Do Quantitative Country Selection Strategies Really Work?

Adam Zaremba[1]*, Poznan University of Economics*

Przemysław Konieczka, Warsaw School of Economics

First version: 21 February 2015

This version: 21 February 2015

Abstract

Our study tests and compares 16 distinct country selection strategies based on inter-market value, size, momentum, quality and volatility effects within a sample of 78 countries for the period 1999-2014. By accounting for country-specific dividend tax rates, market liquidity and openness for investment flows, we design portfolios and assess their performance with asset pricing models. We find that the value strategies based on earnings to price ratio prove useful for investors, while momentum strategies should be approached with caution, as they appear effective only in small markets and may lead to loses in large markets. Selecting low leveraged and illiquid countries also proves profitable. Finally, while the relation between volatility and returns remains strong, it displays different characteristics for open and closed economies. Most return patterns are uneven and abnormal returns result from investments in extreme markets.

Keywords: value, size, momentum, quality, volatility, country-level effects, inter-market effects, cross-section of returns, factor returns, international diversification, asset pricing.

JEL codes: G11, G12, G15.

Introduction

The recent decades has brought two significant changes for international equity investors. Growing integration and openness of global financial markets has increased correlations between stock market returns across different countries (Bekaert& Harvey, 2000; Quinn & Voth, 2008), markedly reducing diversification

[1] Contact author: Adam Zaremba, Poznan University of Economics, al. Niepodleglosci 10, 61-875 Poznan, Poland, e-mail: adam.zaremba@ue.pozan.pl, website: http://adamzaremba.pl/.

benefits of international investments (Goetzman *et al.*, 2005). This has given even greater prominence to the country selection strategies as part of the investment process (Hester, 2013) and has coincided with wide proliferation of passive investment products that granted easy access to international markets: e.g. futures, index funds and exchange traded funds (ETFs). Given both the wealth of opportunities and the considerable size of the global ETF market, the range of investment tools available to ETF investors still seem surprisingly limited while stock-level investors benefit from abundant literature on asset pricing models as well as cross-sectional and time-series patterns, in the field of passive ETFs and index products these tools largely await further development. Reducing this discrepancy is the primary aim of this study.

In the paper we intend to re-examine performance of a number country selection strategies based on value, size, momentum, quality and volatility[2]. Interestingly, some parallels of these stock-level effects have been also identified at the country level by Macedo (1995), Kim (2012) and Zaremba (2014a), who found that the stock markets with low fundamentals indicators yield higher returns than markets with high ratios. In addition, Bhorjaj and Swaminathan (2006) and Balvers and Wu (2006) argue that top performing markets continuously tend to outperform "laggard countries" that maintain negative momentum. Also, Keppler and Encinosa (2011) advocate that "small is beautiful" whereas other papers by Zaremba (2014b, 2014c) seek parallels between the quality and volatility effects on the stock and country level.

This study contributes in a number of ways. First, we test and compare 16 distinct country selection strategies based on inter-country effects of value, size, momentum, quality and risk within a comprehensive and up-to-date data sample from 78 countries in the years 1999-2014. Contrary to the previous studies, this research accounts for the effect of various weighting schemes. We consider the role of country-specific dividend taxes, which can significantly influence some anomalies, e.g. the dividend yield strategies. Finally, we attempt to control investment constraints across countries by controlling liquidity and sub-setting the countries based on the KAOPEN index (Chin & Ito, 2008).

Most notably, we find that some value strategies - particularly based on earnings to price ratio - prove useful for investors. Momentum strategy should be approached with particular caution, as it appears to work only in small markets and generates loses in large markets. Opting for countries with low-indebted companies

[2] All these strategies stem from stock-level effects. The value effect is a tendency of stocks with high fundamentals relative to price to outperform stocks with low fundamentals relative to price. The size effect is a tendency of small companies to outperform large companies. The momentum anomaly refers to a phenomenon that past winners outperform past losers. The quality strategies assume that the high-quality stock in terms of profitability, liquidity, credit risk etc. outperform low quality stocks. The volatility-based strategies rely on relations between stock returns and their risk metrics. The above mentioned stock-level strategies are comprehensively discussed for example by Fama and French (2012), Asness *et al.* (2013), de Moor and Sercu (2013), Frazzini and Pedersen (2014), Asness *et al.* (2014), Ang (2014).

becomes a profitable strategy, especially for large markets. The illiquidity premium seems reliable, but demands investing in highly illiquid countries. Finally, we have observeda strong positive correlation between volatility and return, which displays different characteristics among open and closed economies. Most return patterns remain uneven and reveal no significant mononicity between returns and underlying variables, and abnormal returns result from investments in extreme markets.

The rest of the paper is organized as follows: the next section presents research methods and data sources, which is followed by findings and final conclusions.

Research Methods

The study aims to test the performance of a number of quantitative country-selection strategies. In the methods section we present the data sources, procedures used in constructing the portfolios, as well as the asset pricing models and testing methods we employed.

Data sources and initial preparation

This research is based on returns of international stock market indices from 78 countries[3]. All source data are obtained from the Bloomberg database. Monthly time-series are implemented as they provide a sufficient number of observations (192) to ensure the effectiveness of the tests and allow to avoid excessive exposure to micro-structure issues (de Moor and Sercu, 2013). We adopted MSCI indices for all the countries to maintain a consistent return computation methodology as the indices represent capitalization-weighted benchmarks that are commonly tracked worldwide. Additionally, MSCI indices constitute the basis for numerous futures contracts and over 650 exchanged funds traded all over the world[4].Therefore our decision to adopt MSCI also aims at aligning this research with the investment practice. These indices are constructed and managed with a view to being fully investable from the perspective of international institutional investor (MSCI, 2014a), and cover about 85% of stock market capitalizations in countries they represent (MSCI, 2014b). In a country where the MSCI index is unavailable, Dow Jones was our second index of choice, and STOXX the third.

[3] Argentina, Australia, Austria, Bahrain, Bangladesh, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Cyprus, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Latvia, Lebanon, Lithuania, Luxemburg, Malaysia, Malta, Mexico, Morocco, Mauritius, Netherlands, New Zealand, Nigeria, Norway, Oman, Pakistan, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Serbia, Saudi Arabia, Singapore, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Trinidad and Tobago, Tunisia, Turkey, Ukraine, United Arab Emirates, United Kingdom, USA, Venezuela, Vietnam.

[4] Data from http://www.msci.com/products/indexes/ [accessed 1 November 2014].

The returns are computed based on capitalization-weighted net total return indices, i.e. the returns are adjusted for corporate actions (splits, reverse splits, issuance rights etc.) and cash distributions to investors (dividends). The "net" technique of computation ensures that the returns account for country-specific dividend tax rates. The sample period for returns runs from January 1999 to December 2014, as available. The total sample includes 78 country equity markets. Both existing and discontinued indices (e.g. MSCI Venezuela) are used to avoid a survivorship bias. A stock market is included in the sample in month *t* if it is possible to compute: its size indicators at the end of month *t*-1, return in month *t* and a statistic necessary to examine a give strategy at the end of month *t*-1. The exact sample size varies across both the strategies and time, and averages at57.The initial market and accounting data are maintained in the local currencies, and any comparisons using different currency units could be misleading. Therefore, we convert all financial data into USD to obtain polled international results. In order to comply with the USD approach, excess returns are computed over the one month benchmark US T-Bill rate.

Examined Portfolios and Strategies

In this paper we research the performance of various portfolios. Thus, in each *t-1*month, all stock market indices are ranked against their characteristics. We apply16 distinct metrics divided into 5 grand groups: (1) value: book to market ratio (B/M), earnings to price ratio (E/P), cash flow to price ratio (CF/P), dividend yield (DY);(2) size: total market capitalization (Cap);(3) momentum: momentum metrics based on performance during previous 12, 9, 6 and 3 months (Mom12, Mom9, Mom6, Mom3);(4) quality: return on assets (ROA), leverage (Lev), balance sheet liquidity (Liq), share turnover ratio (Turn); and (5) volatility: standard deviation (SD), value at risk (VaR), idiosyncratic volatility (IVol)[5]. Precise definitions of the above metrics are presented in Appendix A.As a result, for each characteristic, the 20th, 40th, 60th and 80th percentiles are defined as breakpoints and thus five subgroups emerge. Finally, the indices in the respective groups are valued to form portfolios. We subsequently add differential portfolios – effectively synthetic zero-portfolios - that form long/short portfolios: 100% long in the quantile of markets with the highest metrics, and 100% short in the quantile of markets with the lowest metrics. We use three distinct weighting schemes . First, the commonly employed equal-weighting, used for example by Asness *et al.* (2013). This approach may,

[5] ROA is a ratio 12-month net profit to total assets at time *t*. Leverage (Lev) is a ratio of total assets to common equity at time *t*. Liquidity (Liq) is a ratio of short term investments to total assets. Turnover ratio (Turn) is average share turnover to average capitalization in 12-months preceding time *t*. Idiosyncratic volatility (IVol) is an idiosyncratic variance from the country-level CAPM model described in the methods section. SD, VaR and IVol are calculated based on 24 months of past performance. All the momentum metrics are computed with the last month skipped, so as to avoid the potential impact of the short-term reversal. B/M, E/P, CF/P, ROA, Lev and Liq are lagged 3 months in order to avoid look-ahead bias. B/M, E/P, CF/P, ROA, Lev and Liq are calculated for individual stocks and then weighted according to an index weight to obtain index level values.

however, distort the results in at least two ways: First, by assuming monthly inflows and outflows from markets that may be characterised by constrained size, liquidity and capacity; second, by being influenced by so called diversification return (Willenbrock, 2011). We attempt to overcome the above difficulties by opting for two additional weighting schemes: capitalization-weighting and – probably even more widely adopted investment approach - liquidity-weighting. In the case of the latter, we apply 12-months average turnover as a proxy for stock market liquidity. When calculating the returns on portfolios, we first aggregate the arithmetic returns across sections to form portfolios, and subsequently convert them into log returns for statistical interfering.

Additionally, to account for investment accessibility potentially varying from country to country, we carry out studies of capitalization-weighted portfolios having initially sorted countries on additional variables. Subsequently, we test the strategies on the specific subsets of the entire sample. Within the first approach, we test the strategies separately in large (L) and small (S) markets, which were divided by a median capitalization on a monthly basis. In the second approach we examine the country-selection techniques exclusively in the open (O) and close (C) markets. To this end, for each month we sort countries based on their KAOPEN indices (Chin & Ito, 2008) - measuring the country's *de jure* degree of capital account openness, and applied as a rough proxy for investment accessibility- and define open economies as having the index above median and close economies with the index below median[6]. KAOPEN is an index

Performance evaluation

Examining multi-country international portfolios requires an appropriate asset pricing model. The model should comply with the perspective of an international investor, motivated to invest in foreign indices-based instruments, e.g. ETFs or futures contracts. In this paper we use, two models. To begin with, we employ a country-level CAPM model (Sharpe, 1964). In this approach, proposed by Zaremba (2014a), the global market portfolio is composed of all the country portfolios in the sample weighted according to their capitalizations. Secondly, we attempt to consider other cross-sectional asset pricing effects, such as value, size and momentum. However, we apply no global stock-level asset pricing factors, as it is inconsistent with the assumption that investors allocate money to index-based vehicles. On the other hand, we use no country-level asset pricing factors, as it was performed by Zaremba (2014b, 2014c), for it is irrational to test some cross-national anomalies in pricing models of which they are an integral part. Therefore, apart from the country-

[6] As the KAOPEN index is already updated only to 2012, in further years we use values from 2012. The values of indices for various countries are available at Hiro Ito's website: http://web.pdx.edu/~ito/Chinn-Ito_website.htm (accessed 4 February 2015).

level CAPM model, we test whether the quantitative country selection strategies extend the frontier for a US stock-level investor, and take advantage of the four-factor model by Carhart (1997) based on the US stock-level data[7].

All the regression models are estimated using the OLS regressions and t-statistics corresponding to the parameters estimated using bootstrap standard errors. In order to find whether the intercepts in a group of portfolios statistically differ from 0, they are evaluated with the common GRS test statistic, as suggested by Gibbons *et al.* (1989). The test's null hypothesis assumes that all the intercepts (five) are equal to 0, with the alternative hypothesis assuming the contrary.

The GRS test statistic weaknesses is its indication to the significant outperformance of some portfolio sets, irrespective of the structure of the returns or their monotonicity. To test whether the excess return are systematically fluctuating in synchrony with the underlying variable, we additionally carry out a monotonic relation (MR) test introduced by Patton and Zimmermann (2010). This is a simulation-based test assuming a basic hypothesis of no monotonic patter in excess returns, and an alternative hypothesis to the contrary. The precise testing procedure is described in the paper by Patton and Timmerman (2010). Each MR test in this paper was based on 10.000 random draws and was applied to excess returns.

Results and Discussion

Table 1 reports the performance statistics of the equal-weighted portfolios. For brevity purposes, we provide selective statistics of every examined portfolio and limit the presentation to *p*-values of synthetic tests for 5 portfolios (MR, GRS) while providing detailed statistics for the zero-portfolio. Beginning with the value metrics, the outcomes confirm the previous results on B/M and E/P indicators reported by e.g. Macedo (1995), Desrosiers *et al.* (2007) or Asness *et al.* (2013). Zero-portfolios based on these metrics have average excess returns of 0.60% and 0.54%, respectively. Additionally, both portfolios deliver intercepts from the CAPM and four-factor model varying from 0.46% to 0.53%, which are significantly different from 0 at 10% level. Nonetheless, the formal GRS tests are applied and the MR test definitely proves monotonicity for raw excess returns on portfolios from sorts on B/M ratios. This may indicate that although the zero-portfolio based on extreme quantiles outperforms the market, the interim return pattern among the remaining quantiles is rather

[7] The stock level data come from Andrea Razzing's data library: http://www.econ.yale.edu/~af227/data_library.htm (accessed 4 February 2015).

uneven[8].The zero-portfolios from CF/P sorts yield modest monthly excess returns of 0.26%, which effectively equal 0. This observation displays some similarities with a study to the Macedo (1995), who also found no premium for CF/P sorts for years 1974-1990. Finally, the case of dividend yields proves probably the most interesting: contrary to the previous studies carried out by, for example, Macedo (1995) or Keppler (1991), we find no evidence of outperformance in high-dividend yield countries. Also Zaremba (2014a), who investigated a very similar period, observed relationship between country-level returns and dividend yields. Considering the fact that the previous studies were based on gross returns, the high returns appear at least partly compensating for dividend taxes[9].

Table 1. *Performance of equally weighted portfolios*

	Raw excess returns					Global country-level CAPM			US stock-level four-factor model		
	R	*t*-stat	SD	SR	MR	α	*t*-stat	GRS	α	*t*-stat	GRS
						Value					
B/M	**0.60****	***2.07***	4.23	0.49	**4.6**	**0.53***	***1.78***	12.0	**0.47***	***1.67***	28.1
E/P	**0.54****	***2.19***	3.58	0.53	20.0	**0.48***	***1.92***	46.8	**0.46***	***1.83***	46.8
CF/P	0.26	*1.25*	3.22	0.28	70.6	0.19	*0.76*	47.5	0.11	*0.74*	47.5
DY	0.09	*0.45*	3.35	0.09	75.4	0.16	*0.66*	13.4	0.11	*0.47*	34.0
						Size					
Cap	-0.34	*-0.99*	4.50	-0.26	39.0	-0.50	*-1.62*	73.3	-0.39	*-1.22*	65.9
						Momentum					
Mom12	0.46	*1.49*	4.37	0.36	15.5	0.51	*1.59*	28.1	0.35	*1.20*	20.7
Mom9	0.44	*1.42*	4.68	0.33	37.7	0.47	*1.39*	13.5	0.32	*1.07*	12.0
Mom6	0.11	*0.46*	4.34	0.09	33.6	0.18	*0.56*	69.2	0.04	*0.12*	72.0
Mom3	0.17	*0.59*	4.40	0.13	11.3	0.25	*0.80*	78.8	0.12	*0.38*	85.1
						Quality					
ROA	0.26	*1.01*	3.67	0.24	44.1	0.20	*0.82*	31.6	0.21	*0.83*	30.5
Lev	**-0.82****	***-2.83***	4.12	-0.69	82.3	**-0.77****	***-2.64***	**5.0**	**-0.82****	***-2.68***	**1.7**
Liq	0.09	*0.45*	3.35	0.09	75.4	0.16	*0.66*	**3.4**	0.11	*0.47*	**3.4**
Turn	**-0.96****	***-2.62***	4.91	-0.67	75.7	**-0.82****	***-2.36***	47.0	**-1.00****	***-2.96***	21.6
						Volatility					
SD	0.53	*1.51*	4.73	0.39	40.1	0.24	*0.90*	66.4	0.39	*1.40*	70.4
VaR	-0.01	*-0.11*	4.80	-0.01	12.7	-0.29	*-0.90*	65.4	-0.15	*-0.51*	71.8
IVol	0.52	*1.47*	4.72	0.38	38.9	0.23	*0.86*	67.4	0.38	*1.36*	71.8

Note. The table reports performance statistics of equal-weighted portfolios from single sorts on 16 distinct value, size, momentum, quality and volatility metrics: book to market ratio (B/M), earnings to price ratio (E/P), cash flow to price ratio (CF/P), dividend yield (DY), total market capitalization (Cap), four momentum metrics based on excess returns in 12, 9, 6 and 3 previous months (Mom12, Mom9, Mom6, Mom3), return on assets (ROA), leverage (Lev), balance sheet liquidity (Liq), share turnover ratio (Turn), standard deviation (SD), value at risk (VaR) and idiosyncratic volatility (IVol). R it an average monthly excess log return and *t-stat* is its corresponding *t*-statistics. SD is a monthly standard deviation of excess log returns and SR is a Sharpe ratio of a given strategy. MR and GRS columns represent *p*-values for the test of monotonic relation by Patton and Timmerman (2010) and for the test of mean-variance spanning by Gibbons *et al.* (1989). * and ** represent values significantly different from 0 at 10% and 5% levels correspondingly. All statistics significantly different than 0 at 10% level and *p*-values for MR and GRS test rejected at least at 10% level are typed in bold.

The impact of size variable seems relatively modest. The intercepts from the CAPM and four-factor models amount to -0.50% and -0.39%, respectively. In other words, within the investigated period the small

[8] This observation has some parallels to stock-level studies, as for example De Moor and Sercu (2013a) observe a S-shaped rather than linear return pattern for value metrics.
[9] Additionally, Zaremba (2014a) bases his study on arithmetic (not logarithmic) returns, which may partly inflate the outcomes.

countries indeed outperformed the large ones, which is analogous to the observations made by Keppler and Encinosa (2011), yet statistically insignificant. As a result, the GRS tests must be rejected.

The returns on momentum strategies may be particularly disappointing in light of the earlier studies. Even when we consider the best performing variant of this strategy – based on the past one-year performance, monthly average excess return equals 0.46% whereas Asness *et al.* (2013) reported 0.73%[10]. In addition, neither the intercepts statistically differ from 0 nor the GRS tests are rejected.

The investigations of quality metrics generally follow the observations proposed by Zaremba (2014b) based on gross returns. First, the sorts on ROA provide no conclusive results. Second, as far as balance sheet liquidity is considered, the GRS tests are rejected while the performance of other interim portfolios, as the returns and alphas on zero-portfolio, approximates zero. Third, the low-leveraged countries outperform top-leveraged countries by a solid 0.82% monthly. Although the MR tests suggest that the relation is not monotonic, all the intercepts and GRS tests for leverage become significant at 5%. Interestingly, analogously as in the paper by Zaremba (2014b), these are the high indebted stocks that underperform. This observation contradicts the theoretical and empirical evidence by Bhandari (1988), who documents appositive relation between indebtedness and market returns. Finally, we observe significant outperformance of the least liquid markets in comparison to the most liquid ones. The difference in excess returns between the two extreme quantile portfolios reaches 0.96% basis and is significant for both the CAPM and four-factor models.

Finally, the sorts on volatility seem largely inconclusive. No GRS tests confirm returns patterns. For the portfolios from sorts on standard deviation and idiosyncratic volatility, the returns on zero-portfolios turn positive (about 0.5% monthly), but effectively equal to 0. The return on VaR-sorted portfolio moves close to zero. Nonetheless, as it was observed by Zaremba (2014c), these outcomes may be particularly distorted by equal-weighting scheme, as the diversification return is rising along with the return volatility (Erb & Harvey, 2006).

Changing the weighting scheme to one based on capitalization (Table 2) in some instances dramatically impacts performance of the strategies. For example, when value-based metrics are considered, the performance of the portfolios from sorts on B/M deteriorates dramatically: both the alphas and excess return drop to zero. The profitability of E/P-based strategy improves further, so the average monthly excess returns increases to as much as 1.3%, and intercepts from CAPM and four-factor models are both significantly

[10] Precisely, the authors reported 8.7% annually.

differ from 0 and exceed 1%. Moreover, the performance of CF/P ratio also improves and becomes nearly as profitable as the E/P ratio. Finally, we observe little change the in the case of the dividend yield: the sorts still prove unprofitable.

Table 2. *Performance of capitalization-weighted portfolios*

	Raw excess returns					Global country-level CAPM			US stock-level four-factor model		
	R	*t*-stat	SD	SR	MR	α	*t*-stat	GRS	α	*t*-stat	GRS
						Value					
B/M	-0.06	*-0.22*	8.24	-0.03	16.7	0.00	*0.00*	65.5	-0.10	*-0.11*	65.5
E/P	**1.30****	***2.61***	6.62	0.68	**0.6**	**1.18****	***2.48***	**6.5**	**1.16****	***2.44***	12.4
CF/P	**1.14****	***2.27***	7.10	0.55	**7.5**	**0.92****	***1.96***	23.3	**0.97***	***1.94***	23.3
DY	-0.07	*-0.15*	6.19	-0.04	32.3	0.10	*0.26*	81.4	-0.07	*-0.17*	81.4
						Size					
Cap	0.28	*0.85*	5.12	0.19	39.8	0.01	*-0.02*	31.2	0.17	*0.41*	74.1
						Momentum					
Mom12	-0.67	*-1.36*	7.47	-0.31	48.3	-0.71	*-1.38*	84.1	-0.79	*-1.55*	82.0
Mom9	-0.74	*-1.40*	7.56	-0.34	94.1	-0.67	*-1.24*	10.8	**-0.96***	***-1.79***	**9.9**
Mom6	**-1.11***	***-1.70***	8.37	-0.46	50.5	**-1.12***	***-1.91***	57.9	**-1.29****	***-2.29***	30.2
Mom3	-0.79	*-1.30*	8.50	-0.32	47.1	-0.69	*-1.25*	73.3	-0.89	*-1.43*	86.2
						Quality					
ROA	0.20	*0.45*	8.42	0.08	26.1	-0.08	*-0.06*	42.3	0.02	*0.08*	68.5
Lev	-0.25	*-0.55*	6.40	-0.13	24.5	-0.21	*-0.53*	89.5	-0.22	*-0.54*	99.1
Liq	-0.07	*-0.15*	6.19	-0.04	32.3	0.10	*0.26*	81.4	-0.07	*-0.17*	81.4
Turn	**-1.19****	***-2.79***	5.84	-0.70	91.0	**-0.78****	***-2.34***	**3.6**	**-1.00****	***-2.43***	**3.4**
						Volatility					
SD	**0.82***	***1.68***	7.01	0.40	28.8	0.38	*0.89*	10.9	0.54	*0.89*	11.4
VaR	**1.54****	***3.15***	7.70	0.69	46.1	**1.26****	***2.48***	**2.5**	**1.35****	***2.36***	**4.7**
IVol	0.73	*1.47*	6.97	0.36	33.0	0.32	*0.74*	**9.1**	0.46	*0.97*	10.3

Note. The table reports performance statistics of capitalization-weighted portfolios from single sorts on 16 distinct value, size, momentum, and quality and volatility metrics. All abbreviations and symbols are identical as in Table 1.

While the "small country effect" observed by Keppler and Encinosa (2011) is no longer visible, momentum portfolios are probably the biggest surprise, with all the momentum portfolios turning highly unprofitable. Moreover, some excess returns and corresponding alphas turn even negative and significantly differ from 0. Clearly, the country-level momentum strategy performs poorly when the top-capitalization markets strongly influence the portfolios.

Turning to quality, while the returns on leverage sorts markedly decreased and are no longer substantial. , the impact of share turnover remains highly significant. The mean excess return on zero-portfolio amounts to -1.19% whereas the MR test indicates decrease monotonicity. Furthermore, either in the case of the CAPM or four-factor model, the GRS tests' hypotheses is rejected while the alphas turn negative and significantly differ from 0.

Finally, the performance changes significantly and resembles the results of Zaremba (2014c). We observe no country-level version of low risk anomaly, which is discussed for example by Ang (2014: 332). Riskier markets deliver higher returns for all three examined metrics, and the phenomenon is mostly

pronounced by VaR. The differential return across extreme portfolios equals 1.54% and is highly significant. The importance of VaR is confirmed by the rejected GRS hypothesis and the sizeable alphas from both the CAPM and four-factor models. These results correspond with the stock-level investigations of Bali and Cakici (2004), who observed that value at risk (VAR) can explain the cross-sectional variation in expected returns while the total volatility or beta have almost no effect.

The liquidity-weighting approach (Table 3) results in some minor variations. Despite the best performance of the E/P ratio sorts, the general profitability of value strategies have decreased, with the highest Sharpe ratio, rejected GRS tests and high and significant alphas on zero-portfolios. The "small country effect" returns to negative, yet approximates zero. The performance of momentum strategies continue to disappoint, with mostly negative (not significantly different from 0) intercepts from asset pricing models. Among quality metrics, the leverage and turnover deserve most attention. This time, however, the negative returns rise higher for leverage, and the abnormal returns on the zero-portfolios turnover from sorts remain considerable, but lose their statistical significance. Finally, focusing on volatility metrics, all the intercepts and excess returns fall markedly and the outcomes are no longer statistically significant. Nonetheless, the positive relation between risk and return is maintained.

Table 3. *Performance of liquidity-weighted portfolios*

	Raw excess returns					Global country-level CAPM			US stock-level four-factor model		
	R	*t*-stat	SD	SR	MR	α	*t*-stat	GRS	α	*t*-stat	GRS
						Value					
B/M	0.59	*1.47*	5.75	0.36	**4.7**	0.43	*1.05*	35.1	0.47	*1.25*	35.1
E/P	**0.78****	***2.56***	4.33	0.62	12.6	**0.63****	***2.13***	**1.6**	**0.69****	***2.26***	**1.5**
CF/P	0.42	*1.29*	4.22	0.34	**3.5**	0.27	*0.95*	47.9	0.24	*0.83*	47.9
DY	0.15	*0.43*	4.26	0.12	84.4	0.43	*1.06*	69.0	0.06	*0.11*	13.7
						Size					
Cap	-0.24	*-0.87*	4.51	-0.19	10.5	-0.18	*-0.59*	90.5	-0.11	*-0.39*	89.7
						Momentum					
Mom12	-0.01	*0.05*	5.93	-0.01	40.0	-0.05	*-0.11*	63.0	-0.20	*-0.46*	51.0
Mom9	-0.24	*-0.45*	5.94	-0.14	42.9	-0.31	*-0.67*	70.5	-0.45	*-0.72*	83.0
Mom6	-0.63	*-1.40*	5.85	-0.37	79.3	-0.65	*-1.54*	13.2	-0.76	*-1.55*	**7.5**
Mom3	0.28	*0.77*	8.85	0.11	**9.3**	0.35	*0.86*	33.7	0.22	*0.62*	40.4
						Quality					
ROA	0.18	*0.69*	4.22	0.15	61.7	0.01	*0.06*	21.2	0.11	*0.41*	18.5
Lev	**-0.78****	***-2.32***	4.93	-0.55	66.2	**-0.64***	***-1.86***	32.9	**-0.75****	***-2.03***	38.8
Liq	0.15	*0.43*	4.26	0.12	84.4	0.04	*0.12*	13.7	0.06	*0.13*	13.7
Turn	-0.62	*-1.46*	5.26	-0.41	85.4	-0.43	*-1.14*	**7.5**	-0.50	*-1.34*	**8.8**
						Volatility					
SD	0.42	*0.94*	5.35	0.27	31.3	0.12	*0.36*	53.1	0.23	*0.58*	47.4
VaR	0.30	*0.72*	5.55	0.19	26.3	0.08	*0.25*	74.9	0.15	*0.37*	89.6
IVol	0.41	*0.94*	5.35	0.27	30.4	0.12	*0.35*	55.5	0.23	*0.58*	48.5

Note. The table reports performance statistics of liquidity-weighted portfolios from single sorts on 16 distinct value, size, momentum, quality and volatility metrics.All abbreviations and symbols are identical as in Table 1.

Table 4 sets out the performance of the strategies implemented separately across the large and small markets. These results should be interpreted with a great deal of caution. On the one hand, the lower intra-portfolio diversification that leads to higher return volatility, may lead to reduce statistical significance of the outcomes. The effectiveness of some strategy may drop, as they may stem from variation of variables across the large and small markets, and not within a single group of markets. Nonetheless, a diligent examination of Table 4 provides a number of interesting insights.

Table 4. *Performance of country-level strategies in large and small markets*

		Raw excess returns			Global country-level CAPM			US stock-level four-factor model		
		R	*t*-stat	MR	α	*t*-stat	GRS	α	*t*-stat	GRS
					Value					
B/M	L	-0.36	*(-0.82)*	52.9	-0.36	*(-0.63)*	81.1	-0.49	*(-0.80)*	81.1
	S	0.69	*(1.11)*	26.1	0.56	*(1.16)*	23.3	0.51	*(1.06)*	23.4
E/P	L	**1.20****	***(1.99)***	23.7	**1.10****	***(2.23)***	**9.7**	**1.10****	***(2.18)***	**9.7**
	S	0.27	*(0.54)*	26.1	0.09	*(0.23)*	94.2	0.12	*(0.25)*	94.2
CF/P	L	0.75	*(1.49)*	**1.2**	0.56	*(1.14)*	58.0	0.58	*(1.15)*	58.0
	S	0.41	*(1.18)*	26.1	0.33	*(0.80)*	47.0	0.15	*(0.29)*	47.0
DY	L	0.50	*(1.13)*	**8.1**	0.56	*(1.31)*	56.4	0.49	*(1.11)*	56.5
	S	0.34	*(0.73)*	26.1	0.37	*(0.73)*	72.7	0.47	*(1.00)*	72.8
					Size					
Cap	L	0.37	*(1.25)*	64.0	0.12	*(0.42)*	43.0	0.20	*(0.68)*	46.9
	S	0.08	*(0.23)*	26.1	0.01	*(0.04)*	63.9	0.01	*(0.07)*	65.3
					Momentum					
Mom12	L	-0.78	*(-1.53)*	67.0	-0.81	*(-1.46)*	25.0	**-0.91***	***(-1.67)***	38.9
	S	**0.95****	***(2.01)***	26.1	**1.00***	***(1.84)***	11.7	**0.88***	***(1.70)***	14.1
Mom9	L	-0.27	*(-0.54)*	71.0	-0.21	*(-0.36)*	18.0	-0.34	*(-0.58)*	21.6
	S	0.40	*(0.92)*	26.1	0.45	*(0.86)*	23.4	0.32	*(0.66)*	14.2
Mom6	L	**-1.19***	***(-1.81)***	27.9	**-1.15****	***(-2.02)***	84.7	**-1.34****	***(-2.43)***	69.7
	S	0.22	*(0.60)*	26.1	0.32	*(0.62)*	39.1	0.2	*(0.41)*	51.8
Mom3	L	-0.73	*(-1.24)*	17.6	-0.70	*(-1.20)*	73.2	-0.88	*(-1.36)*	94.5
	S	0.37	*(0.91)*	26.1	0.46	*(0.99)*	34.8	0.45	*(1.01)*	24.5
					Quality					
ROA	L	0.62	*(1.05)*	14.1	0.37	*(0.74)*	23.3	0.49	*(0.86)*	31.6
	S	-0.55	*(-1.07)*	26.1	-0.59	*(-1.17)*	81.5	-0.46	*(-0.83)*	82.0
Lev	L	-0.33	*(-0.79)*	48.4	-0.25	*(-0.61)*	78.9	-0.23	*(-0.54)*	88.1
	S	-0.43	*(-0.91)*	26.1	-0.34	*(-0.86)*	45.2	-0.47	*(-1.11)*	34.7
Liq	L	0.50	*(1.13)*	**8.1**	0.56	*(1.31)*	56.4	0.49	*(1.11)*	56.5
	S	0.34	*(0.73)*	26.1	0.37	*(0.73)*	72.7	0.47	*(1.00)*	72.8
Turn	L	**-1.08****	***(-2.39)***	85.1	**-0.63***	***(-1.72)***	**7.1**	**-0.87****	***(-1.95)***	**9.6**
	S	**-0.78***	***(-1.82)***	26.1	-0.8	*(-1.55)*	69.8	**-0.82***	***(-1.73)***	57.4
					Volatility					
SD	L	**1.27****	***(2.48)***	39.9	**0.82***	***(1.90)***	**3.6**	**1.01****	***(2.00)***	**3.0**
	S	0.62	*(1.01)*	26.1	0.33	*(0.64)*	88.1	0.54	*(1.10)*	64.6
VaR	L	**1.15****	***(2.26)***	33.2	**0.84***	***(1.69)***	**1.7**	**0.93***	***(1.68)***	19.6
	S	-0.40	*(-0.89)*	26.1	-0.74	*(-1.37)*	60.0	-0.46	*(-0.92)*	65.2
IVol	L	**1.27****	***(2.48)***	40.2	**0.82***	***(1.90)***	**3.7**	**1.01****	***(2.00)***	**3.2**
	S	0.61	*(0.99)*	26.1	0.32	*(0.61)*	89.5	0.53	*(1.06)*	67.1

Note. The table reports performance statistics of capitalization-weighted portfolios from single sorts on 16 distinct value, size, momentum, quality and volatility metrics. The strategies were tested in large (L) and small (S) markets, which were divided by a median capitalization in a given month. All abbreviations and symbols are identical as in Table 1.

In general, value and quality sorting among both large and small markets follow the similar pattern as in Tables 1-3. The impact of size is generally inconclusive, which bear some similarities to our previous results discussed in this paper. Nevertheless, the momentum and volatility anomalies reveal some noteworthy patterns. The momentum strategy appear to be successful only in the case of the small markets, with all the excess returns and intercepts on all variants of momentum in the small markets positive. The best performing version – 12-month momentum – displays both positive and statistically significant outstanding returns. Surprisingly, the returns on momentum become inverted in the large markets. Again, in this case the excess returns and intercepts on all variants of momentum in large markets are, in effect, negative. This is most pronounced in the case of the momentum strategy with the past performance of 6 months. In this case, the intercepts from both the CAPM and four-factor models significantly differ from 0 and reach-1.15% and -1.35%, respectively. Although the GRS tests are allowed, in the large markets group the past winners undoubtedly outperform the past losers[11]. To conclude, the momentum strategy appears to vary across the large and small markets, and this phenomenon may explain the discrepancies between the equally and capitalization-weighted portfolios presented in Tables 1 and 2.

Another valid observation pertains to the volatility strategy. This approach works markedly better in the large markets, with GRS tests rejected and substantial alphas significantly differ from 0. In the case of the small markets, the strategy proves less impressive, particularly in the case of VaR, where it turns negative.

Finally, Table 5 reports on the performance of the strategies across the open and closed markets. Similarly to Table 4, the contents of Table 3 should be interpreted with due caution. To some extent, the Table resembles conditions closer to the real-life practice, as investing in closed markets may prove difficult in real life circumstances.

Principally, the value and momentum strategies reveal similarities to the results in Table 4, with the E/P sorts as the best performing strategy and predominantly negative momentum returns. Curiously, the effectiveness of the "small market" strategy rises in the open markets. Its CAPM intercept equals -0.76% and significantly varies from 0.Inthe close markets, the size impact reverses (with the biggest markets outperforming the smallest).

While the leverage strategy proves effective for the open markets (although GRS tests are allowed), for closed markets its performance inverts. In other words, although in the open markets the bigger the

[11] For comparison, Zaremba (2014a), who also momentum investigated long/short strategies in a group of 30% largest markets using gross arithmetical returns, find returns slightly below zero on the zero-cost portfolios, but the scale of negative returns was much smaller.

leverage, the worse the returns, it is reversed in the close markets (although here the intercepts are statistically insignificant).

The turnover effect, which has been observed in the above tables, now is detectable predominately within the closed markets. Investors should appreciate this observation, as it indicates that easily accessible markets provide no drag for improved liquidity. On the other hand, the notion of market openness is directly linked to liquidity. Bearing in mind that the excess returns on liquidity sorted portfolios in Table 2 are not monotonic, it may prove that only significantly illiquid markets are rewarded with an investment premium. Within the relatively liquid and openly accessible markets the premium disappears.

Table 5. *Performance of country-level strategies in open and closed economies*

		Raw excess returns			Global country-level CAPM			US stock-level four-factor model		
		R	*t*-stat	MR	α	*t*-stat	GRS	α	*t*-stat	GRS
					Value					
B/M	O	0.19	*(0.48)*	14.1	0.14	*(0.25)*	39.9	-0.06	*(-0.14)*	40.0
	C	-0.28	*(-0.60)*	13.8	-0.34	*(-0.66)*	99.0	-0.36	*(-0.69)*	99.0
E/P	O	**0.89***	***(2.16)***	**8.8**	**0.77****	***(1.97)***	**2.9**	**0.72***	***(1.75)***	**2.9**
	C	**1.00***	***(1.66)***	88.4	**1.13***	***(1.86)***	**0.6**	**1.19****	***(1.98)***	**0.6**
CF/P	O	0.42	*(1.05)*	26.2	0.3	*(0.73)*	12.7	0.15	*(0.32)*	12.7
	C	0.86	*(1.54)*	81.0	0.82	*(1.45)*	38.1	0.77	*(1.42)*	38.1
DY	O	0.36	*(0.93)*	25.2	0.2	*(0.58)*	53.3	0.18	*(0.50)*	53.3
	C	-0.01	*(0.10)*	13.0	0.25	*(0.52)*	83.3	0.07	*(0.08)*	83.3
					Size					
Cap	O	**-0.74***	***(-1.84)***	62.3	**-0.76***	***(-1.83)***	35.0	-0.65	*(-1.24)*	59.4
	C	0.61	*(1.16)*	56.8	0.29	*(0.46)*	56.5	0.47	*(0.75)*	57.5
					Momentum					
Mom12	O	-0.61	*(-1.15)*	50.3	-0.56	*(-1.19)*	35.6	-0.58	*(-1.40)*	28.3
	C	-0.36	*(-0.67)*	11.4	-0.33	*(-0.58)*	99.7	-0.45	*(-0.84)*	99.3
Mom9	O	-0.27	*(-0.56)*	48.5	-0.23	*(-0.43)*	70.0	-0.25	*(-0.49)*	63.0
	C	-0.40	*(-0.66)*	38.6	-0.36	*(-0.61)*	85.0	-0.72	*(-1.25)*	81.7
Mom6	O	-0.35	*(-0.54)*	41.5	-0.28	*(-0.51)*	35.0	-0.44	*(-0.86)*	32.3
	C	**-1.44****	***(-2.46)***	91.6	**-1.41****	***(-2.37)***	**4.6**	**-1.63****	***(-2.90)***	**3.4**
Mom3	O	0.13	*(0.30)*	**9.6**	0.24	*(0.41)*	23.1	0.02	*(0.04)*	14.5
	C	-1.16*	*(-1.86)*	49.1	**-1.09***	***(-1.75)***	85.3	**-1.23****	***(-2.08)***	69.7
					Quality					
ROA	O	**0.63***	***(1.66)***	**9.5**	0.52	*(1.42)*	16.2	0.53	*(1.44)*	**7.2**
	C	-0.22	*(-0.19)*	61.3	-0.33	*(-0.41)*	85.2	-0.44	*(-0.55)*	81.4
Lev	O	**-0.86****	***(-2.27)***	80.9	**-0.87****	***(-2.28)***	16.4	**-0.82****	***(-2.08)***	**17.1**
	C	0.92*	*(1.67)*	54.4	0.7	*(1.32)*	42.4	0.74	*(1.33)*	51.5
Liq	O	0.36	*(0.93)*	25.2	0.2	*(0.58)*	53.3	0.18	*(0.50)*	53.3
	C	-0.01	*(0.10)*	13.0	0.25	*(0.52)*	83.3	0.07	*(0.08)*	83.3
Turn	O	0.14	*(0.21)*	43.1	0.14	*(0.42)*	30.2	0.13	*(0.39)*	25.7
	C	**-1.04***	***(-2.16)***	40.6	**-0.71***	***(-1.72)***	64.1	**-1,00****	***(-2.30)***	68.7
					Volatility					
SD	O	-0.17	*(-0.28)*	33.8	-0.53	*(-1.06)*	49.9	-0.41	*(-0.88)*	68.6
	C	0.65	*(1.37)*	61.8	0.32	*(0.62)*	17.8	0.3	*(0.56)*	33.2
VaR	O	-0.45	*(-0.88)*	95.6	-0.78	*(-1.56)*	20.4	-0.49	*(-0.95)*	51.8
	C	0.59	*(1.09)*	37.5	0.51	*(0.82)*	14.1	0.33	*(0.55)*	**4.6**
IVol	O	-0.17	*(-0.26)*	35.5	-0.52	*(-1.04)*	45.3	-0.4	*(-0.87)*	65.3
	C	0.67	*(1.46)*	62.1	0.33	*(0.65)*	14.4	0.3	*(0.56)*	23.3

Note. The table reports performance statistics of capitalization-weighted portfolios from single sorts on 16 distinct value, size, momentum, quality and volatility metrics. The strategies were tested in open (O) and close (C) economies, which were divided by a median KAOPEN index (Chin & Ito, 2008) a given month. All abbreviations and symbols are identical as in Table 1.

Last but not least, the volatility effect, which is presented in Table 2, arises only in the closed markets. In the open markets, however, we observe a version of inter-market low-risk anomaly, which indicates to the superior performance of low volatility countries. Although this observation lacks statistical significance, we advocate that the country-level volatility strategies be treated with caution.

Concluding remarks

In our research, we have re-examined the robustness of a number of quantitative country selection strategies. The results prove E/P sorts to be an effective value strategy. The "small market effect" discovered by Keppler and Encinosa (2011) has been found both limited in scale and insignificant. The momentum strategy should be applied with particular caution, as it appears to yield results only for small markets and generates losses in large markets. Seeking countries with low-indebted companies proves a profitable strategy, especially for large markets, although the illiquidity premium seems reliable, it requires investments in highly illiquid countries. Finally, we observe strong positive volatility – return relation, which should, however, be approached with cautions it mainly characterizes large markets and varies significantly across open and closed economies. These findings may provide valuable lessons for country-level investors, asset managers and fund pickers.

We should stress here that the results bear two important limitations: firstly, the research period spans over the years of the global financial crisis, which may affect the findings; secondly, our study takes no account of transaction costs, which are largely investor-specific.

Further research on the issues addressed in this paper could be pursued in a number of directions. The interactions between various strategies require further examination. Even if the standalone sorts' performance disappoints, the combinations thereof may provide satisfactory results. Also, the nonlinearities and the non-monotonic relation between returns and underlying variables may warrant further investigation. Similarly interesting is the potential impact of some parallels in stock-level anomalies, e.g. calendar effects, on the performance of country-level strategies. Also, further exploration whether the performance of these strategies may be successfully predicted with stock-level analysts' tools, like for example factor spreads, may deliver interesting insights.

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