs and liquidity constraints on the performance of quality strategies could be investigated. Finally, the sources of anomalous outcomes regarding the inverted liquidity premium should be explored.

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Appendix

Definitions of the quality characteristics.

1. Accruals = – (change in working from *t-12* to *t* – cumulative depreciation over 12 months (*t-12* to *t*)/total assets at *t*. The higher characteristic, the better quality.

2. The bid and ask prices are retrieved at the end of trading session, after the fixing price is determined. Bid-ask spread = (ask price – bid price)/(ask price + bid price). The lower characteristic, the better quality.

3. Cash-to-assets ratio = cash and short term investments/assets. The higher characteristic, the better quality.

4. Profitability = gross profit over 12 months (*t-12* to *t*)/total assets. The higher characteristic, the better quality.

5. Leverage = total assets/common equity. The lower characteristic, the better quality.

6. Payout = dividends paid over 12 months (*t-12* to *t*)/net income over 12 months (*t-12* to *t*). The higher characteristic, the better quality.

7. Turnover ratio = market value of shares traded over last month/company market capitalization at *t*.

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