2. Data, variables, and methodology

2.1 Data

Our sample data was provided by our supervisors Steffen Windmüller and Matthias Hanauer from TUM. It includes monthly stock market data for companies within the BRIC region. This includes companies from Brazil, Russia, India, and China. Additionally, we were provided a static data sheet containing general company information and a 3rd datasheet with annual accounting information for this companies. The data extraction was – to our best knowledge – done like in Hanauer and Lauterbach (2019). To make monthly and yearly data comparable and to have the same scaling for both, we multiplied the market capitalisation from the monthly datasheet by 10^6 and the yearly accounting data by 10^3.

Due to either poor and/or rare company information before the mid-90s, we decided to limit our raw data to the period from July 1996 to October 2018 for the monthly data and from 1995 to 2018 for the annual data. Subsequently we calculated the 1-month lagged market value (LMV and LMV.USD), the 36-month rolling window volatility (Volatility) and the 12-month rolling window Momentum. Finally, we added a column, with the lagged market value in June of year y for a stock in the respective time July of year y to June of year y + 1 (MV.USD.June). A security was only included to the sample if all these figures were available, as well as the market value in local currency, the market value in US-Dollar and the return in US-Dollar.

Additionally, we excluded securities where no book equity, operating profit or asset growth was available for year y.

As risk-free rate we used the US 1-month T-bill rate. We therefore downloaded from Kenneth R. French’s website under the link <https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html> the Fama/French 5 Factors (2x3) CSV-sheet, which includes the 1-month T-bill rate.

Table X?3X – Statistics on securities included: Big and small stocks.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **BRIC** | **Brazil** | **Russia** | **India** | **China** |
| Total no. firms | 6471 | 232 | 395 | 3022 | 2822 |
| Min no. firms | 201 | 33 | 1 | 167 | 34 |
| Mean no. firms | 2493 | 100 | 100 | 1131 | 1184 |
| Max no. firms | 5255 | 169 | 241 | 2284 | 2696 |
| Mean size in USD | 3.390764\*10^12 | 3.085325\*10^11 | 3.757233\*10^11 | 7.388358\*10^11 | 2.045772\*10^12 |
| Median size in USD | 2.322141\*10^12 | 3.331569\*10^11 | 4.258591\*10^11 | 6.159941\*10^11 | 1.074046\*10^12 |
| Total size in USD | 9.087246\*10^14 | 7.528195\*10^13 | 8.716783\*10^13 | 1.980080\*10^14 | 5.482669\*10^14 |
| % of total size | 100 | 8.23 | 9.59 | 21.79 | 60.33 |
| Start ym | July 1996 | July 1998 | July 1999 | July 1996 | July 1996 |
| End ym | October 2018 | October 2018 | October 2018 | October 2018 | October 2018 |

Big stocks are defined as the stocks belonging to a portfolio of the first stocks summing up to 90% of the overall market capitalisation in the BRIC region. Hereby, we rebalance yearly based on MV.USD.June. The benchmark is defined as the portfolio containing all big stocks in the referring year.

Table X?2X – Statistics on securities included: Big stocks and Benchmark.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **BRIC** | **Brazil** | **Russia** | **India** | **China** |
| Total no. firms | 2987 | 144 | 121 | 468 | 2254 |
| Min no. firms | 67 | 11 | 1 | 49 | 18 |
| Mean no. firms | 830 | 44 | 33 | 149 | 612 |
| Max no. firms | 1865 | 91 | 72 | 270 | 1571 |
| Mean size in USD | 3.021840\*10^12 | 2.965055\*10^11 | 3.659025\*10^11 | 6.536660\*10^11 | 1.781470\*10^12 |
| Median size in USD | 2.045943\*10^12 | 3.078790\*10^11 | 4.067016\*10^11 | 5.652417\*10^11 | 8.723458\*10^12 |
| Total size in USD | 8.098532\*10^14 | 7.234736\*10^13 | 8.488939\*10^13 | 1.751825\*10^14 | 4.774340\*10^14 |
| % of total size | 100 | 8.93 | 10.48 | 21.63 | 58.95 |
| Start ym | July 1996 | July 1998 | July 1999 | July 1996 | July 1996 |
| End ym | October 2018 | October 2018 | October 2018 | October 2018 | October 2018 |

All size variables refer to monthly market capitalisation in USD.

2.2 Variables

For calculating the five factors from Fama and French (2015) we needed to calculate multiple variables. This includes the book equity for the HML and RMW factor, the operating profits for the RMW factor and asset growth for the CMA factor. Additionally, for creating our strategy and show the Momentum factor, we needed to define and calculate which stocks are considered winner and which looser stocks. To implement our low volatility strategy, we further calculated the volatility for every stock. The concrete implementation is illustrated in Table X?1?.

All variable calculations refer to a security in year y. For accounting data, we refer to the accounting data from the fiscal year ending in the mentioned year.

Table X?1? - Variables

|  |  |
| --- | --- |
| Book equity | Book equity was calculated as in Hanauer and Lauterbach (2019) as Common Equity (Worldscope code: WC03501) in year y - 1 plus Deferred Taxes (WC03263) in year y - 1, with Deferred Taxes set to 0, if missing. |
| Operating profits | Operating profits were calculated as in Fama and French (2015) as Net Sales or Revenue (WC01001) minus Cost of Goods Sold (WC01051) minus Selling, General and Administrative Expenses (WC01101) minus Interest Expense on Debt (WC01251). All from year y – 1. If a value was missing for one of these items, we set the respective item to 0. This was not the case, when all four items were missing. |
| Asset growth | We calculated the asset growth as in Cooper et al. (2008). Therefore, we divided Total Assets (WC02999) from year y – 1 minus Total Assets from year y – 2 by Total Assets from year y – 2. |
| Book-to-Market Ratio (B/M) | As we use Momentum as one of our portfolio selection criteria, we followed Hanauer and Lauterbach (2019), Asness and Frazzini (2013) and Barillas and Shanken (2018) and calculated the B/M-ratio - for both strategy and Fama French factors - by dividing Book Equity by the latest local currency Market Value. |
| OP/BE-Ratio | The Operating Profits-to-Book Equity Ratio (OP/BE-Ratio) is computed dividing Operating Profits by Book Equity. |
| Momentum | Our Momentum variable was calculated following Grinblatt and Moskowitz (2004) using positive returns as criterium and looking at a 12-month rolling window. a security is defined a winner, if 8 out of 11 months had positive returns. The 11 months comprise the last 12 months without the most recent previous month measured. As we are not considering contrarian strategies, we treat missing returns (NA’s) like negative returns, to avoid filtering out winner stocks, where only one to three returns are missing, due to bad data quality. |
| Volatility | We calculated our volatility variable based on Hanauer and Lauterbach (2019) with a 36-month rolling window. The volatility is thereby the standard deviation of the last 36 monthly stock returns, with a minimum of 12 returns being required. Deviating from Hanauer and Lauterbach (2019) we use USD-returns instead of local currency returns in order to reflect better on our BRIC as a whole focus. |

2.3 Factor calculation

Following Fama and French (2015) we calculated our factors based on 2x3 sorts by using the 30th and 70th NYSE percentiles for respectively B/M, OP/BE, and Asset growth. For Size we followed Hanauer and Lauterbach (2019) and Fama and French (2012) and used 90% of market capitalisation as breakpoint instead of the NYSE median. Like them, we decided to exclude micro stocks.

|  |  |
| --- | --- |
| Factor | Used Variable |
| SMB “Size” | MV.USD |
| HML “Value” | B/M |
| RMW “Profitability” | OP/BE |
| CMA “Investment” | Asset Growth |

Literature:

@article{grinblatt2004predicting,

title={Predicting stock price movements from past returns: The role of consistency and tax-loss selling},

author={Grinblatt, Mark and Moskowitz, Tobias J},

journal={Journal of Financial Economics},

volume={71},

number={3},

pages={541--579},

year={2004},

publisher={Elsevier}

}