RESEARCH ARTICLE

AESTIMATIO, THE IEB INTERNATIONAL JOURNAL OF FINANCE, 2018. 17: 82-103 DOI:10.5605/IEB.17.5

Size, value and momentum in stock returns: The case of Latin American emerging markets

Vuong, Ngoc B.
Vu, Trang T.Q.

▸ RECEIVED: 15 SEPTEMBER 2017 / ▸ ACCEPTED: 1 NOVEMBER 2017 / ▸ PUBLISHED ONLINE: 27 NOVEMBER 2017

Abstract

The paper examines value and momentum effects in four Latin American emerging markets, namely Brazil, Chile, Mexico, and Peru, during the period from 2006 to 2015. Empirical evidence shows that value and momentum premiums are present in most of these countries, except in Peru where there is no momentum premium. We also investigate the size pattern of these two factors and find that value and momentum have smaller impacts on big stocks than on small stocks. With the exception of Chile, we discover negative correlations between value and momentum premiums in each country, but the relationships between these factors across countries are weak with small coefficients, and only five out of sixteen coefficients are statistically significant. In addition, when performing asset-pricing tests for returns of value and momentum portfolios against excess market returns, we observe mostly positive and strongly significant alphas but small and insignificant betas in all countries.

Keywords: Emerging stock markets, Size effect, Value premium, Momentum premium.

JEL classification: G11, G14.

Please cite this article as:

Vuong, Ngoc B. and Vu, Trang T.Q. (2018). Size, value and momentum in stock returns: The case of Latin American emerging markets, *AESTIMATIO, The IEB International Journal of Finance,* **17**, pp. 82-103. doi: 10.5605/IEB.17.5

Vuong, N. B. ✉ Lecturer in Finance at Faculty of Finance – Banking and Business Administration at Quy Nhon University (Vietnam). 170 An Duong Vuong, Quy Nhon, Binh Dinh, Vietnam. Email: vuongbaongoc@fbm.edu.vn.
Vu, T.T. Q. Bank for Investment and Development of Vietnam – Hanoi Branch (Vietnam).

AESTIMATIO, THE IEB INTERNATIONAL JOURNAL OF FINANCE, 2018. **17**: 82-103

Tamaño, valor y momentum en los rendimientos de las acciones: **el caso de los mercados emergentes latinoamericanos**

Vuong, Ngoc B.
Vu, Trang T.Q.

Resumen

En este artículo se investigan los efectos valor y momentum en cuatro mercados latinoamericanos, Brasil, Chile, México y Perú, en el periodo 2006-2015. La evidencia empírica demuestra la existencia de primas de los factores valor y momentum, con la excepción de la prima de momentum en Perú. También se investiga el patrón de tamaño en estos dos factores, llegándose a la conclusión de que tanto el valor como el momentum tienen un impacto menor en las "big stocks" que en las "small stocks", tal y como se han definido en este artículo. Exceptuando Chile, en los demás países analizados se detectan correlaciones negativas entre las primas por valor y momentum; sin embargo, las correlaciones cruzadas son débiles y tan solo 5 de un total de 16 de ellas son estadísticamente significativas. Además, en la estimación de tres modelos CAPM diferentes para los rendimientos de carteras de valor y de momentum frente al exceso de rendimiento de los mercados considerados (respecto del activo libre de riesgo), se observa que, en todos los países analizados, las alfas son mayoritariamente positivos y fuertemente significativos mientras que las betas son pequeñas y no significativas en todos los países.

Palabras clave:

Mercados emergentes de acciones, efecto tamaño, prima de valor, prima del factor momentum.

1. Introduction

Nowadays, stock markets in emerging countries are playing an increasingly important role in the global stock markets. Due to their greater economic growth and potentially higher returns, emerging markets have been the focus of growing attention from investors in the developed world. Such countries are also said to provide diversification benefits for these investors because of their low correlations with assets in developed markets. However, despite the attractiveness of emerging markets, investing in them entails many issues and associated risks that are not present in the developed world. Moreover, compared to advanced economies, relatively few researchers investigate investment issues in emerging markets due to the lack of available and high-quality data. These limitations prompted us to focus our study on these markets, and particularly value and momentum anomalies in Latin American developing countries. Among emerging regions, our paper concentrates on Latin America rather than Asia or Europe, since it is experiencing a better recovery, especially Brazil, and there are few studies to date focusing exclusively on this area.

In reality, value investing is not a new investment strategy. It derives from the ideas that Ben Graham and David Dodd began teaching at Columbia Business School in 1928 and subsequently developed in their 1934 text, Security Analysis. Value premiums generally involve buying securities that appear under-priced by some forms of fundamental analysis. On the contrary, the existence of momentum is also a market anomaly but is based on the idea that stocks with strong past performance continue to outperform stocks with poor past performance in the following period. One of the most well-known momentum strategies – buying winners and selling losers – was introduced in Jegadeesh and Titman (1993). From that time on, not only a significant number of investors but also many researchers have been paying close attention to the effects of value and momentum on stock returns.

According to previous empirical research, value and momentum are proved to be present in many markets all over the world. For the U.S., Fama and French (1993) report an average premium of 0.40% per month for the book-to-market (value) factor during the period between 1963 and 1991. Expanding the sample period, Chen *et al.* (2008) find that from 1945 to 2005, the expected value premium is on average 6.1% per annum and has been largely stable over the last half century, compared to the equity premium. Like the value factor, over the period 1926-1995, a momentum strategy in the U.S. market would have earned an average monthly "return" (profit per dollar long) of 0.44%, according to Grundy and Martin (2001). Globally, Griffin *et al.* (2003) show that the winner-minus-loser portfolios are largely profitable around the world, with Asian countries displaying the weakest momentum profits. Asness *et al.* (2013) also discover consistent value and momentum return premiums

across eight diverse markets and asset classes, and a strong common factor structure among their returns. Value and momentum effects in international stock markets are also introduced in the papers of Rouwenhorst (1998), and Fama and French (1998, 2012). Specifically, Rouwenhorst (1998) discovers that an international diversified portfolio of past medium-term winners out-performs a portfolio of medium-term losers, although he only concentrates on developed European countries. Fama and French (2012) examine four regions (North America, Europe, Japan, and Asia Pacific) and show that, except for Japan, they all reveal momentum returns. Cakici and Tan (2014) support the results of these papers by working with country-level data. In addition, there are several empirical studies that document the presence of value and momentum in emerging markets. The paper of Cakici *et al.* (2013) examines value and momentum effects in 18 emerging stock markets and finds strong evidence for value and momentum in all emerging regions, except Eastern Europe (no momentum). In more recent research, Zaremba and Konieczka (2015) find very high value premiums and strong synergy effects between value and momentum strategies in Eastern European stock markets.

Relating to the size patterns in value and momentum effects, Atanasov and Nitschka (2014) find that the small stock component of value and momentum factors explains differences in returns on regional and global size, value and momentum portfolios, but this result does not hold for the big stock component of common risk factors. According to Fama and French (2012), there are value premiums in average stock returns that, except for Japan, decrease with size, while spreads in average momentum returns also decrease from smaller to bigger stocks. Similarly, big stock value and momentum premiums also appear to be smaller than with small stocks, as shown by Cakici and Tan (2014). In particular, when studying value and momentum for 18 European countries as well as the European region in general, Foye (2016) demonstrates that value and momentum premiums exist at a Europe-wide level, but the size premium can only be detected at a national level.

Based on these findings, in this research, we not only study the impact of value and momentum on stock returns but also look more closely at the size patterns in value and momentum by using country-level data rather than regional data, focusing exclusively on Latin American emerging stock markets.

In general, our results can be summed up in four main points. Firstly, we test for the existence of value and momentum, which have been addressed in recent research papers, especially those of Cakici and Tan (2013) and Zaremba and Konieczka (2015) which also study emerging markets. We find that in the four countries under analysis, value and momentum returns appear in all countries' stock markets and have impacts on the returns of diversified portfolios during the period from January 2006 to December 2015;

however, momentum premiums are not found in Peru, while value effects are statistically significant in Mexico and Peru, and momentum effects only in Chile.

Secondly, we provide country-level evidence of the size patterns in value and momentum returns. The purpose of this study is to determine whether investors can earn the same value and momentum returns if they invest primarily in stocks which have large market-capitalization (big stocks) and so often have lower transaction costs compared to small market-capitalization stocks (small stocks). We discover that in all four countries, value and momentum factors have a smaller effect on big stocks than on small stocks, with the exception of the value effect in Mexico; not all effects are statistically significant however. This result is also consistent with the findings for developed countries reported in Cakici and Tan (2014).

Thirdly, the benefits of combining value and momentum strategies are documented through the correlations between the two factors in the same country. The results of negative correlations between value and momentum factors in three out of the four countries (all except Chile) suggest that investors in these countries can make a profit from diversified portfolios that combine both value and momentum strategies. In addition, we broaden the scope of value and momentum effects by investigating the correlation between the value factor in one country with the momentum factor in another. In recent years, as a result of globalization, investors have not been limiting their investments to their home country. Thus, the economic issue here is whether investors can benefit from value and momentum effects when they invest in different countries. We find that half (8 out of 16) of the cross-country correlations between value and momentum factors are negative but only two of them are statistically significant.

Finally, we report the results of asset-pricing tests, which are used to discover the abnormal returns generated from value and momentum factors. We find the same pattern in the results of alphas and betas for the two variables. In conclusion, value and momentum strategies in emerging Latin American markets can be attractive to local, regional and U.S. investors because alphas from the three CAPM models are mostly positive and strongly significant. The magnitude of alphas is also in line with the expected returns of value and momentum factors. On the contrary, small and insignificant betas indicate a weak relationship of value and momentum with market returns.

The paper is organized as follows. In section 2, we introduce the data used and the methodology applied to form the value and momentum portfolios. The results and robustness tests are reported in sections 3 and 4, respectively. The last section summarizes our paper.

2. Data and methodology

This section details the data we use in the paper. We also explain here how value and momentum factors are created by using stock return data.

2.1. Equity data

Our sample comprises stock data from four Latin American securities markets: Brazil, Chile, Mexico, and Peru. All these data come from Thomson Reuters Datastream (TDS). In this research, we include both active and delisted shares[1] to minimize survival bias in our sample. The sample is then extensively filtered to select only common stock issues using the method provided in Annaert *et al.* (2013) described in Appendix A. For these companies, we download the end-of-month return index (RI), market capitalization (MV) and market-to-book value (MTBV) from 31 December 2004 to 31 December 2015[2]. According to Cakici and Tan (2014), one year of data is lost in forming the momentum factors, so our research sample starts from January 2006. All return indices are in U.S. dollars. Stock returns are calculated using return indices. In order to correct potential decimal errors in the TDS database, we omit returns which are above 400% or below -85%. Then we set returns as missing if R_t or R_{t-1} is greater than 300% and $[(1+R_{t-1})(1+R_t)-1]$ is less than 50%[3]. Finally, we remove stocks which do not have at least 12 months past returns during our sample period[4]. The end results in a sample of 1027 companies. Excess returns are calculated relative to the one-month U.S. T-bill. Returns of the U.S. T-bill as well as U.S. excess market returns are downloaded from Kenneth French's website. Book-to-market (*B/M*) ratio is simply the reverse of market-to-book value. We work with data at country level.

2.2. Calculation of asset-pricing factors

For each country in our sample, we compute four factors that will be used in the asset-pricing test: the market factor, the size (*SMB* - Small minus Big) factor, the value (*HML* - High minus Low) factor and the momentum (*WML* - Winner minus Loser) factor. The market return is simply the value-weighted average of all stock returns in the country. However, to figure out the *SMB*, *HML*, and *WML* factors, we need to sort on both size and *B/M* ratio as well as on size and momentum, respectively. Following previous research papers, the 6-month lagged value of the *B/M* ratio is used

[1] The lists used are: FBRA, DEADBRA (Brazil); FCHILE, DEADCHI (Chile); FMEX, DEADME (Mexico); FPERU, DEADPE (Peru).

[2] To correct the error that TDS continuously reports data for dead stocks after delisting date, we use special datatype (e.g. RI*((P#T)/(P#T)) for return index) to set data of dead stocks as "na" from delisting date.

[3] The error and correct methods are presented in detail in Annaert et al. (2013).

[4] Following Asness *et al.* (2013), we require stocks to have at least 12-month returns during the sample period in order to comfortably run the estimation at monthly frequency.

to ensure the available accounting information at the time of sorting portfolios. All portfolios are formed monthly.

We follow the methodology applied in Fama and French's paper (2012) when calculating the *SMB*, *HML* and *WML* factors. For each country, we form six portfolios to calculate the *SMB*, *HML* factors and four portfolios to determine the *WML* factor.

Firstly, to construct *SMB* and *HML* factors, at the end of June of each year t, we divide stocks into big and small stocks, such that big stocks are the top 90% in terms of market capitalization and the remainder are small stocks. Then, using the *B/M* ratio of big stocks in December of year $t-1$, we define the bottom 30% (growth), middle 40% (neutral) and top 30% (value) breakpoints applied to both the big and small stocks. We use breakpoints from big stocks to prevent the sorts from being driven by the plentiful but less important tiny stocks. Six value-weighted portfolios are formed: *SG, SN, SV, BG, BN, BV,* in which *S* and *B* denote small and big; and *G, N,* and *V* stand for growth, neutral, and value, respectively. We compute monthly value-weighted returns for each portfolio from July of year t to June of $t+1$. The size factor, *SMB*, is the equal-weighted average of the returns on the three small stock portfolios (Small) minus the equal-weighted average of the returns on the three big stock portfolios (Big).

The value factor, *HML,* is constructed from value-minus-growth returns of both small and big stocks: $HML_S = SV - SG$ and $HML_B = BV - BG$, and *HML* is the equal-weighted average of HML_S and HML_B.

The method used to construct the momentum factor is identical to that for the value factor, except that the sort is carried out monthly and based on lagged momentum return, not the *B/M* ratio.

For portfolios formed at the end of month t, the lagged momentum return is the stock's cumulative return from $t-12$ to $t-2$ (the formation month $t-1$ is excluded as is common practice in the momentum literature). Therefore, to be included in the sort, stock returns must be available in every month from $t-12$ to $t-2$ and size must be available in month $t-1$. After classifying by size, we form four value-weighted portfolios: *SL, SW, BL* and *BW*, where *S* and *B* are small and big, respectively; *L* denotes losers (bottom 30% of lagged momentum) and *W* winners (top 30% of lagged momentum). The momentum factor, *WML*, is the equal-weighted average of WML_S and WML_B, in which $WML_S = SW - SL$ is winner-minus-loser returns of small stocks and $WML_B = BW - BL$ is winner-minus-loser returns of big stocks.

3. Results

3.1. Market, size, value and momentum

3.1.1. Market and size factors

● Table 1. **Market premiums and size factors: means and *t*-statistics**

	$R_m - R_f$		*Small (S)*		*Big (B)*		*SMB*	
	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.
Brazil	1.22	1.20	0.80	0.66	1.20	1.22	-0.41	-0.93
Chile	0.85	1.39	1.25	2.01**	0.87	1.43	0.38	1.70*
Mexico	1.21	1.77*	1.44	2.21**	1.29	1.81*	0.15	0.05
Peru	1.99	2.52**	2.06	3.26***	1.85	2.26**	0.21	0.44

The table shows means and t-statistics (t-stat.) for market risk premiums as well as size factors for monthly stock returns of companies in Brazil, Chile, Mexico, and Peru. R_m is the value-weighted returns of all stocks in each country's market. R_f is one-month U.S. T-bill rates. *Small* (*S*) and *Big* (*B*) are the equal-weighted returns of three small portfolios and three big portfolios, respectively. *SMB* is the difference between Small and Big returns. Stock returns are converted to U.S. dollars. *t*-statistics are calculated using heteroskedasticity and autocorrelation consistent (HAC) covariance matrix estimation. The data period is from January 2006 to December 2015.
*, **, ***: significance level at 10%, 5%, and 1%, respectively.

Table 1 shows the average returns for market risk premiums and size factors of the stock market in each country. The table also displays *t*-statistics of excess market returns and returns of *Small*, *Big* and *SMB* portfolios. As can be seen from the table, the means of excess market returns in the four countries are all positive, with the lowest in Chile at 0.85% per month and the highest in Peru at 1.99% a month. However, these market premiums are significant in Mexico and Peru only.

We also note that with the exception of the Brazilian market, all the countries witness higher returns for small stocks than big stocks, and all of these results are statistically significant. In particular, the returns are highest in Peru for both size portfolios, 2.06% and 1.85% per month for *Small* and *Big* portfolios, respectively.

The contrast in magnitude between the returns for small and big shares in Brazil compared with other countries means that the Brazilian market is the only one with a negative size premium point estimate (–0.41% per month for the *SMB* mean). However, we find that there is no size effect in three out of the four markets, with the exception of Chile, which reports significantly positive expected returns for the *SMB* portfolio (0.38%). Our results are consistent with Fama and French (2012) and Cakici and Tan (2014), who also find no size premium in developed countries all over the world, but differ from Foye (2016), and Zaremba and Konieczka (2015), who focus on European countries only and find strong size effects.

3.1.2. Value factors

● Table 2. **Value factors: means, *t*-statistics and Sharpe ratios**

	HML_S		HML_B		HML_{S-B}		HML		
	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Sharpe ratio
Brazil	1.00	1.87*	0.10	0.16	0.90	1.06	0.55	1.48	0.11
Chile	0.75	2.22**	-0.11	-0.42	0.86	1.92*	0.32	1.63	0.14
Mexico	0.85	1.50	0.85	1.76*	~0	~0	0.85	2.12**	0.21
Peru	2.50	2.63***	0.93	1.46	1.56	1.51	1.71	2.75***	0.30

The table shows means, *t*-statistics (*t*-stat.) and Sharpe ratios for the value factor, *HML*, for monthly stock returns of companies in Brazil, Chile, Mexico, and Peru. HML is the difference between returns of value stocks (high book-to-market ratios) and growth stocks (low book-to-market ratios). The table also reports means and *t*-statistics (*t*-stat.) for HML_S, the value factor for small stocks, and HML_B, the value factor for big stocks, as well as HML_{S-B} which captures the difference between them. Stock returns are converted into U.S. dollars. *t*-statistics are calculated using HAC estimation. The data period is from January 2006 to December 2015.

*, **, ***: significance level at 10%, 5%, and 1%, respectively.

Table 2 exhibits the means and *t*-statistics of the value factor (*HML*) in four Latin American emerging countries. In all countries, the expected returns of the difference between small value stocks and small growth stocks (HML_S means) are positive and markedly significant, except for Mexico (*t*-stat. at 1.50).

The largest dissimilarity is in Peru, which presents expected returns of 2.50% per month. Based on these results, we can conclude that for small companies, value stocks often outperform growth stocks. We see the same pattern for big stocks except in Chile's market with negative expected returns (–0.11% per month for HML_B portfolio), although these returns for big stocks are significant in Mexico's market only.

Regarding the value premium point estimates (*HML* means), it can be seen that they are positive in all four countries but only statistically significant in half of them, namely Mexico and Peru. Sharpe ratios are also positive for all four countries and do not show marked differences, ranging from 0.11 to 0.30.

Additionally, to examine whether there is a size effect on the value premium, we focus on the means and *t*-statistics of HML_{S-B}. In Mexico, there is no difference in value premium between small and big stocks. However, in other countries, value premium point estimates for small stocks are always larger than for big stocks, although the difference is not really significant (just significant in Chile, but at the 10% level).

Our results seem to be in line with Cakici and Tan (2013), who do not find a difference in the mean premium across small and big stocks in the Latin American region, which includes all the countries in our analysis. On the contrary, Fama and French (1993), Kothari *et al.* (1995), and Loughran (1997) find larger value premiums for small stocks in the U.S.

3.1.3. Momentum factors

● Table 3. **Momentum factors: means, t-statistics and Sharpe ratios**

	WML_S		WML_B		WML_{S-B}		WML		
	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Sharpe ratio
Brazil	0.85	1.14	0.20	0.15	0.65	0.46	0.53	0.65	0.06
Chile	1.42	2.48**	0.45	1.15	0.97	1.72*	0.94	2.32**	0.23
Mexico	1.05	1.44	-0.27	-0.50	1.33	2.03**	0.39	0.70	0.08
Peru	0.08	0.08	-0.62	-0.66	0.70	0.61	-0.27	-0.34	-0.04

The table shows means, *t*-statistics (*t*-stat.) and Sharpe ratios for the momentum factor, *WML*, for monthly stock returns of companies in Brazil, Chile, Mexico, and Peru. WML is the difference between returns of winner stocks (high returns in prior months) and loser stocks (low returns in same period). The table also reports means and *t*-statistics (*t*-stat.) for WML_S, the momentum factor for small stocks, and WML_B, the momentum factor for big stocks, as well as WML_{S-B} which captures the difference between them. Stock returns are converted into U.S. dollars. *t*-statistics are calculated using HAC estimation. The data period is from January 2006 to December 2015.
*, **, ***: significance level at 10%, 5%, and 1%, respectively.

Table 3 indicates means and *t*-statistics for the momentum factor (WML) including the momentum returns of small and big stocks as well as the difference between them in four Latin American emerging countries.

Regarding the momentum factor of small stocks (WML_S), it can be seen that the average momentum returns of small stocks are positive in all countries, while Chile leads the other countries with an expected return of 1.42% per month. This result is significant during the period under analysis. In contrast, the difference between the winners and the losers in returns of small stocks in Peru is almost zero. However, the *t*-statistic is also quite low, indicating statistical insignificance.

As opposed to small stocks, the momentum factors of big stocks (WML_B) have quite low means, and they are even negative in Mexico and Peru. Chile is still the emerging country with the highest average momentum return for big stocks in the Latin American region (0.45% per month). However, no countries exhibit statistically significant big stock momentum premiums.

To compare momentum returns between small stocks and big stocks in the four countries, we also report the mean and *t*-statistics of WML_{S-B} returns. The results show that the momentum returns of small stocks are always higher than those of big stocks. Mexico reports the biggest gap at 1.33% per month and statistically significant. It is followed by Chile, where the mean of the difference in momentum returns between small and big stocks is 0.97% per month, but significant at 10% only. The differences in Brazil and Peru are smaller (0.65% and 0.7%, respectively) and they are not statistically significant. Our results for Chile and Mexico are identical to those of Fama and French (2012), who report a positive and statistically significant mean of WML_{S-B} for North America, Asia Pacific and Europe.

Finally, we investigate the momentum factor and its Sharpe ratios for the whole market in all the countries. Only Peru reports a negative mean of momentum returns (-0.27% per month). In the other three countries, we record positive results, with Chile showing the highest mean in momentum returns. Nevertheless, except for Chile, which has a *t*-statistic of 2.32, the remaining countries witness statistically insignificant momentum premiums. The Sharpe ratio is negative only in Peru — although close to zero (–0.04) — and positive in the other countries.

3.2. Factor correlations

3.2.1. Intercountry correlations

● Table 4. **Intercountry correlations between value and momentum factors and means, *t*-statistics and Sharpe ratios of the combined portfolio strategy**

	HML_S and WML_S		HML_B and WML_B		*HML* and *WML*		*HWML*		
	Corr.	*t*-stat.	Corr.	*t*-stat.	Corr.	*t*-stat.	Mean (%)	*t*-stat.	Sharpe ratio
Brazil	-0.01	-0.05	0.11	1.25	-0.10	-1.14	0.54	1.18	0.11
Chile	0.24	2.67***	-0.03	-0.28	0.22	2.46**	0.63	2.63***	0.25
Mexico	-0.01	-0.06	-0.21	-2.31**	-0.19	-2.13**	0.62	1.95*	0.21
Peru	-0.12	-1.33	-0.04	-0.49	-0.12	-1.28	0.72	1.35	0.16

The table shows correlation coefficients and *t*-statistics (*t*-stat.) between value and momentum factors (HML_S and WML_S, HML_B and WML_B, and *HML* and *WML*) for each country: Brazil, Chile, Mexico, and Peru. The table also reports means, *t*-statistics (*t*-stat.) and Sharpe ratios for *HWML*, where the portfolio invests equally in *HML* and *WML*. Stock returns are converted into U.S. dollars. The data period is from January 2006 to December 2015.

*, **, ***: significance level at 10%, 5%, and 1%, respectively.

To support investors in creating portfolios by combining stocks using value and momentum effects, we investigate the relationship between value and momentum factors within the same country. Table 4 exhibits the correlation coefficients and *t*-statistics of value factors and momentum factors (*HML* and *WML*, respectively) as well as these two factors for small stocks (HML_S and WML_S) and big stocks (HML_B and WML_B).

Firstly, we examine the correlations between *HML* and *WML* in each country. The coefficient point estimates are negative in three out of the four countries, with the exception being Chile. The result means that when value stocks perform well, momentum stocks will perform badly and vice versa, whereas the positive correlation in Chile implies that the two factors move in the same direction. There are two statistically significant coefficients in Chile and Mexico, both at 95% confidence level. The negative correlations suggest that investors should combine value and momentum strategies in their investment portfolios to make use of the risk-return trade off. These results are further supported by the expected returns, *t*-statistics and Sharpe ratios of the combined portfolios presented in Table 4. *HWML* is the portfolio which

invests 50% in value stocks and 50% in momentum stocks. The average returns of this portfolio are positive in all countries. It is worth noting that despite the positive correlation between value and momentum factors, the combined portfolio in Chile still has a high return (0.63% per month). Sharpe ratios of the combined portfolios in four countries are quite small.

Additionally, to discover whether or not these two factors for small and big stocks have the same pattern, we focus on the correlations between HML_S and WML_S as well as HML_B and WML_B. We find that value and momentum factors of small stocks have the same correlations with value and momentum factors of the whole market, which are negative in Brazil, Mexico and Peru and positive in Chile. However, the relationship is only significant in Chile. The correlations between the two risk factors for big stocks differ slightly and the only country to show a positive coefficient is Brazil, not Chile. Also, no country has a statistically significant correlation, except Mexico.

3.2.2. Cross-country correlations

● Table 5. **Correlations between value factors across countries**

	Brazil	Chile	Mexico	Peru
Brazil	1.00	-0.01	0.02	-0.11
Chile		1.00	-0.03	0.11
Mexico			1.00	0.12
Peru				1.00

The table reports the correlation coefficients of value factors between four countries: Brazil, Chile, Mexico, and Peru. Stock returns are converted into U.S. dollars. *t*-statistics are unreported. The data period is from January 2006 to December 2015.

*, **, ***: significance level at 10%, 5%, and 1%, respectively.

Table 5 reports the correlations between value factors in two different countries. As can be seen from the table, the relationships between value factors across countries are mixed, though very small in all cases. Of the six correlation coefficients, half are negative. However, none of the coefficients are statistically significant.

● Table 6. **Correlations between momentum factors across countries**

	Brazil	Chile	Mexico	Peru
Brazil	1.00	0.23**	0.27***	0.26***
Chile		1.00	0.33***	0.29***
Mexico			1.00	0.28***
Peru				1.00

The table reports the correlation coefficients of momentum factors between four countries: Brazil, Chile, Mexico, and Peru. Stock returns are converted into U.S. dollars. *t*-statistics are unreported. The data period is from January 2006 to December 2015.

*, **, ***: significance level at 10%, 5%, and 1%, respectively.

Table 6 displays the correlation coefficients in momentum factors between two different countries. In contrast to value factors, the correlations between momentum factors across countries are unique.

In general, all coefficients are positive and strongly statistically significant. Particularly, the coefficients are quite similar for all pairs, ranging from 0.23 to 0.33. Compared to those of value factors, these coefficients are much higher. The co-movement in returns of momentum stocks implies that implementing a strategy of investing in international momentum stocks will make it quite difficult to reach the target returns.

● Table 7. **Correlations between value and momentum factors across countries**

	Brazil	Chile	Mexico	Peru
Brazil	-0.10	-0.03	0.20**	-0.13
Chile	0.02	0.22**	0.04	0.02
Mexico	-0.12	0.03	-0.19**	-0.09
Peru	-0.15*	0.16*	0.03	-0.12

The table reports the correlation coefficients of value (row) and momentum (column) factors between four countries: Brazil, Chile, Mexico, and Peru. Stock returns are converted into U.S. dollars. t-statistics are unreported. The data period is from January 2006 to December 2015.

*, **, ***: significance level at 10%, 5%, and 1%, respectively.

Table 7 reveals the correlations between value and momentum factors in each pair for the four countries. As can be seen from the table, these relationships are equally diverse. On the one hand, the correlations between momentum factors of Brazil and Peru and their value factors are negative, as are those with other countries. However, the only statistically significant negative coefficients are those between the momentum and value factor of Mexico (–0.19) and between the former of Brazil and the latter of Peru (–0.15).

In contrast, the momentum factors of Chile and Mexico have slightly positive correlations with their value factors and those of other neighbours. There are three statistically significant correlations out of eight positive coefficients, and Chile is the country that has the greatest correlation coefficient (0.22) between momentum and value factors. Generally, the relationships between value and momentum factors across countries are weak with small coefficients and only five out of sixteen coefficients are statistically significant.

3.3. CAPM alphas and betas

3.3.1. Value Factor

● Table 8. **Alphas, betas and *t*-statistics of country value factor**

	Country CAPM				Regional CAPM				U.S. CAPM			
	α (%)	*t*-stat.	β	*t*-stat.	α (%)	*t*-stat.	β	*t*-stat.	α (%)	*t*-stat.	β	*t*-stat.
Brazil	0.59	1.69*	-0.03	-0.63	0.60	1.68*	-0.04	-0.57	0.51	1.31	0.06	0.58
Chile	0.37	1.96*	-0.06	-1.74*	0.40	2.13**	-0.06	-1.82*	0.36	1.78*	-0.05	-1.16
Mexico	0.70	1.91*	0.13	2.66***	0.65	1.85*	0.16	3.30***	0.74	1.95*	0.18	2.63***
Peru	1.21	2.37**	0.26	3.00***	1.56	2.66***	0.13	1.82*	1.69	2.70***	0.04	0.49

The table presents the alphas and betas of value factor (HML) for each country —Brazil, Chile, Mexico, and Peru— with respect to three CAPM models. In the Country CAPM, the explanatory return is the country's own market return calculated in this paper. In the Regional CAPM, the explanatory return is the market return across the Latin American region including stocks of all four countries. In the U.S. CAPM, the explanatory return is the U.S market return. The market return series for the U.S. CAPM specification are taken from Kenneth French's website. Excess market returns are calculated relative to the one-month U.S. T-bill rate. All stock returns are converted into U.S. dollars. t-statistics are calculated using HAC estimation. The data period is from January 2006 to December 2015.

*, **, ***: significance level at 10%, 5%, and 1%, respectively.

Table 8 reports the alphas, betas and *t*-statistics of each country's value return with respect to three different CAPM models. The alpha values range between 0.36 and 1.69 across the countries and CAPM models. Relating to the first CAPM identification —the Country CAPM— all alpha coefficients are positive and statistically significant. This result is quite consistent with positive means of *HML* returns in section 3.1.2. The same pattern can also be seen in Regional and U.S. CAPMs. Specifically, the magnitude of the alphas in the three models does not differ considerably, except in Peru, which witnesses the greatest divergence of 0.48%. Of the three models, both the lowest and highest alphas (0.36% in Chile and 1.69% in Peru) are found for the U.S. CAPM specification. Chile is the market that has the smallest alphas in all three CAPM models (0.37%, 0.4%, and 0.36% in Country, Regional and U.S. CAPM specifications, respectively). Almost all alphas are statistically significant, except that of Brazil. These outcomes underline the effective performance of value stocks in all four Latin American countries' markets.

On the contrary, in all three CAPM models, more than half of the betas (7 out of 12) are negative, small and statistically insignificant. The negative betas appear mostly in Chile (in all CAPM models) and Brazil (except the U.S. CAPM model). Nevertheless, as with the alphas, the beta coefficients are also lowest in Chile (–0.06) and highest in Peru (0.26), all in the Country CAPM model. These results are homogeneous in the case of Chile's and Peru's markets, which have the lowest and highest value premium point estimates (*HML* means), respectively. In general, the outcomes for betas imply that value returns are not greatly affected by — or may have a negative relation-

ship with— local, regional and even U.S. market returns. Our results support the findings of Goetzmann *et al.* (2005) that emerging markets offer both lower correlations with developed countries and an expanded number of markets to invest in. More recently, Eun and Lee (2010) have confirmed that, although the performance of emerging markets is converging with that of developed markets, they are still more distinct from one another than developed markets are and still provide diversification benefits to the global investor.

3.3.2. Momentum factor

● Table 9. **Alphas, betas and t-statistics of country momentum factor**

	Country CAPM				Regional CAPM				U.S. CAPM			
	α (%)	*t*-stat.	β	*t*-stat.	α (%)	*t*-stat.	β	*t*-stat.	α (%)	*t*-stat.	β	*t*-stat.
Brazil	0.98	1.67*	-0.37	-2.40**	1.06	1.84*	-0.42	-2.64***	0.63	0.79	-0.17	-0.78
Chile	1.11	3.06***	-0.20	-2.07**	1.16	3.14***	-0.17	-2.03**	1.04	2.65***	-0.17	-1.50
Mexico	0.73	1.83*	-0.29	-2.51**	0.77	2.06**	-0.31	-2.59**	0.64	1.39	-0.40	-2.94***
Peru	0.12	0.19	-0.20	-1.05	0.02	0.03	-0.23	-1.80*	-0.08	-0.10	-0.32	-1.73*

The table presents the alphas and betas of momentum factor (*WML*) for each country —Brazil, Chile, Mexico, and Peru— with respect to three CAPM models. In the Country CAPM, the explanatory market return is taken as the market return of the country calculated in this paper. In the Regional CAPM, the market return is the market return of the Latin American region including stocks of all four countries. In the U.S. CAPM, the market return is the market return of the United States. The market returns of the U.S. are taken from Kenneth French's website. Excess market returns are calculated relative to the one-month U.S. T-bill rate. All stock returns are converted into U.S. dollars. t-statistics are calculated using HAC estimation. The data period is from January 2006 to December 2015.
*, **, ***: significance level at 10%, 5%, and 1%, respectively.

Table 9 reports the alphas, betas and *t*-statistics results for the country momentum factors. The same three CAPM models are applied to explain momentum returns. As with the outcomes for country value factor, the alphas are mostly positive and statistically significant, especially in Country and Regional CAPM models (except the alpha of Peru). In the U.S. CAPM model, only the value of Chile is significant. However, in contrast to the *HML* alphas, these figures for momentum are lowest in Peru (0.12%, 0.02%, and –0.08%) and highest in Chile (1.11%, 1.16%, and 1.04%) for Country, Regional and U.S. CAPM models, respectively. Once again, the results are identical to the momentum premium point estimates for these two countries.

On the other hand, all momentum betas in the three CAPM models are negative and most of them are statistically significant (9 out of 12 betas). Beta values range from –0.42 (for Brazil in Regional CAPM) to –0.17 (for Chile in Regional CAPM and U.S. CAPM and for Brazil in U.S. CAPM). These results imply that it may be advisable for investors to consider momentum strategies in Latin American emerging markets, where alphas are markedly significant and betas are negative at country and regional levels, as well as in the U.S. market.

Generally, regarding both value and momentum factors, small betas in U.S. CAPM models for all countries prove the weak relationship between developing and advanced markets.

4. Robustness

In this section, we report our results from the robustness tests for significant value and momentum premiums in previous sections.

4.1. January effect

Our first exercise is investigating the impact of January returns on value factors in Mexico and Peru as well as momentum factors in Chile. This robustness test is derived from earlier research papers that find extremely high value returns and low momentum returns in January. For example, Loughran (1997) discovers that during the period 1963-1995, value firms exhibit much higher January returns than growth firms. Regarding the momentum factor, according to Grundy and Martin (2001), a momentum strategy would have earned an average monthly "return" (profit per dollar long) of 0.44% in the U.S. stock market over the period 1926 through 1995. However, the mean is −5.85% (t =−4.93) in Januaries and 1.01% (t = 4.44) in non-Januaries. Similarly, Jegadeesh and Titman (2001) report the momentum profits in January and non-January and the results indicate that the losers outperformed the winners by an impressive 2.92% on average in January in the period 1965-1989. Losers again outperform winners in January in the nineties, but now the return difference is 1.21%.

● Table 10. **Robustness test for January effect on value and momentum factors**

	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Sharpe ratio
	HML_S		HML_B		HML_{S-B}		HML		
Mexico	0.70	1.44	1.00	1.91*	-0.30	-0.44	0.86	2.29**	0.22
Peru	2.69	2.93***	0.81	1.18	1.89	1.79*	1.75	2.85***	0.32
	WML_S		WML_B		WML_{S-B}		WML		
Chile	1.08	1.78*	0.76	1.88*	0.32	0.55	0.92	2.16**	0.23

The table shows the results of the robustness test for the January effect on value factors in Mexico and Peru, and momentum factors in Chile. Returns in January of each year are omitted when calculating value and momentum portfolios. Stock returns are converted into U.S. dollars. t-statistics are calculated using HAC estimation. The data period is from January 2006 to December 2015.

*, **, ***: significance level at 10%, 5%, and 1%, respectively.

Table 10 shows means, t-statistics and Sharpe ratios for value and momentum factors in Mexico, Peru, and Chile, respectively, after January returns are removed from our sample. Compared to the results in Tables 2 and 3, we can see that in Mexico and

Peru, value premiums (*HML* means) are slightly higher, increasing from 0.85% and 1.71% to 0.86% and 1.75% per month, respectively, while expected returns of the momentum factor (*WML* mean) in Chile is not as low. Nevertheless, all of them are still strongly significant. In addition, the Sharpe ratios have not changed considerably.

4.2. Micro stocks effect

Secondly, we examine the effect of microcap stocks on value and momentum returns. Fama and French find that the spreads in momentum and value versus growth average returns are larger for small stocks, especially microcaps. Likewise, Zaremba (2015) analyses stock-level data from 10 countries in Central and Eastern Europe from the period April 2001 – June 2014 and observes particularly high abnormal returns on microcaps. As a result, we re-calculate value and momentum factors in countries which have strongly significant means in value and momentum premiums of small stocks as well as all stocks together after deleting micro stocks, which account for only 1% of total market capitalization, in our sample.

● Table 11. **Robustness test for the micro stocks effect on value and momentum factors**

	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Mean (%)	*t*-stat.	Sharpe ratio
	HML_S		HML_B		HML_{S-B}		*HML*		
Peru	2.41	2.36**	0.99	1.57	1.41	1.23	1.70	2.73***	0.30
	WML_S		WML_B		WML_{S-B}		*WML*		
Chile	1.74	2.74***	0.49	1.21	1.26	1.99**	1.11	2.60**	0.26

The table shows the results of robustness test for the micro stocks effect on value factors in Peru and momentum factors in Chile. Micro stocks, which make up 1% of total market capitalization, are deleted when calculating value and momentum portfolios. Stock returns are converted into U.S. dollars. *t*-statistics are calculated using HAC estimation. The data period is from January 2006 to December 2015.
*, **, ***: significance level at 10%, 5%, and 1%, respectively.

Table 11 reports the results of our second robustness exercise for value factors in Peru and momentum factors in Chile, including expected returns, *t*-statistics and Sharpe ratio. As can be seen from the table, when we exclude micro stocks, the value return of small stocks in Peru decreases slightly, from 2.50% to 2.41% per month. However, value premiums and the Sharpe ratio for all stocks remain unchanged. On the contrary, for momentum factors in Chile, the means of momentum premiums for small stocks as well as for all stocks grow considerably (respectively, 1.74% and 1.11% compared to 1.42% and 0.94% per month in Table 3). These average returns are stably significant.

Generally, the robustness results suggest that value and momentum premiums in Latin American emerging countries still exist and are immune from the impact of the January effect or micro stocks returns.

5. Conclusion

Aside from the obvious evidence about value and momentum effects in developed countries, this paper contributes proof of the existence of these anomalies in Latin American emerging countries – Brazil, Chile, Mexico, and Peru. Our research also reveals the size patterns in value and momentum factors as well as international correlations between the two factors. CAPM models are applied to determine active returns at local, regional and U.S. levels. Generally, the findings of our analysis help to provide a better understanding of the risk and return profile of value and momentum strategies in developing countries.

The results from investigating size patterns of value and momentum factors in four Latin American emerging countries help us to conclude that the value and momentum premiums of big stocks are less than those of small stocks. Therefore, it would seem that investors cannot take advantage of the low transaction costs of big stocks to earn the same returns as with small stocks.

Although most of the correlations between value and momentum premiums in each country are negative (with the exception of Chile), only half of the regional correlations are below zero. These results suggest that while investors can be confident in combining value and momentum strategies within the four analysed countries to earn diversification benefits, they should carefully consider forming combined portfolios in the Latin American region.

Using CAPM models, we find positive and statistically significant abnormal value (momentum) returns in country, regional and U.S. specifications. However, the small and insignificant betas of all models reveal weak relationships between value (momentum) returns and market returns.

In conclusion, emerging markets are becoming more attractive to global investors thanks to their profitable potential and low correlations with developed countries. Investing in these countries' stock markets may bring more opportunities for investors to diversify their portfolios. In our paper, we restrict the research to four Latin American emerging markets and hope the findings may contribute to the literature on international value and momentum investments as well as provide essential information for investors focusing on these markets. A limitation of this study is that we do not account for the effect of illiquidity and transaction costs, which have been proved to be able to wipe out value and momentum premiums in emerging countries. For example, according to Hatgioannides and Mesomeris (2007), technical trading rules are found to provide excess profits before transaction costs in Latin American and Asian markets, but after transaction costs are considered, excess returns remain only in Asia. More recently,

Zaremba and Konieczka (2015) investigate the impact of illiquidity and transaction costs on value, size and momentum premiums in 11 Central and Eastern European stock markets and find that after accounting for varying bid-ask spreads and liquidity, only the value premium survives, while the size and momentum effects disappear. As a result, we will conduct an analysis of this important issue in future research.

References

- Annaert, J., Ceuster, M.D. and Verstegen, K. (2013). Are extreme returns priced in the stock market? European evidence, *Journal of Banking & Finance*, **37**(9), pp. 3401-3411.
- Asness, C.S., Moskowitz, T.J. and Pedersen, L.H. (2013). Value and Momentum everywhere, *The Journal of Finance*, **68**(3), pp. 929-985.
- Atanasov, V. and Nitschka, T. (2014). The Size Effect in Value and Momentum Factors: Implications for the Cross-Section of International Stock Returns, Tinbergen Institute Discussion Paper [13].
- Bansal, R., Kiku, D. and Yaron, A. (2012). An Empirical Evaluation of the Long-run Risks Model for Asset Prices, *Critical Finance Review*, **1**, pp. 183-221.
- Bergbrant, C.M. and Kelly, J.P. (2015). Macroeconomic Expectations and the Size, Value and Momentum Factors, CEFIR/NES Working Paper [214].
- Cakici, N., Fabozzi, F. J. and Tan, S. (2013). Size, Value, and Momentum in Emerging Market Stock Returns, *Emerging Market Reviews*, **16**, pp. 46-65.
- Cakici, N. and Tan, S. (2014). Size, Value, and Momentum in Developed Country Equity Returns: Macroeconomic and Liquidity Exposures, *Journal of International Money and Finance*, **44**, pp. 179-209.
- Cenesizoglu, T. (2011). Size, Book-to-market Ratio and Macroeconomic News, *Journal of Empirical Finance*, **18**(2), pp. 248-270.
- Chen, L., Petkova, R. and Zhang, L. (2008). The Expected Value Premium, *Journal of Financial Economics*, **87**(2), pp. 269-280.
- Eun, C.S. and Lee, J. (2010). Mean–variance Convergence around the World, *Journal of Banking & Finance*, **34**(4), pp. 856-870.
- Fama, E.F. and French, K.R. (1993). Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics*, **33**(1), pp. 3-56.
- Fama, E.F. and French, K.R. (1998). Value versus Growth: International Evidence, *The Journal of Finance*, **53**(6), pp. 1975-1999.
- Fama, E.F. and French, K.R. (2012). Size, Value, and Momentum in International Stock Returns, *Journal of Financial Economics*, **105**(3), pp. 457-472.
- Goetzmann, W.N., Li, L. and Rouwenhorst, K.G. (2005). Long-term Global Market Correlations, *Journal of Business*, **78**(1), pp. 1-38.

- Griffin, J.M. (2002). Are the Fama and French factors global or country specific? *Review of Financial Studies*, **15**(3), pp. 783-803.
- Griffin, J. M., Ji, S. and Martin, J. S. (2003). Momentum investing and business cycle risk: Evidence from pole to pole, *The Journal of Finance*, **58**(6), pp. 2515-2547.
- Grundy, B. D. and Martin, J. S. M. (2001). Understanding the Nature of the Risks and the Source of the Rewards to Momentum Investing, *Review of Financial Studies*, **14**(1), pp. 29-78.
- Hansen, L. P., Heaton, J. C. and Li, N. (2008). Consumption Strikes Back? Measuring Long-run Risk, *Journal of Political Economy*, **116**(2), pp. 260-302.
- Hatgioannides, J. and Mesomeris, S. (2007). On the Returns Generating Process and the Profitability of Trading Rules in Emerging Capital Markets, *Journal of International Money and Finance*, **26**(6), pp. 948-973.
- Hou, K., Karolyi, G.A. and Kho, B.C. (2011). What Factors Drive Global Stock Returns? *The Review of Financial Studies*, **24**(8), pp. 2527-2574.
- Foye, J. (2016). A New Perspective on the Size, Value, and Momentum Effects: Broad Sample Evidence from Europe, *Review of Accounting and Finance*, **15**(2), pp. 222-251.
- Jegadeesh, N. and Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency, *The Journal of Finance*, **48**(1), pp. 65-91.
- Jegadeesh, N. and Titman, S. (2001). Profitability of Momentum Strategies: An Evaluation of Alternative Explanations, *The Journal of Finance*, **56**(2), pp. 699-720.
- Karolyi, G.A. and Wu, Y. (2012)**.** The Role of Investability Restrictions on Size, Value, and Momentum in International Stock Returns, Johnson School Research Paper Series [12-2012].
- Korajczyk, R.A. and Sadka, R. (2004). Are Momentum Profits Robust to Trading Costs? *The Journal of Finance*, **59**(3), pp. 1039-1082.
- Kothari, S.P., Shanken, J. and Sloan, R. (1995). Another look at the cross-section of expected returns, *The Journal of Finance*, **50**(1), pp. 185-224.
- Lesmond, D.A., Schill, M.J. and Zhou, C. (2004). The Illusory Nature of Momentum Profits, *Journal of Financial Economics*, **71**(2), pp. 349-380.
- Liew, J. and Vassalou, M. (2000). Can Book-to-Market, Size and Momentum be Risk Factors that Predict Economic Growth? *Journal of Financial Economics,* **57**(2), pp. 221-245.
- Longin, F. and Solnik, B. (2001). Extreme Correlation of International Equity Markets, *The Journal of Finance*, **56**(2), pp. 649-676.
- Loughran, T. (1997). Book-to-market Across Firm Size, Exchange, and Seasonality: Is there any Effect? *Journal of Financial and Quantitative Analysis*, **32**(3), pp. 249-268.
- Petkova, R. and Zhang, L. (2005). Is Value Riskier than Growth? *Journal of Financial Economics*, **78**(1), pp. 187-202.
- Rouwenhorst, K.G. (1998). International Momentum Strategies, *The Journal of Finance*, **53**(1), pp. 267-284.
- Zaremba, A. and Konieczka, P. (2015). Are Value, Size and Momentum Premiums in CEE Emerging Markets Only Illusionary? *Czech Journal of Economics and Finance*, **65**(1), pp. 84-104.
- Zaremba, A. (2015). Value, Size, Momentum, and Unique Role of Microcaps in CEE Market Stock Returns, *Eastern European Economics*, **53**(3), pp. 221-241.

Appendices

Appendix A. Filtering procedure

Following Annaert *et al.* (2013), we use Thomson Reuters Datastream constituent lists to construct our dataset, both research and dead lists. Based on this initial sample, we sort out firms which are obviously not a member of our population of interest. To do this, we use firm characteristics, which are assumed to be constant over time, thus employing "static screens". Our first procedure is to keep major listings (MAJOR="Y") and primary quote (ISINID="P"), stocks located in the domestic market (e.g. EXDSCD="RJ" or "SP" for Brazil), and equity stocks (TYPE="EQ"). Secondly, the ISIN code of the stock must start with the correct two letters (e.g. ISIN="BR*" for Brazil or "ME*" for Mexico). A final filter is used to check the industry-type for each company. We do not want to include investments such as REITs, investment trusts, venture capital trusts, asset management funds, or other funds. Also, the expanded company name cannot contain "suspicious" words such as pref, prf, %, duplicate, dupl, afv, vvpr or strip, v.v.

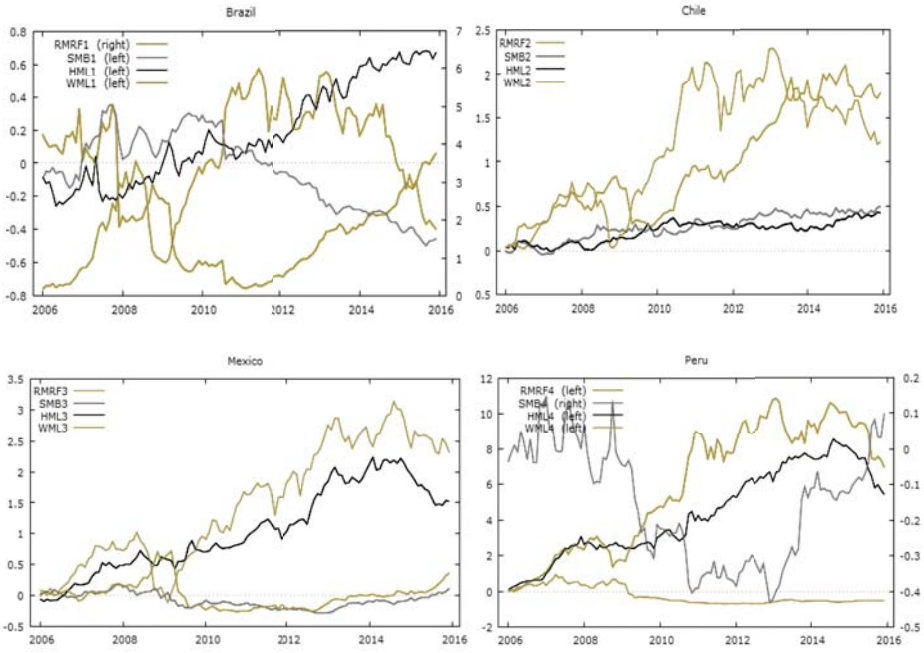
Appendix B. Descriptive statistics

● Table B1. **Descriptive statistics for four factors**

	$R_m - R_f$	*SMB*	*HML*	*WML*	$R_m - R_f$	*SMB*	*HML*	*WML*
	Brazil				**Chile**			
Mean	1.21	-0.41	0.55	0.53	0.85	0.38	0.32	0.94
Median	0.65	-0.10	0.44	1.32	0.67	0.07	0.46	0.96
Minimum	-25.10	-18.63	-20.44	-51.77	-23.19	-8.23	-6.03	-13.10
Maximum	26.31	17.22	20.60	18.51	19.07	9.20	9.36	18.45
Standard deviation	8.66	4.44	4.92	8.86	5.92	2.83	2.34	4.02
Skewness	0.07	-0.07	-0.13	-2.58	-0.45	0.37	0.04	-0.01
Ex. kurtosis	0.87	3.84	3.46	11.78	2.59	0.70	1.35	3.78
5th percentile	-12.10	-6.85	-0.07	-9.84	-9.56	-3.46	-3.92	-6.36
95th percentile	10.23	6.55	0.07	19.67	9.80	6.12	3.60	5.92
	Mexico				**Peru**			
Mean	1.21	0.15	0.85	0.39	1.99	0.21	1.71	-0.27
Median	1.16	0.25	0.72	0.88	0.99	-0.05	1.57	0.55
Minimum	-26.43	-12.51	-8.97	-24.44	-26.20	-13.71	-10.76	-38.80
Maximum	18.08	6.71	14.54	12.59	19.75	18.96	28.48	17.66
Standard deviation	6.49	3.43	3.96	5.04	7.06	5.20	5.64	7.71
Skewness	-0.53	-0.75	0.39	-1.54	-0.20	0.61	1.20	-1.07
Ex. kurtosis	2.20	1.43	0.76	5.69	1.37	2.02	4.06	4.77
5th percentile	-10.75	-5.25	-4.57	-7.88	-8.95	-7.75	-7.00	-14.21
95th percentile	10.48	5.14	8.34	7.13	14.74	10.05	11.90	12.95

The table presents the descriptive statistics for size, value, and momentum factors as well as market premiums in Brazil, Chile, Mexico, and Peru. Stock returns are converted to U.S. dollars. The data period is from January 2006 to December 2015.

■ Figure B1. **Cumulative returns of four factors**



The figure shows the graphs for cumulative returns of monthly excess market return, size (*SMB*), value (*HML*), and momentum (*WML*) in Brazil, Chile, Mexico, and Peru. All stock returns are converted into U.S. dollars. The data period is from January 2006 to December 2015.