Flights to Quality and Momentum Crashes*

Junyong Kim† Donghyun Kim‡ Chang-Mo Kang§

August 20, 2020

Abstract

Momentum crashes, defined as extremely negative returns of momentum portfolios, occur in most developed stock markets and are centered in economic recovery periods after recessions. I find that their negative returns and negative market betas are associated with investor behavior known as flights to quality (FTQ). Low quality—*i.e.*, high default risk—stocks experience larger investor withdrawals and consequential stock price plunges at financial market collapses, featuring higher market betas particularly during recessions. So the momentum strategies, which tend to sell these plunging stocks, exhibit negative market betas before their crashes and underperform once those stocks bounce back to an economic recovery phase. Worldwide momentum returns and two FTQ proxies, US institutional ownership changes and stock market-bond market disagreements, show consistent results.

JEL classification: G12, G15, G23.

Keywords: Momentum crashes, flights to quality, flights to safety, international asset pricing.

*I thank seminar participants at University of Wisconsin–Milwaukee for helpful comments.
†University of Wisconsin–Milwaukee. `junyong@uwm.edu`.
‡Chung-Ang University. `donghyunkim@cau.ac.kr`.
§Hanyang University. `cmkang@hanyang.ac.kr`.

1 Introduction

Since the seminal work of Jegadeesh and Titman (1993), momentum strategies have been considered to be one of the most well-known investment strategies and have been followed by money managers. Despite the momentum strategies' strong long-run returns and high Sharpe ratios, recent studies have reported episodes of momentum crashes, which refers to the strategies' extreme negative returns (Cooper et al. 2004, Stivers and Sun 2010, Barroso and Santa-Clara 2015, Ali et al. 2017). These momentum crashes, which tend to take place when economies recover from recessions, rarely occur but significantly damage the momentum portfolios. Finance literature introduces some methods to forecast or avoid the momentum crashes[1] but pays less attention to the crashes' economic origins. Daniel and Moskowitz (2016), for example, show that the momentum portfolios exhibit negative market betas before these crashes but don't show what drives their negative betas.[2]

I examine whether these momentum crashes and that pre-crash beta behavior originate from investors' flights to quality (FTQ). FTQ, which refers to investors' shifting their portfolios to safer assets, is a well-documented phenomenon around financial market collapses.[3] When these extreme events happen, investors tend to hoard safe assets in fear of the worst case scenario (Caballero and Krishnamurthy 2008). Institutional investors also seek safe and liquid assets because of concerns of retail investors' withdrawals (Vayanos 2004), margin constraints (Krishnamurthy 2010), or lower capital and risk-bearing capacity (He and Krishnamurthy 2012).[4] FTQ affects not only capital markets but also

[1]Ehsani and Linnainmaa (2019) show that the momentum crashes take place when other factors become less autocorrelated. Novy-Marx (2015) shows that momentum strategies based on intermediate horizon past performance, unlike the strategies based on recent past performance, reduce the momentum crashes.

[2]Momentum betas reflect past factor realizations in part by nature as these factors determine the momentum winners and losers (Kothari and Shanken 1992). However, the momentum betas that control these factors also show similar time-varying behavior (Blitz et al. 2011).

[3]Some examples include the market crash in 1987, the Russian default and sovereign debt crisis in 1998, and the global financial crisis in 2007.

[4]See also Barsky (1989) and Bekaert et al. (2009) who explain FTQ in consumption-based asset pricing models.

real estate markets and economic growth (Boudry et al. 2019).

Why would investors' FTQ relate to momentum crashes? This prediction is motivated by the findings of Baele et al. (2019). They find that FTQ events, over short horizons, decrease equity prices relative to safer assets (*e.g.*, sovereign or corporate bonds) and increase expected returns of high default risk (*i.e.*, low quality) stocks relative to low default risk (high quality) stocks. These findings suggest that momentum portfolios, which buy past winner stocks and sell past loser stocks, effectively sell those low quality stocks around recessions. This tendency brings about the momentum crashes as the low quality stocks realize higher returns once the economy enters to a recovery phase. Furthermore, the low quality stocks, which the momentum portfolios sell, exhibit high market betas due to their procyclical returns, so the momentum portfolios feature negative market betas during recessions.

Figure A1 shows intuition for how the market beta of the momentum factor behaves differently from those of the other factors. I estimate monthly market betas of the momentum, size, value, profitability, and investment factors using daily data and plot their one-year moving averages. The momentum factor's market beta, which signals the momentum crashes in turn, fluctuates more often than the other factors' market beta and becomes significantly negative especially around shaded recessions.[5] This pattern implies that, during those times, buying winners and selling losers coincides buying low betas and selling high betas. I examine if this coincidence is driven by the FTQ events and explore how these FTQ events affect momentum returns using worldwide stock returns.

This cross-country analysis is crucial for my research objective because both the momentum crashes and the FTQ events are respectively rare in one country, but at least the momentum profitability and the FTQ behavior are commonly found in many countries (Asness et al. 2013, Baele et al. 2019). Therefore, I first investigate whether the momentum crashes, as well as the momentum effects *per se*, are universal around

[5]Though unreported, the market beta of the residual momentum factor (Blitz et al. 2011) shows similar behavior.

the world, and then relate the FTQ events to these crashes. Moreover, the international data enable to further explore a number of novel research questions: Do these crashes show similar patterns in terms of timing and magnitude? Are the crashes proportional to the momentum profits across countries? Can investors also hedge the foreign crashes using the existing methods? Do the FTQ events lead to the momentum crashes in all developed markets?

I first test whether momentum crashes occur internationally. I find that momentum returns are negatively skewed in most countries. Among 23 MSCI developed countries, 20 countries exhibit negative skewness.[6] In particular, momentum exhibits its worst performance in the recovery period after recessions. During the recovery, winners underperform losers by a significant -1.28% per month. Momentum crashes during the recovery period are most severe in the United States, Canada, and Sweden (-5.13%, -4.23%, and -3.71% per month, respectively), whereas least severe in Israel (1.77% per month).[7] Unlike the momentum returns *per se* that differ by country (Griffin et al. 2003, Chui et al. 2010, Goyal and Wahal 2015)[8], the momentum crashes are universal, which suggest the separate origins of the momentum returns and their crashes (Novy-Marx 2015, Goetzmann and Huang 2018).

Next, I estimate the time-varying market beta of momentum portfolios for each country conditioning on the recovery period. The estimation shows that momentum portfolios have a significantly negative market beta during the recovery, consistent with the US evidence of Daniel and Moskowitz (2016). The market beta of momentum returns during the recovery period is significantly lower by -0.630. Sweden has the largest discrepency (-1.439), whereas Norway has the smallest difference (-0.306). I also implement constant and dynamic volatility strategies widely accepted in recent literature (Moskowitz et al. 2012, Barroso and Santa-Clara 2015, Daniel and Moskowitz 2016, Hurst et al. 2017, Har-

[6]Australia, Switzerland, and Portugal show positive skewness in the momentum return distributions.

[7]Israel, Denmark, and Austria do not experience momentum crashes in the recovery period.

[8]Asness et al. (2013) show that the momentum returns in Japan are positive and significant after accounting other pricing factors.

vey et al. 2018). Both strategies change the weights of the portfolio over time by reducing the leverage of the strategies if the market is predicted to be volatile. These strategies work better than simple momentum strategies in most countries, increasing the average return by 0.41% per month. The strategies also generate much higher Sharpe ratios—0.44 and 0.48 per annum for the constant and dynamic strategies, respectively—than their pure counterparts—0.32 per annum.

The high beta of the losers in the recovery comes from two effects, changes in the composition of the portfolio, that is, more procyclical stocks in the portfolio, and changes in the beta of the constituent stocks. To disentangle the effects, I compare the market betas of momentum portfolios estimated in different windows: of (t-5, t+6), of (t-23, t-12), and of (t+13, t+24) months. During a recession, the market beta of the loser portfolio measured in (t-5, t+6) is higher than the beta of the same portfolio measured in (t-23, t-12) or (t+13, t+24), whereas the beta of the winner portfolio does not change by the estimation windows. The results indicate that the beta of the stocks in the loser portfolio increase temporarily. It is consistent with the hypothesis that the prices of the loser stocks temporarily drop due to FTQ and recovers when the economy improves.

Furthermore, I investigate whether FTQ is related to a sudden fall in the stock prices of the losers and subsequent increase. To capture FTQ, I use fund flows of U.S. institutional investors.[9] From the panel regression, I find that institutional flows have a positive relationship with next quarter stock returns over the normal period, but they are negatively associated with next quarter stock returns over the recovery period. I disentangle the effects of outflows and inflows, and show that the outflows actually lead to a larger increase in stock returns over the next recovery period. In addition, I study the interaction between institutional flows and past stock returns and find that the increase in returns during the recovery is more pronounced for the loser stocks with institutional outflows. Next, I investigate whether the loser stocks during the recovery are those with

[9]U.S. institutional investors are less restricted in transferring funds from one country to another, so their tradings are similar to trading patterns of FTQ.

more institutional outflows and higher default risks. I confirm that the losers indeed experience larger institutional outflows during the recession and have greater leverage during the recovery and therefore have a higher risk of default. My results indicate that the outperformance of the losers relative to the winners during the recovery is keenly related to the trading pattern of the investors.

Finally, following the recent FTQ literature (Baele et al. 2019, Boudry et al. 2019), I also identify both FTQ and flight to risk (FTR) events using both stock and bond market information rather than institutional investors behavior. Since the FTQ and FTR events identified by this method are short and infrequent, I estimate their effects to momentum returns using daily US momentum deciles as well as monthly momentum portfolios in other countries. Consistent with other findings, the results demonstrate that the momentum returns positively (negatively) react to FTQ (FTR) events and their reaction is greater to FTR rather than FTQ events, which are similar to the previous market rebounds.

The remainder of the paper is organized as follows. Section 2 describes the data, and Section 3 documents the international evidences of momentum crashes. Section 4 explores the relation between momentum crashes and FTQ. The final section concludes.

2 Data

2.1 Stock Returns

The returns and market capitalizations of international securities are obtained from Datastream. The intersection of the data contains 45,815 securities across 124 countries from December 1964 to July 2015. Bermuda, Cayman Islands, Côte d'Ivoire, Malawi, Monaco, Virgin Islands, Zambia, Canada, and United States are excluded. I include the observations if at least 10 securities are available for each country and month. From the data, I only keep the stocks identified by the Datastream type (EQ). I use the SEDOL codes to identify the securities and the Datastream return indices to compute the security returns. I obtain the securities' regional (headquarter) information through FactSet using the SEDOL codes.

Following the literature, I include large securities that comprise the first 90% of each country's market capitalization in each month. I adopt the 95% alternatively for Israel and Spain because the 90% threshold drops too many samples in late 1980s and early 1990s.[10] According to the classification of Morgan Stanley Capital International (MSCI), 79 countries are classified by developed, emerging, or frontiers. In detail, 21 countries are classified as developed markets, 25 countries are classified as emerging markets, and 33 countries are classified as frontier markets. In the main analysis, only the results of developed countries are reported, and the results of emerging and frontier countries are included in the appendix.

The return index and market value of each security are denominated in its home currency. The local return in month t is the difference between the return indices in t and t-1 divided by the return index in t-1. The value-weighted portfolio return in month t is based on each participating security's local market capitalization. I rank the securities each month by the (-12,-2) returns, the cumulative returns from t-12 to t-2, and form either the quintile portfolios in the countries with 300 or more securities available or the tercile portfolios otherwise.

In each country, the bear market indicator in month t is 1 if the excess market return from t-25 to t-1 is negative, and the down market indicator in month t is 1 if the one-month or two-month excess market return is negative. The backward, central, and forward betas of each security in month t are the simple regression estimates of the excess security returns on the excess market counterparts from t-24 to t-12, t-6 to t+6, and t+12 to t+24, respectively.

The leverage variables are from Datastream. I calculate the total liabilities to share-

[10]The size distribution of Israel and Spain is quite positively skewed. The largest company in each country has a market share of nearly 40%.

holders' equity ratio and the current liabilities to shareholders' equity counterpart as the default risk measures. I require shareholders' equity (WC03995) observations to have positive values but allow current liabilities (WC03101) observations with negative values. Each total liabilities observation is the difference between the total liabilities and shareholders' equity (WC03999) and the shareholders' equity (WC03995). I alter negative total liabilities observations by zero.

2.2 Currencies

The matching U.S. dollar return is based on the exchange rate return in month t. I collect the United States dollar exchange rates against other currencies from FactSet. I identify each country and each currency by the ISO 3166 and 4217 codes, respectively. I collect the one-month Treasury bill rates as the risk-free rates from the Kenneth R. French's website. Each excess return is the difference between the U.S. dollar return and the risk-free rate. Portfolios' total and excess returns are converted from local currencies to US dollars pursuant their respective definitions.

2.3 Institutional Investments

The institutional ownership data are from Global Ownership of Thomson Reuters. I consider observations with the country code 21 as the U.S. institutions and measure each security's ownership change in each quarter based on the SEDOL code. The institutional ownership change in quarter t is the aggregated value change from t-1 to t divided by the market capitalization in t. Unlike the returns above, I compute each institutional ownership change using the U.S. dollar market capitalization as well as the U.S. dollar value change.

2.4 Stock Market-Bond Market Disagreements

In addition to US institutional investment data, the FTQ and FTR events are identified following Baele et al. (2019) and Boudry et al. (2019). Since this literature employs stock and bond market return data around the world, I use daily total market indices (TOTMK) and benchmark 10 year government bond indices (BM10) from Datastream for stock and bond market returns, respectively. Due to their unavailability issue, I exclude Hong Kong and Israel from this analysis.

3 International Momentum Crashes

Summary statistics from the 21 countries categorized as developed by Morgan Stanley Capital International (MSCI) are presented in Table 1 . I sort the countries in the first column based on the numbers of the stocks available in my data. I append a dagger (†) to a country with less than 300 securities. Each country, I report the beginning and ending dates in the second and third columns, respectively. For example, the data from the United Kingdom and Ireland start early in January 1966, but those from Spain and Portugal start late in April 1988 and September 1989, respectively. Each in the fourth and fifth columns exhibits the time-series average number of available stocks and the number of available months by country.[11] Following Fama and French (2017), I only consider large stocks that account for up to 90% of the country's total market capital each month.[12] For Israel and Spain, where the largest company accounts for nearly 50% of the country's total market capitalization, I apply the threshold of 95% instead of 90%, as the 90% rule drops too many small-caps in the late 1980s and early 1990s. The sixth to ninth columns present the sample means, standard deviations, skewness estimates,

[11] For example, in Japan, there are 498 months, with an average of more than 554 securities per month. In Portugal, there exist 294 months, with less than 10 securities per month on average.

[12] For example, in Japan, there exist 752 stocks available at the beginning of February 1974. According to the rules, I only include the largest 376 securities, with a total capital of 29.12 trillion yen, because they account for 90% of the total capital of 32.37 trillion yen.

and annualized Sharpe ratios of the countries' monthly excess market returns. Each month, I calculate the value-weighted average market return of each country, convert the average return to the dollar return based on the percentage change of the exchange rate, and calculate the excess market return based on a one month U.S. Treasury bill rate. The average excess market return is between 0.213% and 1.041%. Hong Kong has the highest market return (1.04%), whereas Portugal has the lowest market return (0.213%) among developed countries. The average standard deviation of excess market return for developed countries is 6.952%. The excess returns show a positive skewness in the United Kingdom (0.95) and Singapore (0.81), but a negative skewness in Norway (-0.56) and Australia (-0.72). The Sharpe ratios are relatively high in Switzerland (0.51), Sweden (0.45), and Hong Kong (0.40), but relatively low in Austria (0.16), Italy (0.15), and Portugal (0.10).

The last seven columns in Table 1 labeled momentum(-12,-2) display the sample means, standard deviations, and skewness estimates of the countries' winner-minus-loser (WML) portfolios, and then the average returns and annualized Sharpe ratios of the countries' winner and loser portfolios. For each country, I form the value-weighted quintile or tercile (†) portfolios based on the returns from t-12 to t-2 of the sample stocks, rebalance them each month, and adopt the highest and lowest portfolios with past returns as the winner and loser portfolios following Daniel and Moskowitz (2016). Consistent with the international momentum literature, the average monthly returns of WML portfolios are positive in all countries except Spain. Instead, the average momentum return in Spain is positive for the equal-weighted momentum strategy without sample selection.[13] The average returns of the momentum portfolios in Israel (1.69%) and Denmark (1.32%) are relatively high, but those in Japan (0.19%) and Belgium (0.0009%) are relatively low.[14] The WML portfolios in the United Kingdom (5.91%) and Australia (6.15%) are riskier

[13]Without sample screening, the mean, standard deviation, and skewness of WML portfolio of Spain are 0.64%, 5.83%, and -1.08, respectively.

[14]In Belgium, the average return of the momentum portfolio becomes much higher (0.77%) if I use the equal-weighted tercile portfolios and do not exclude any stocks based on the market capital.

than those in Sweden (11.63%) and Israel (14.26%). In my sample periods, the value-weighted momentum strategies show a significance greater than 10% for 14 out of the 21 countries. As documented in the previous literature, momentum strategies are profitable in most countries.

It is worth noting that 18 of the 21 skewness estimates of momentum portfolios are negative, indicating that the momentum strategy is embedded in the possibility of a crash. The skewness estimates are positive in Australia (0.08), Portugal (0.03), and Switzerland (0.03), but are very negative in Singapore (-1.16), Sweden (-1.47), and Spain (-2.16). The correlation between the means and skewness of the momentum is 0.51. It shows that the occasional momentum collapse seriously affects the average of momentum gains.

Following Daniel and Moskowitz (2016), if the excess market returns in the previous two years are negative, I define time as a bear market, otherwise it will be a normal market. In the bear market, I divide time into up and down markets. If the excess market return for the current month is negative (positive), then it is a down (up) market. Table 2 displays the average returns of the market, winner, loser, and WML portfolios in the developed countries during the normal, bear-down, and bear-up markets. For each country in the first column, I report the average returns of the market, winner, loser, and WML portfolios during the normal period in Panel A. For each WML portfolio, I also report the t-statistic and the number of observations in the sixth and seventh columns respectively. Panel B and Panel C present the same statistics during the bear-down and the bear-up markets respectively. The bottom row exhibits the averages of the average returns and their t-statistics.

Consistent with the momentum literature, the average returns of momentum portfolios are positive in non-bear markets (0.38%) and bear markets (0.42%). In detail, the average returns during the bear-down and bear-up markets are asymmetric. In the bear market, the sample mean is largely positive (3.36%), whereas in the bear market it is negative (-1.17%). However, the bear-up months (101 months on average) are about twice more often the bear-down months (55 months on average). The average returns during the bear-down markets are positive in all countries except Israel, and those during the bear-up markets are negative in the most countries, 18 out of 21 countries. In 16 out of 21 t-statistics during the bear-down markets are greater than 1.64 and 7 out of 21 t-statistics during the bear-up markets are less than -1.64. The results show that the momentum strategy is profitable in normal period and at the beginning of recession periods, but in the recovery period, the momentum returns are globally negative. Based on the findings that momentum crashes occur during a given period, the momentum crash seems to be a systematic problem. This suggests that the stocks included mechanically in the momentum portfolio during the recovery are systematically different from those of other periods.

The average returns during the bear-down markets are relatively high in Sweden (8.53%), Norway (6.29%), and Hong Kong (4.91%), but relatively low in Australia (0.72%), Austria (0.32%), and Israel (-0.32%). Likewise, the average returns during the bear-up markets are relatively low in Sweden (-3.71%), Singapore (-3.52%), and Switzerland (-2.65%), but relatively high in Denmark (0.16%), Austria (0.48%), and Israel (1.77%). The countries with the wide gaps are the countries with the high excess market returns. The average market returns in Hong Kong, Sweden, Singapore, Switzerland, and Norway are 1.04%, 0.99%, 0.76%, 0.75%, and 0.73%, respectively. The correlation coefficient between the WML gaps during the bear-down and bear-up markets and the excess market returns are 0.58.

Table 3 displays the market timing regression estimates and the corresponding t-statistics from the developed countries. Following Daniel and Moskowitz (2016), I consider (1) a regression with one alpha and three betas during non-bear, bear-up, and bear-down markets; (2) a simple market regression with one alpha and one beta; (3) a regression with two alphas and two betas during non-bear and bear markets respectively;

and (4) a regression with two alphas during non-bear and bear markets, and three betas during non-bear, bear, bear-up markets. I report the estimates of the first regression obtained from the developed countries in Table 3, and those of the other regression specifications and those obtained from the emerging and unclassified countries in Appendix. For each country in the first column, I report the estimates (t-statistics) of the alpha, normal beta, bear-down beta, and bear-up beta in the even (odd) columns, respectively. The bottom row exhibits the averages of the countries' regression estimates and their t-statistics.

Consistent with the literature, the alpha estimates are positive in all countries but Belgium. In Belgium, alternatively, the alpha estimate of the equal-weighted counterpart is also positive (0.90%) and statistically significant at 1% level. The estimates are relatively high in Israel (2.98%), Portugal (2.57%), and Denmark (1.91%), but relatively low in Japan (0.31%), Spain (0.27%), and Belgium (-0.02%). Fifteen of 21 t-statistics are greater than 1.64.[15]

Non-bear beta estimates are positive in 18 of the 21 countries and significant in 11 countries. The estimates are relatively high in Japan (0.40), Portugal (0.31), and Israel (0.27), but relatively low in Germany (0.06), New Zealand (0.04), and the United Kingdom (0.02). The estimates are negative in France (-0.004), Spain (-0.007), and Italy (-0.08), but insignificant. The average of the estimates is 0.14.[16] I confirm that the non-bear market beta of WML is negative in the U.S., but positive outside the U.S., consistent with the literature (Novy-Marx 2012, Daniel and Moskowitz 2016).

The bear-down beta estimates are negative in all countries but Israel and significant in 15 out of 21 countries. The bear-up beta estimates are negative and significant in all countries. Note that the bear-up beta captures the time-varying amount of beta from the bechmark beta, that is, non-bear beta. In all countries, the sum of non-bear beta and

[15] In the appendix, the average alphas from the regression models (2), (3), and (4) are 0.89%, 0.92%, and 0.92%, respectively.

[16] The averages from the regressions (2), (3), and (4) above are -0.14, 0.14, and 0.14, respectively.

bear-up beta is also siginficantly negative, suggesting that momentum portfolios have negative market betas in the recovery. The averages of the bear-down beta estimates and the bear-up counterparts are -0.45 and -0.72, respectively. The results are consistent with (a) Grundy and Martin (2001) as the betas are time-varying and negative during bear markets, (b) Cooper et al. (2004) as the WML portfolios underperform during bear markets, and (c) Daniel and Moskowitz (2016) as there exists the optionality in the upside and downside beta estimates during the bear markets. The bear-up beta estimates are greater in magnitude than the bear-down counterparts in 17 out of 21 countries by 0.28 on average, and the F-statistics about their respective differences are significant in 7 out of 21 countries.[17]

There is an interesting relationship between the alphas and the difference between the bear-down beta and bear-up beta. The alphas are relatively high in the countries where the differences between betas are greater in magnitude. In other words, the market beta of momentum portfolio is more time-varying in the countries with the momentum profits. It suggests that in countries with momentum profits, momentum crash is more likely to occur during the recovery periods. The differences between the bear-down and bear-up betas in Israel, Portugal, and Denmark are -1.38, -0.85, and -0.59, respectively. The correlation coefficient between the alphas and the differences is -0.85. The same coefficient between the bear (non-bear) alphas and the bear-beta differences is -0.86 (-0.39).

The time-varying beta of momentum portfolio can be dissected by the beta changes of winners and losers. It can be further divided into a time-varying composition of the portfolio and a time-varying betas of constituent stocks. We examine the channels of time-varying beta of momentum portfolio in Table 4 by looking at the behavior of the central, backward, and forward 12-month betas from the winner, loser, and WML port-

[17]The bear beta estimates from the regressions (3) and (4) are significant in all countries and 16 out of 21 countries respectively. The averages of the bear beta estimates from the regressions (3) and (4) are -0.61 and -0.40 respectively.

folios during the non-bear, bear-up, and bear-down markets. I obtain the equal-weighted betas of the countries' winner, loser, and WML portfolios based on the betas of the constituent stocks each month and report their time-series averages during the non-bear, bear-down, and bear-up markets. I regress the securities' returns on the corresponding market returns to acquire the stocks' market betas. In each month t, I estimate (i) the central betas using the monthly returns from t-5 to t+6, (ii) the backward betas using the monthly returns from t-23 to t-12, and (iii) the forward betas using the monthly returns from t+13 to t+24.

In Panel A, I present the central betas for each country. The backward betas and the forward betas are reported in Panel B and Panel C, respectively. Each panel contains the averages of the winner, loser, and WML betas during the non-bear, bear-down, and bear-up markets, respectively. The asterisks present the significance of the averages from the respective WML portfolios. The results with the central window in Panel A are consistent with the results in Table 3. The averages of the WML portfolios' equal-weighted betas during the non-bear markets are positive in all countries but New Zealand and significant in 16 out of 21 countries. The averages during the bear-down and bear-up markets are negative and significant in all countries. The non-bear, bear-down, and bear-up averages of the respective 21 WML averages are 0.14, -0.39, and -0.36. Both beta changes in winners and losers seem to contribute beta changes in WML portfolio. During the recovery period, the loser's beta change is more pronounced, at 0.3, whereas the winner's beta decreases by 0.2.

The results with the backward beta in Panel B are also consistent as the non-bear betas are positive in 16 out of 21 countries and the bear betas in all countries except the bear-up beta in Switzerland are negative. Unlike the central betas, however, the backward counterparts exhibit a relatively weaker pattern. Fifty-five out of 63 backward WML betas are less in magnitude by 0.15 on average than the central counterparts. The non-bear, bear-down, and bear-up averages of the respective 21 WML averages are

0.03, -0.23, and -0.16. Likewise, the pattern of the forward betas in Panel C is relatively weaker than that in the central betas. Forty-seven out of 63 forward WML betas are less in magnitude by 0.10 on average than the central counterparts. The non-bear, bear-down, and bear-up averages of the respective 21 WML averages are 0.08, -0.29, and -0.20.

It is worth noting that during a recession, central beta of the losers (winners) are higher (less) than backward and forward betas of the same portfolio. The loser's market beta has increased over the past year before being included in the loser portfolio, and after the formation period, the market beta has declined. It can be inferred that the increase in the beta of losers during this period is mainly due to changes in the beta of individual stocks rather than changes in composition. If the loser's stock price temporarily falls more than other stocks and then rebounds more, then the beta change pattern can be similar. The time-varying beta of the losers is due to the capture of this fluctuation.

Table 5 displays the returns and Sharpe ratios of (i) the plain WML strategy, (ii) the constant volatility strategy, and (iii) the dynamic volatility strategy by country. Following Daniel and Moskowitz (2016), I estimate the full-sample GJR-GARCH(1,1)-M with each country's WML portfolio and scale the portfolio based on the mean and variance estimates to implement the constant and dynamic volatility strategies.[18] I adjust the time-invariant scalars in the scaling factors of the constant and dynamic strategies to equate the strategies' full-sample volatilities and the plain strategy's counterpart.

For each country in the first column, I report the average returns of the plain, constant, and dynamic strategies in the second, third, and fourth columns, respectively. The brackets below the averages display the annualized Sharpe ratios. I also report the GARCH estimates of each country in the fifth to tenth columns. The parentheses below the estimates exhibit the t-statistics. The bottom row presents the averages of the countries' estimates and their t-statistics.

[18]As aforementioned in Daniel and Moskowitz (2016), these GARCH-based strategies are not implementable in real time. Some strategies using trailing volatilities allow real time implementation but require daily returns as well as monthly returns (Moreira and Muir 2017, Harvey et al. 2018).

The results in Table 5 are consistent with not only Barroso and Santa-Clara (2015) as the constant volatility strategies outperform the plain WML strategies in all countries, but also Daniel and Moskowitz (2016) as the dynamic volatility strategies outperform the constant volatility strategies in all countries but Finland. The return improvements from the plain strategies to the constant counterparts are relatively high in Spain (0.75%), Israel (0.71%), and Sweden (0.61%), but relatively low in New Zealand (0.07%), Norway (0.06%), and Finland (0.03%). The return improvements from the constant strategies to the dynamic counterparts are relatively high in Spain (1.22%), Singapore (0.64%), and Belgium (0.58%), but relatively low in Norway (0.03%), New Zealand (0.02%), and Sweden (0.01%), and negative in Finland (-0.03%). The average returns (Sharpe ratios) of the countries' plain, constant, and dynamic strategies are 0.77% (0.30), 1.06% (0.41), and 1.31% (0.51), respectively. The improvements by the constant strategies are not in some countries, but those by the dynamic counterparts are in most countries. The correlation coefficients of the plain strategies' averages with the improvements by the constant and dynamic strategies are -0.03 and -0.57, respectively.

The results in the 8th column are also consistent with the momentum literature. The asymmetry parameters are negative in all countries but Germany and significant in 18 out of 21 countries. The pattern suggests the momentum crashes as the volatility react strongly to the positive shocks and weakly to the negative counterparts. Unlike the literature, however, the feedback parameters in the 10th column are significant in 3 out of 21 countries, though their average is -0.59.

The unreported alphas of the plain strategies are positive in all countries but Spain (-0.16%) and significant in 17 out of 21 countries. The alphas of the constant strategies are positive in all countries including Spain. They are significant in 18 out of 21 countries. The alphas of the dynamic strategies are positive and significant in all countries. The averages from the unreported alphas of the plain, constant, and dynamic strategies are 0.85%, 1.13%, and 1.34%, respectively. Likewise, I examine whether the plain strategies span the constant and dynamic strategies based on the regression alphas of the constant and dynamic strategies on the plain counterparts. The unreported alphas of the constant and dynamic strategies after the plain counterparts are significant in 17 out 21 countries respectively. The averages of the unreported alphas from the constant and dynamic strategies are 0.34% and 0.74% respectively.

In addition, the averages of the plain, constant, and dynamic strategies' unreported skewness estimates are -0.54, -0.24, and 0.36, respectively. Consistent with Barroso and Santa-Clara (2015) and Daniel and Moskowitz (2016), the results indicate that the constant and dynamic volatility strategies mitigate the momentum crashes of the plain WML strategies and improve them significantly in the international markets. The results also prove that the performance improvements by the dynamic volatility strategies are more effective and stable than those by the constant counterparts.

4 Flights to Quality and Momentum Crashes

4.1 FTQs by Institutional Investments

In Table 6 panel A, I investigate the stock return consequences of flight-to-quality. FTQ is proxied by ownership changes of U.S. financial institutions. The rationale for this proxy is that U.S. institutions are less constrained to withdraw their money from one country, their investment behavior would resemble the investment pattern of FTQ investors. Due to the filing frequency of ownership data, I use quarterly returns and quarterly holding changes of U.S. institutions. I run the following panel regression:

$$R_{cit+1} = \alpha_t + \left(\beta + \left(\gamma + \delta I_{Uct+1}\right) I_{Bct}\right) \Delta IO_{it} + \varepsilon_{cit+1}, \tag{1}$$

where R is the dollar return, I_B is the bear market indicator, I_U is the up market indicator, and ΔIO is the institutional ownership change at the stock level. For the up market indicator (I_{Uct+1}), I use the beginning month of the quarter (I_{U1}) or the same quarter $\left(I_{U(1,3)}\right)$ relative to the quarter of stock return. The subscripts c, i, and t indicate each country, stock, and quarter, respectively. In the regression, I include time fixed effects and cluster standard errors by country. Column 1 shows that changes in U.S. institutional ownership is positively and significantly associated with the next quarter stock returns. It is consistent with the literature of smart money effect in foreign equity sector by U.S. institutions. I decompose the ownership changes by positive and negative changes. This decompositition allows me to examine whether return predictability comes from inflows, outflows, or both. The result in column 2 shows that outflows predominantly predict returns, but not inflows. When U.S. institutions collectively sell, then the returns of the stocks are lower in the next quarter. In columns 3–8, I divide the periods to distinguish the effect of institutional holding changes over different periods. In columns 5 and 7, I find that the stock return becomes opposite to the direction of institutional flows in the next quarter if the next quarter is up market during the recession. The results in columns 6 and 8 indicate that the reversal during bear-up market period is concentrated in stocks with institutional outflows.

In panel B of Table 6, I examine the interaction effect of institutional flows and momentum. In the previous section, I show that momentum crash is due to the extremely high return of losers in the recovery. The results in columns 6 and 8 indicate that there is an interaction between momentum and FTQ. The returns of the losers, which also experienced U.S. institutional outflows, are particularly higher during the bear-up market period. It is consistent that the reversal of the losers are associated with the flight-to-quaility and the subsequent flight-from-quality, that is, investors over-sell risky stocks at high risk of default, but the price declines of losers rebound rapidly during the market recovery phase, when market-wide fears about default risks are resolved.

Table 7 displays changes in institutional ownership prior to the formation of the winner and loser portfolios during the non-bear, bear-down, and bear-up markets. I obtain the institutional ownership changes of the securities from Global Ownership and compute the value-weighted averages of the winner and loser portfolios. Changes in ownership of the winner and loser portfolios are calculated monthly, even if institutional ownership changes are quarterly, as the portfolio is rebalanced each month. For example, value-weighted averages for October, November and December are derived from changes in institutional ownership from the previous quarter, from July through the end of September. I winsorize the ownership changes at the 0.5th and 99.5th percentiles by country and months.

For each country in the first column, I report the means of the monthly value-weighted average institutional ownership changes based on the previous quarter data (ΔIO from t-2 to t-1) in Panel A, based on the data from two quarters before (ΔIO from t-3 to t-2) in Panel B, and based on the previous two quarter data (ΔIO from t-3 to t-1) in Panel C, respectively. Each Panel of 9 columns exhibits the winner and loser portfolios' means and their differences during the non-bear, bear-down, and bear-up markets respectively. The bottom row presents the averages of the countries' estimates and their t-statistics.

The results indicate that the institutional investors increase their ownership of the winner securities more and the ownership of the loser counterparts less on average. In panel A, the differences between the winner and loser average ownership changes are positive in 16 out of 21 countries during the non-bear, bear-down, and bear-up markets, respectively. In panel B, the differences are positive in 16, 13, and 18 countries during the non-bear, bear-down, and bear-up markets, respectively. In panel C, the differences are positive in 17, 16, and 18 countries during the non-bear, bear-down, and bear-up markets, respectively. The averages of the differences during the non-bear, bear-up, and bear-down markets are 0.10, 0.19, and 0.18 in panel A, 0.13, -0.01, and 0.19 in panel B, and 0.22, 0.00, and 0.30 in panel C, respectively. This evidence suggests that the institutional investors prefer the momentum strategy to the reversal counterpart.

The results also indicate that the institutional investors increase their ownership more during the non-bear markets and less during the bear-down and bear-up markets on average. In panel C, the averages from the countries' winner portfolios during the non-bear, bear-down, and bear-up markets are 0.55, 0.02, and 0.17, respectively. Likewise, the same averages from the countries' loser counterparts are 0.33, 0.02, and -0.14, respectively. This evidence suggests that the institutions relatively inject capital into the international markets prior to the non-bear markets and relatively eject from the markets prior to the bear-down and bear-up markets.

An interesting pattern exists between the countries' average WML returns and the institutional ownership changes. The correlation coefficients of the average returns with the differences between the winner and loser portfolios' ownership changes during the non-bear, bear-down, and bear-up markets are 0.12, 0.32, and 0.60, respectively. The same coefficients with the central (backward) betas in Table 4 are 0.08 (0.28), 0.11 (-0.54), and 0.48 (-0.25), respectively. The results suggest that the momentum strategies by the institutional investors are effective as the returns of the WML portfolios are proportional to the differences between the winner and loser portfolios' ownership changes.

Table 8 exhibits the winner and loser portfolios' equal-weighted averages of the book leverages with the total and current liabilities respectively during the non-bear, bear-down, and bear-up markets. I acquire the current liabilities, total liabilities, and shareholders' equity of each participating security from Datastream and compute the current liabilities-to-shareholders' equity ratio and the total liabilities-to-shareholders' equity counterpart as the default risk measures. I estimate the monthly equal-weighted averages of the winner and loser portfolios with the annual balance sheet items as I rebalance the portfolios each month. For example, I calculate the monthly equal-weighted averages in year t with the leverage ratios based on the accounting data in year t-1. I exclude observations with negative shareholders' equity values and alter negative total liabilities values by 0s. I winsorize the ratios at the 99th percentile by country and year.

For each country in the first column, I report the means from the monthly equal-weighted averages with the total liabilities-to-shareholders' equity ratios of the winner and loser portfolios in the second to tenth columns, and the same means with the current liabilities-to-shareholders' equity ratios in the eleventh to nineteenth columns, respectively. Each partition of nine columns display the winner and loser portfolios' means and their differences during the non-bear, bear-down, and bear-up markets. The bottom row exhibits the averages of the countries' estimates and their t-statistics.

The results present that the differences between the leverage ratios of the winner and loser portfolios increase (decrease) prior to the non-bear (bear-down and bear-up) markets on average. In panel A, 13 (8) out of 21 differences are positive (significant) during the non-bear markets and the average is 0.19. In contrast, 15 (6) differences are negative (significant) during the bear-down markets and 14 (9) differences are negative (significant) during the bear-up markets. The averages during the bear-down and bear-up markets are -1.02 and -1.03 respectively. In panel B, likewise, 13 (8) out of 21 differences are positive (significant) during the non-bear markets, but 14 (9) differences are negative (significant) during the bear-down markets and 14 (10) differences are negative (significant) during the bear-up markets. The averages during the non-bear, bear-down, and bear-up markets are 0.02, -0.24, and -0.22, respectively. The correlation coefficient between the WML returns during all the periods and the leverage ratios with the total liabilities (current liabilities) is 0.29 (0.16). The unreported results with the value-weighted leverage ratios are also consistent with the results in Table 8. This evidence demonstrates that the default risk measures explain the time-varying returns of the WML portfolios in part as the leverage ratios allegedly proxy the default probabilities.

One characteristic of flight-to-quality events is the enhanced negative correlation between the stock and bond markets (Baele et al. 2019). If the flight-to-quality events affect these two markets more during the bear markets than the bull markets, then the correlation between the stock and bond markets will decrease. Following Baele et al. (2019), I investigate whether the daily return correlations between the stock and bond markets in the countries decrease during the bear markets. Table 9 exhibits the daily return performance of the stock and bond markets in the MSCI developed markets except the United States, Canada, Hong Kong, and Israel.

Among 19 countries, the correlation between the stock and bond markets is negative in 14 countries and significant in 10 countries during the bull markets, while the correlation is positive in 5 countries and significant in Italy, Ireland, Spain and Portugal. During the bear-down markets, in contrast, the correlation is negative and significant in 11 countries, but positive and significant in Italy and Portugal. The positive and significant correlations in Spain and Ireland become insignificant and negative, respectively. In detail, during the bear-down markets, the correlation drops in 16 countries and the decreases are significant in 8 countries. Similarly, during the bear-up markets, the correlation drops in 15 countries but significant in only 4 countries. This is consistent with the literature as the flight-to-quality events are more likely during the bear-down markets according to the definition of the flight-to-quality. Consistent with Baele et al. (2019), these findings imply that the flight-to-quality episodes affect both the stock and bond markets in the countries during the bear markets, especially during the bear-down markets, and that the bear market indicator variables capture the flight-to-quality effects consistently.

4.2 FTQs by Stock Market-Bond Market Disagreements

FTQ behavior by investor is informative but difficult to directly observe. Researchers, therefore, also use market information to indirectly identify FTQ events and measure their effects (Baele et al., 2019; Boudry et al., 2019). They identify the FTQ events as the periods with large negative stock market returns and large positive bond market returns together. Since these events are short and infrequent, the researchers examine daily data from stock and bond markets.

Following this literature, I examine how FTQ affects momentum crashes using the indirect method as well. Following Baele et al. (2019), I compute daily stock and bond market returns from US Datastream market total return index (TOTMKUS) and US benchmark 10 year Datastream government bond total return index (BMUS10Y), respectively. Daily FTQ events are identified as follows.

$$FTQ_t = I\left\{r_t^b > \kappa\sigma_t^b\right\} \times I\left\{r_t^e < -\kappa\sigma_t^e\right\},$$

where r_t^b and r_t^e are the daily bond and stock market returns, respectively. σ_t^b and σ_t^e are the second moments of these returns estimated using a one-sided normal kernel with a bandwidth of 250 days skipping the nearest 5 days to avoid any influence of FTQ and FTR events. κ is 1.5 following Boudry et al. (2019) while the results are robust regardless of the choice.

While both FTQ and flight to risk (FTR) affect momentum returns, momentum crashes are affected more by FTR events because these crashes often occur during market recoveries. Therefore, I identify FTR events in addition to the FTQ counterparts using the opposite inequalities. That is, the FTR events are identified as the periods with large negative bond market returns and large positive stock market returns together.

Figure A3 shows the annual distribution of FTQ and FTR days identified using the stock and bond market returns from the 21 countries. The results confirm that the FTQ and FTR days tend to cluster over time. For example, there were 33 FTQ days in the United States and 387 FTQ days outside the United States in 2007 and 2008. These FTQ days account for 29.2% and 26.7% of all the FTQ days identified in and outside the United States, respectively. Likewise, 19.7% of FTR days in the United States and 28.2% of FTR days outside the United States are concentrated in 2007 and 2008.

Though untabulated, the unconditional likelihood of the identified FTQ events is 1.13% and their estimated daily price impact is 4.01%. These results are consistent with the 1.74% likelihood of Baele et al. (2019) and the 1.54% likelihood of Boudry et al.

(2019) but lower than these two. Similarly, the unconditional likelihood of the identified FTR events is 0.76% and their estimated daily price impact is 3.69%.

Since these FTQ and FTR events are identified at a monthly frequency, I first examine daily momentum returns. Due to the lack of daily momentum return data by country, I investigate US daily momentum deciles. After than, I generalize the definition of the FTQ and FTR events to incorporate monthly momentum returns around the world. Using these events, I estimate the following regression.

$$R_t^e = \alpha + \beta^\top f_t + \gamma FTQ_t + \beta_Q FTQ_t f_t^{MKTRF} + \delta FTR_t + \beta_R FTR_t f_t^{MKTRF} + \varepsilon_t,$$

where R_t^e is a daily excess return of each momentum decile or a daily winner-minus-loser (WML) return from the deciles, and f_t is a vector of pricing factors (Fama and French, 2015). I estimate γ and δ with and without these factors, and then test whether γ, δ, β_Q, and β_R are significant.

Table 10 exhibits the regression results. The first partition displays the results without the pricing factors. The intercept of the daily WML returns is 4.8 basis points (12.1% per annum) and its t-statistics is 2.86. Consistent with previous results, the γ and δ estimates are 0.9% and -1.3% and their t-statistics are 2.60 and -3.32, respectively. The results show that the WML portfolio experiences positive returns during FTQ events and negative returns during FTR events, and that the magnitude of the negative returns is greater than that of the positive returns. The unreported Wald statistic that tests their difference is 13.82.

The second and third partitions display the results with the pricing factors. The intercept after controlling the factors is 6.2 basis points (12.1% per annum) and its t-statistics is 4.12. Following the literature, the daily WML returns exhibit negative loadings to the market, size, and value factors but positive loadings to the profitability and investment factors, respectively. Furthermore, consistent with previous results, the

β_R is negative and significant. That is, the WML returns react more negatively to the market factor during FTR events.

Similar to Boudry et al. (2019), I also examine how FTQ and FTR events affect momentum returns using monthly FTQ and FTR variables as well as monthly momentum returns around the world. After excluding the United States, Canada, Hong Kong, and Israel, I compute the daily FTQ and FTR variables of the 19 MSCI developed countries using their stock (TOTMK) and bond (BM10Y) market returns (Baele et al., 2019) and examine whether there are FTQ and FTR events occurred in each month to incorporate monthly information. Monthly FTQ (FTR) variables are one in month t if one or more FTQ (FTR) events identified in month t. Similar to the previous regression, both γ and δ are estimated with monthly WML returns by country but without other factors.

Table 11 exhibits the regression results. The intercept is positive in all countries but Belgium and significant in 5 out of 19 countries. When all countries are used, it is positive ($\alpha = 0.008$) and significant ($t = 6.52$). The γ for the FTQ events is positive (significant) in 14 (6) out of 19 countries. When all countries are used, it is positive ($\gamma = 0.012$) and significant ($t = 3.67$). The δ for the FTR events is negative in 15 out of 19 countries and significant in France, Norway, and Austria. When all countries are used, it is negative ($\delta = -0.015$) and significant ($t = 4.12$). The results are also consistent when NFTQ and NFTR replace FTQ and FTR, respectively. Consistent with previous findings, these results show that the WML returns react positively (negatively) to FTQ (FTR) events, and that the magnitude of the return reaction to FTR events is greater than its counterpart to FTQ events.

5 Conclusion

Many papers have explored the momentum effect and the momentum crashes. These papers are also suggesting some successful trading methods that improve the static momentum portfolios, which are vulnerable to those momentum crashes. In contrast, the economic reason of these momentum crashes has drawn relatively less attention from those papers. I examine the momentum crashes in international stock markets and introduce flights to quality in financial markets to help explain the way the momentum crashes take place. While the flights to quality are being studied actively, I relate them to the momentum crashes to better understand the cross-sectional phenomena.

Like the momentum effect *per se*, the momentum crashes are universal in the international security markets, as well as the United States market. Alongside the positive and economically significant Sharpe ratios of the momentum portfolios around the world, their skewness estimates are negative and economically significant as well on average. In particular, the crashes are concentrated during the bear-up rather than non-bear and bear-down markets, and the tendencies are captured by the market timing regressions with the respective indicators. The time-varying betas explain the crashes in part as the betas are weakly positive during the non-bear markets and strongly negative during the bear markets, and the bear-up betas are greater in magnitude than the bear-down counterparts. These patterns are clear with the central betas, but unclear with the backward and forward betas.

The momentum crashes are also noticeable in the countries where the momentum performance is insignificant. The constant and dynamic volatility strategies proposed by Barroso and Santa-Clara (2015) and Daniel and Moskowitz (2016) respectively are effective to avoid the crashes and improve the WML portfolios. The constant and dynamic volatility portfolios with the GJR-GARCH(1,1)-M estimates outperform not only the corresponding market portfolios but also the plain momentum counterparts. The improvements of the dynamic volatility portfolios are proportional, but those of the constant volatility counterparts are disproportionate. The decrease in the negative skewness estimates after these portfolios is economically significant. The momentum returns across the countries are weakly correlated with each other.

Flight-to-quality by U.S. institutional investors precedes the momentum crashes. The institutional ownership changes proxy the flight-to-quality. The returns react positively to the flight-to-quality during the non-bear markets. This relation becomes negative during the bear-down markets. This reversal confirms both the smart money effect by the institutional investors and the price rebounds of the securities followed by the flight-to-quality. The smart money effect comes from the negative institutional ownership changes, i.e. the outflows, rather than the positive counterparts, i.e. the inflows. Likewise, the reversal arises after the outflows but does not after the inflows. The rebounds are more pronounced among the loser securities than the winner counterparts, resulting in the collapses of the WML portfolios.

Momentum returns exhibit consistent patterns when both FTQ and FTR events are identified by stock and bond market data rather than US institutional investor data. The FTQ and FTR events identified by Baele et al. (2019) and Boudry et al. (2019) demonstrate the positive reaction of the WML returns during the FTQ events and the negative reaction during the FTR events. The results also show that the negative FTR reaction is greater than the positive FTQ reaction. These empirical findings answer why the momentum crashes occur in part.

The flight-to-quality coincides with how default risk behaves around the bear markets. Two leverage ratios, the total liabilities and current liabilities-to-shareholders' equity ratios respectively, proxy the default risk. During the bear markets, the institutional flows to the loser securities fall more than those to the winner counterparts do. At the same time, the loser securities become riskier than the winner counterparts. The evidence advocates the time-varying risk literature as the default risk measures as well as the central betas exhibit a negative relation with the flight-to-quality proxies. The results associate the increased loser default risk during the bear markets with the institutional flight-to-quality and exhibit the post flight loser rebounds that crashes momentum.

References

Ali, Usman, Kent Daniel, and David Hirshleifer, 2017, One Brief Shining Moment(um): Past Momentum Performance and Momentum Reversals , *Working Paper* .

Asness, Clifford S., Tobias J. Moskowitz, and Lasse Heje Pedersen, 2013, Value and Momentum Everywhere, *The Journal of Finance* 68, 929–985.

Baele, Lieven, Geert Bekaert, Koen Inghelbrecht, and Min Wei, 2019, Flights to Safety, *The Review of Financial Studies* .

Barroso, Pedro, and Pedro Santa-Clara, 2015, Momentum Has Its Moments, *Journal of Financial Economics* 116, 111 – 120.

Barsky, Robert, 1989, Why don't the prices of stocks and bonds move together?, *American Economic Review* 79, 1132–45.

Bekaert, Geert, Robert J Hodrick, and Xiaoyan Zhang, 2009, International stock return comovements, *The Journal of Finance* 64, 2591–2626.

Blitz, David, Joop Huij, and Martin Martens, 2011, Residual momentum, *Journal of Empirical Finance* 18, 506–521.

Boudry, Walter I., Robert A. Connolly, and Eva Steiner, 2019, What Happens During Flight to Safety: Evidence from Public and Private Real Estate Markets, *Real Estate Economics* 1–26.

Caballero, Ricardo J., and Arvind Krishnamurthy, 2008, Collective risk management in a flight to quality episode, *The Journal of Finance* 63, 2195–2230.

Chui, Andy C.W., Sheridan Titman, and K.C. John Wei, 2010, Individualism and Momentum around the World, *The Journal of Finance* 65, 361–392.

Cooper, Michael J., Roberto C. Gutierrez Jr., and Allaudeen Hameed, 2004, Market States and Momentum, *The Journal of Finance* 59, 1345–1365.

Daniel, Kent, and Tobias J. Moskowitz, 2016, Momentum Crashes, *Journal of Financial Economics* 122, 221 – 247.

Ehsani, Sina, and Juhani Linnainmaa, 2019, Factor Momentum and the Momentum Factor, *Working Paper* .

Fama, Eugene F, and Kenneth R French, 2015, A five-factor asset pricing model, *Journal of financial economics* 116, 1–22.

Fama, Eugene F., and Kenneth R. French, 2017, International Tests of a Five-factor Asset Pricing Model, *Journal of Financial Economics* 123, 441 – 463.

Goetzmann, William N., and Simon Huang, 2018, Momentum in Imperial Russia, *Journal of Financial Economics* 130, 579 – 591.

Goyal, Amit, and Sunil Wahal, 2015, Is momentum an echo?, *Journal of Financial and*

Quantitative Analysis 50, 1237–1267.

Griffin, John M, Xiuqing Ji, and J Spencer Martin, 2003, Momentum investing and business cycle risk: Evidence from pole to pole, *The Journal of Finance* 58, 2515–2547.

Grundy, Bruce D., and J. Spencer Martin Martin, 2001, Understanding the Nature of the Risks and the Source of the Rewards to Momentum Investing, *The Review of Financial Studies* 14, 29–78.

Harvey, Campbell R, Edward Hoyle, Russell Korgaonkar, Sandy Rattray, Matthew Sargaison, and Otto Van Hemert, 2018, The impact of volatility targeting, *The Journal of Portfolio Management* 45, 14–33.

He, Zhiguo, and Arvind Krishnamurthy, 2012, A Model of Capital and Crises, *The Review of Economic Studies* 2, 735–777.

Hurst, Brian, Yao Hua Ooi, and Lasse Heje Pedersen, 2017, A century of evidence on trend-following investing, *The Journal of Portfolio Management* 44, 15–29.

Jegadeesh, Narasimhan, and Sheridan Titman, 1993, Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency, *The Journal of Finance* 48, 65–91.

Kothari, Shanker P, and Jay Shanken, 1992, Stock return variation and expected dividends: A time-series and cross-sectional analysis, *Journal of Financial Economics* 31, 177–210.

Krishnamurthy, Arvind, 2010, Amplification mechanisms in liquidity crises, *American Economic Journal: Macroeconomics* 2, 1–30.

Moreira, Alan, and Tyler Muir, 2017, Volatility-managed portfolios, *The Journal of Finance* 72, 1611–1644.

Moskowitz, Tobias J, Yao Hua Ooi, and Lasse Heje Pedersen, 2012, Time series momentum, *Journal of financial economics* 104, 228–250.

Novy-Marx, Robert, 2012, Is Momentum Really Momentum?, *Journal of Financial Economics* 103, 429 – 453.

Novy-Marx, Robert, 2015, Fundamentally, momentum is fundamental momentum, *Working Paper* .

Stivers, Chris, and Licheng Sun, 2010, Cross-Sectional Return Dispersion and Time Variation in Value and Momentum Premiums, *The Journal of Financial and Quantitative Analysis* 45, 987–1014.

Vayanos, Dimitri, 2004, Flight to Quality, Flight to Liquidity, and the Pricing of Risk , *Working Paper* .

Table 1: Market and Momentum Portfolios by Country

This table presents summary statistics of market and momentum returns of each country. The returns are US dollar return, i.e. local returns are coverted into US dollar retruns using exchange rates. Monthly US and Canadan return data are collected from Compustat. Monthly local return data are collected from Datastream and classified by the FactSet ISO country codes—classes other than EQ are excluded. If Datastream, I only include the top 90% of each country by size each month to exclude outliers following the previous literature. For each country, the value-weighted market portfolio and the winner-minus-loser momentum portfolio are formed respectively. I construct the WML portfolio using quintile or tercile († is displayed next to the country name) depending on the number of stocks available in the country following Daniel and Moskowitz (2016). The second and third columns display the beginning and ending periods of my samples. N is the time-series average of the number of stocks in the country and T is the number of monthly observations. The market and momentum columns report the mean, standard deviation, skewness, and annualized Sharpe ratio of market portfolio and momentum portfolio. The last row displays the pooled estimates from all country returns and the corresponding t-statistics. The table shows the results of MSCI developed countries and the results of MSCI emerging and other countries are available in the appendix.

					Market (Value-Weighted)				Momentum (-12,-2)						
Country	Start	Finish	N	T	Mean (%)	St Dev (%)	Skew	Sharpe	Mean (%)	St Dev (%)	Skew	Winner Mean (%)	Loser Mean (%)	Winner Sharpe	Loser Sharpe
United States	19500731	20181231	3,572.1	822	0.634	4.247	-0.555	0.517	1.046	6.074	-1.146	1.049	0.003	0.679	0.002
Canada	19510131	20181231	106.5	816	0.511	5.532	-0.524	0.320	1.138	10.494	-0.557	0.905	-0.233	0.400	-0.076
Japan	19740228	20150731	554.4	498	0.389	6.042	0.270	0.223	0.195	6.391	-0.499	0.573	0.378	0.293	0.178
United Kingdom	19660131	20150731	136.3	595	0.637	6.173	0.945	0.357	0.571	5.909	-0.585	0.878	0.308	0.461	0.134
Australia	19740228	20150731	72.4	498	0.656	7.039	-0.720	0.323	0.680	6.150	0.075	0.982	0.302	0.436	0.127
France	19740228	20150630	66.3	497	0.615	6.188	-0.281	0.344	0.480	6.935	-0.563	0.938	0.458	0.512	0.183
Germany	19740228	20150630	39.9	497	0.387	5.880	0.047	0.228	0.810	9.859	-0.193	0.993	0.183	0.462	0.072
Hong Kong	19740228	20150731	68.7	498	1.041	8.993	-0.310	0.401	0.830	8.087	-0.881	1.410	0.580	0.519	0.185
Singapore	19740228	20150731	49.6	498	0.761	8.136	0.806	0.324	0.417	8.019	-1.160	1.132	0.714	0.419	0.224
Sweden	19830228	20150630	26.0	389	0.988	7.536	-0.140	0.454	0.966	11.625	-1.472	1.839	0.873	0.753	0.253
Israel	19870228	20150630	95.6	341	0.648	7.946	-0.554	0.283	1.691	14.264	-0.629	-0.296	1.395	0.410	-0.080
Italy	19740228	20150630	24.9	482	0.297	6.955	0.332	0.148	0.778	10.635	-0.448	0.533	-0.196	0.205	-0.061
Switzerland	19740228	20150630	27.5	497	0.747	5.112	-0.360	0.506	0.575	7.007	0.031	0.950	0.374	0.530	0.169
Norway	19810228	20150630	25.5	413	0.725	7.441	-0.558	0.338	1.132	9.322	-0.067	1.334	0.202	0.508	0.065
Netherlands	19740228	20150731	23.9	498	0.618	5.696	-0.288	0.376	0.770	9.418	-0.168	1.101	0.331	0.535	0.123
Denmark	19740228	20150630	23.8	497	0.638	5.924	-0.337	0.373	1.316	9.195	-0.383	1.386	0.071	0.639	0.026
Belgium†	19740228	20150630	15.8	497	0.519	5.677	-0.356	0.316	0.001	7.749	-1.002	0.593	0.615	0.331	0.266
Spain†	19880430	20121130	28.8	296	0.348	7.273	-0.307	0.166	-0.277	9.152	-2.162	0.737	0.460	0.230	0.251
New Zealand†	19870228	20150630	20.0	341	0.492	6.620	-0.448	0.257	0.837	7.110	-0.156	0.928	0.091	0.468	0.037
Finland†	19880229	20150630	18.7	317	0.632	9.199	0.239	0.238	1.097	9.253	-0.155	1.386	0.289	0.544	0.094
Austria†	19740228	20150630	15.4	497	0.307	6.515	-0.217	0.163	0.837	6.557	-0.693	0.715	-0.122	0.361	-0.055
Ireland†	19660131	20150731	10.2	578	0.614	6.379	-0.078	0.333	1.305	9.405	-0.225	1.115	-0.168	0.502	-0.064
Portugal†	19890930	20150630	9.7	294	0.213	7.433	0.462	0.099	1.142	11.242	0.033	0.814	-0.349	0.307	-0.106
Total					0.594***	6.592***	-0.076	0.312***	0.805***	8.720***	-0.576***	1.015***	0.209***	0.455***	0.076***
					(9.46)	(85.17)	(-0.62)	(9.38)	(9.86)	(65.67)	(-2.99)	(11.39)	(2.35)	(13.62)	(2.37)

Table 2: Momentum Profits for Different Time Periods

This table reports average monthly returns of all, winner, loser, and winner-minus-loser (WML) portfolios for three different time periods: (i) normal periods, (ii) bear down market periods, and (iii) bear up market periods. I_B is the bear market indicator, I_{BD} is the bear down market indicator, and I_{BU} is the bear market and up market indicator. I define the bear market if the 2-year excess market return is negative, or 0 otherwise. I define the down (up) market if the contemporaneous excess market return is negative (positive), or 0 otherwise. The loser and winner portfolios are the bottom and top quintile—or tercile if less than 300 stocks are available—portfolios. The fourth and fifth columns of each period exhibit t-statistics of the winner-minus-loser portfolios and number of monthly observations. The returns of all, loser, winner portfolios are the excess returns after the one-month T-bill rates and the return of the winner-minus-loser portfolios is the long-short return. The last row displays the pooled estimates from all countries and their bootstrap t-statistics. This table includes 23 MSCI developed countries - other emerging and unclassified countries are also available in the appendix.

	Panel A						Panel B						Panel C					
	$I_B = 0$						$I_{BD} = 1$						$I_{BU} = 1$					
Country	All	Winner	Loser	WML	t Stat	T	All	Winner	Loser	WML	t Stat	T	All	Winner	Loser	WML	t Stat	T
United States	0.969	1.430	0.160	1.270	(6.35)	718	-4.944	-4.241	-9.006	4.765	(4.23)	40	5.329	4.664	9.798	-5.134	(-3.77)	50
Canada	0.656	1.174	-0.547	1.722	(4.67)	636	-3.651	-3.409	-7.042	3.633	(2.90)	72	5.391	5.113	9.347	-4.234	(-2.76)	99
Japan	0.224	0.353	0.544	-0.190	(-0.43)	200	-5.435	-4.860	-6.421	1.561	(2.60)	78	3.841	3.687	4.997	-1.310	(-2.20)	122
United Kingdom	0.646	0.709	0.904	-0.195	(-0.30)	152	-6.499	-5.771	-8.311	2.540	(2.66)	56	4.813	4.488	6.280	-1.791	(-2.14)	96
Australia	1.631	1.489	1.710	-0.221	(-0.47)	154	-5.135	-4.515	-5.232	0.717	(0.91)	51	4.981	4.462	5.147	-0.685	(-1.18)	103
France	0.820	1.073	1.129	-0.057	(-0.09)	177	-6.123	-4.339	-8.333	3.994	(4.05)	56	4.033	3.577	5.508	-1.931	(-2.58)	121
Germany	0.643	1.244	0.591	0.653	(0.75)	178	-4.906	-2.951	-6.274	3.322	(2.91)	64	3.758	3.599	4.445	-0.846	(-0.71)	114
Hong Kong	0.805	1.043	0.770	0.273	(0.32)	130	-8.849	-6.642	-11.553	4.911	(4.08)	44	5.745	4.975	7.074	-2.100	(-2.00)	86
Singapore	1.095	1.305	2.044	-0.739	(-0.87)	144	-5.540	-4.480	-8.518	4.038	(5.32)	53	4.960	4.675	8.196	-3.521	(-3.01)	91
Sweden	1.000	2.482	1.471	1.011	(0.55)	96	-7.430	-2.715	-11.248	8.533	(4.19)	37	6.287	5.741	9.447	-3.706	(-1.48)	59
Israel	-0.083	0.753	-0.835	1.588	(2.23)	193	-7.182	-8.487	-8.164	-0.323	(-0.10)	28	4.882	5.770	4.000	1.770	(0.96)	96
Italy	0.226	0.947	0.120	0.898	(1.24)	217	-5.525	-4.590	-7.448	2.857	(3.44)	88	4.149	4.753	5.282	-0.449	(-0.42)	129
Switzerland	0.823	0.701	0.945	-0.244	(-0.30)	126	-4.654	-3.477	-8.045	4.568	(2.97)	42	3.562	2.790	5.440	-2.650	(-3.12)	84
Norway	1.436	1.959	0.619	1.340	(1.29)	130	-6.703	-4.853	-11.139	6.285	(3.19)	37	4.674	4.670	5.297	-0.627	(-0.54)	93
Netherlands	0.378	0.321	0.446	-0.125	(-0.14)	155	-6.211	-5.251	-9.426	4.175	(2.65)	48	3.334	2.820	4.874	-2.054	(-1.92)	107
Denmark	1.588	2.217	1.235	0.982	(1.13)	165	-5.876	-5.154	-8.556	3.402	(2.15)	42	4.137	4.733	4.578	0.156	(0.15)	123
Belgium	0.385	0.489	0.235	0.254	(0.36)	186	-4.649	-3.390	-6.184	2.793	(2.47)	70	3.422	2.830	4.108	-1.278	(-1.43)	116
Spain	0.714	0.759	1.199	-0.440	(-0.59)	136	-7.722	-5.345	-9.067	3.722	(3.17)	46	3.988	3.591	4.633	-1.042	(-1.13)	90
New Zealand	0.260	1.104	-0.042	1.147	(1.53)	120	-7.509	-4.975	-8.936	3.961	(3.35)	42	4.444	4.378	4.747	-0.369	(-0.40)	78
Finland	0.661	1.474	0.796	0.679	(0.66)	120	-9.122	-5.806	-10.564	4.758	(2.73)	42	5.929	5.394	6.912	-1.518	(-1.25)	78
Austria	0.088	0.466	0.057	0.409	(0.90)	254	-3.913	-3.519	-3.839	0.320	(0.62)	112	3.243	3.609	3.130	0.479	(0.68)	142
Ireland	0.624	0.526	0.176	0.350	(0.47)	193	-5.823	-5.285	-7.210	1.925	(1.63)	66	3.974	3.546	4.014	-0.469	(-0.49)	127
Portugal	0.608	1.162	0.558	0.640	(0.53)	118	-6.996	-5.756	-8.256	2.500	(1.51)	45	5.295	5.486	5.992	-0.523	(-0.31)	73
Total	0.608***	1.086***	-0.019**	1.101**			-5.838***	-4.620***	-7.760***	3.140***			4.374***	4.204***	5.490***	-1.281***		
	(8.51)	(12.08)	(-0.21)	(12.51)			(-41.09)	(-26.01)	(-32.23)	(12.32)			(36.79)	(30.91)	(23.84)	(-5.52)		

Table 3: Time-Varying Betas of Momentum Portfolios in Bear and Up Markets by Country

Following Daniel and Moskowitz (2016), I estimate the market timing regression for each country to capture the changing behavior of WML portfolios during bear down (BD) and bear up (BU) markets.

$$R_{\text{WML}it} = \alpha_i + \left(\beta_i + \left(\beta_{BDi} I_{BDit} + \beta_{BUi} I_{BUit}\right)\right) R_{Mit} + \varepsilon_{it}$$

Where the subscripts i and t represent each country and month, respectively. R_{WML} is the return of the WML portfolio, R_M is the market return of each country, I_{BD} is the bear down market indicator, and I_{BU} is the bear up market indicator, respectively. I define the bear market if the 2-year excess market return is negative, or 0 otherwise. I define the down (up) market if the contemporaneous excess market return is negative (positive), or 0 otherwise. This table only covers the results of the specification above - the regression results of other specifications are available in the appendix. The last row displays the pooled estimates from all countires and their t-statistics. This table includes 23 MSCI developed countries - other emerging and unclassified countries are also available in the appendix. The asterisks indicate the significance at 10% (*), 5% (**), and 1% (***) levels.

Country	α (%)	$t(\alpha)$	β	$t(\beta)$	β_{BD}	$t(\beta_{BD})$	β_{BU}	$t(\beta_{BU})$
United States	1.275***	(6.02)	-0.054	(-1.00)	-0.632***	(-4.04)	-1.143***	(-7.87)
Canada	1.780***	(4.66)	0.054	(0.73)	-0.537**	(-2.18)	-1.322***	(-7.41)
Japan	0.315	(1.03)	0.405***	(6.17)	-0.652***	(-5.08)	-0.888***	(-8.49)
United Kingdom	0.787***	(3.05)	0.024	(0.45)	-0.225**	(-2.00)	-0.475***	(-5.44)
Australia	1.023***	(3.40)	0.181***	(3.69)	-0.251*	(-1.77)	-0.489***	(-4.94)
France	1.094***	(3.42)	-0.004	(-0.06)	-0.438***	(-3.26)	-0.858***	(-7.63)
Germany	1.393***	(2.99)	0.064	(0.63)	-0.314	(-1.50)	-0.680***	(-3.87)
Hong Kong	0.974***	(2.75)	0.157***	(3.25)	-0.612***	(-5.43)	-0.601***	(-6.30)
Singapore	0.747**	(2.02)	0.113*	(1.91)	-0.567***	(-3.59)	-0.788***	(-7.06)
Sweden	1.343**	(2.24)	0.260***	(2.81)	-1.153***	(-5.38)	-1.439***	(-8.15)
Israel	2.976***	(3.66)	0.274**	(2.12)	0.383	(1.30)	-0.998***	(-4.31)
Italy	0.924	(1.64)	-0.079	(-0.77)	-0.227	(-1.14)	-0.313*	(-1.84)
Switzerland	0.475	(1.38)	0.166**	(2.20)	-0.968***	(-4.59)	-0.670***	(-4.08)
Norway	0.734	(1.45)	0.083	(1.03)	-0.536***	(-2.75)	-0.306**	(-1.99)
Netherlands	1.007**	(2.22)	0.198**	(2.02)	-0.690***	(-3.46)	-1.067***	(-5.67)
Denmark	1.914***	(4.20)	0.079	(0.82)	-0.078	(-0.39)	-0.664***	(-3.98)
Belgium	-0.017	(-0.04)	0.254***	(3.23)	-0.972***	(-5.89)	-0.870***	(-6.02)
Spain	0.265	(0.48)	-0.067	(-0.56)	-0.406**	(-2.29)	-0.535***	(-3.16)
New Zealand	1.146***	(3.12)	0.036	(0.47)	-0.265**	(-1.97)	-0.551***	(-4.38)
Finland	1.516***	(2.66)	0.168**	(2.18)	-0.622***	(-4.03)	-0.797***	(-6.30)
Austria	1.129***	(3.40)	0.083	(1.37)	-0.194	(-1.60)	-0.518***	(-4.53)
Ireland	1.522***	(3.44)	0.132	(1.56)	-0.427**	(-2.31)	-0.701***	(-4.49)
Portugal	2.566***	(3.14)	0.307	(1.62)	-0.129	(-0.46)	-0.976***	(-4.01)
Total	1.041***		0.098***		-0.458***		-0.630***	
	(11.66)		(2.93)		(-6.77)		(-8.89)	

Table 4: Backward and Forward Market Beta of Momentum Portfolio for Different Time Periods

This table reports equal-weighted average of market beta (β) of winner, loser, and winner-minus-loser (WML) portfolios for three different time periods: (i) normal periods, (ii) bear down market periods, and (iii) bear up market periods. Market beta (β) is measured from rolling regressions for three different horizons for each stock: from -5 to 6 months $\left(\beta_{(-5,6)}\right)$, from -23 to -12 months $\left(\beta_{(-23,-12)}\right)$, and from 13 to 24 months $\left(\beta_{(13,24)}\right)$ relative to the portfolio formation period. I_B is the bear market indicator, I_{BD} is the bear down market indicator, and I_{BU} is the bear market and up market indicator. I define the bear market if the 2-year excess market return is negative, or 0 otherwise. I define the down (up) market if the contemporaneous excess market return is negative (positive), or 0 otherwise. The loser and winner portfolios are the bottom and top quintile—or tercile if less than 300 stocks are available—portfolios. This table only includes 21 MSCI developed countries - other emerging and unclassified countries are also available in the appendix. WML columns of each period include asterisks, which indicate the significance at 10% (*), 5% (**), and 1% (***) levels.

	Panel A								
	$\beta_{(-5,6)}$								
	$I_B = 0$			$I_{BD} = 1$			$I_{BU} = 1$		
Country	W	L	WML	W	L	WML	W	L	WML
Japan	1.08	0.83	0.25***	0.91	1.21	-0.3***	0.86	1.17	-0.31***
United Kingdom	1.09	0.99	0.1***	0.91	1.42	-0.51***	0.92	1.29	-0.37***
Australia	1.06	0.93	0.13***	0.93	1.06	-0.13**	0.9	1.07	-0.17***
France	1.04	0.94	0.1***	0.84	1.39	-0.55***	0.79	1.32	-0.54***
Germany	0.95	0.77	0.18***	0.59	0.95	-0.37***	0.65	1.07	-0.42***
Hong Kong	0.99	0.93	0.06**	0.82	1.2	-0.38***	0.89	1.21	-0.32***
Singapore	1.11	1.02	0.09***	0.93	1.4	-0.47***	0.87	1.21	-0.34***
Sweden	0.93	0.9	0.04	0.49	1.35	-0.86***	0.64	1.37	-0.73***
Israel	1.17	0.96	0.21***	0.83	1.2	-0.37***	0.84	1.21	-0.37***
Italy	1.1	0.88	0.22***	0.87	1.33	-0.46***	0.8	1.26	-0.46***
Switzerland	1.02	0.96	0.06***	0.86	1.69	-0.83***	0.87	1.31	-0.44***
Norway	0.99	0.97	0.02	0.95	1.27	-0.32***	1.04	1.22	-0.18**
Netherlands	1.05	0.94	0.11***	0.89	1.11	-0.23**	0.85	1.21	-0.36***
Denmark	1.03	0.91	0.12***	0.88	1.07	-0.19**	0.89	1.14	-0.26***
Belgium	0.92	0.68	0.25***	0.77	1.08	-0.31***	0.72	1.04	-0.32***
Spain	0.92	0.87	0.05	0.66	1.27	-0.59***	0.57	1.2	-0.63***
New Zealand	0.9	0.91	-0.01	0.87	1	-0.13**	0.78	1.01	-0.23***
Finland	0.92	0.67	0.25***	0.61	0.99	-0.38***	0.61	0.97	-0.36***
Austria	1.07	0.86	0.21***	0.95	1.16	-0.21**	0.89	1.03	-0.14**
Ireland	0.95	0.89	0.06	0.76	1.05	-0.29***	0.75	1	-0.25***
Portugal	1.15	0.75	0.39***	0.8	1.12	-0.34***	0.79	1.17	-0.41***
Total	1.02***	0.88***	0.14***	0.82***	1.21***	-0.39***	0.81***	1.17***	-0.36***
	(58.13)	(42.63)	(6.28)	(29.27)	(30.59)	(-9.09)	(31.83)	(46.21)	(-11.35)

	Panel B									Panel C								
	$\beta_{(-23,-12)}$									$\beta_{(13,24)}$								
	$I_B = 0$			$I_{BD} = 1$			$I_{BU} = 1$			$I_B = 0$			$I_{BD} = 1$			$I_{BU} = 1$		
Country	W	L	WML	W	L	WML	W	L	WML	W	L	WML	W	L	WML	W	L	WML
Japan	0.99	0.97	0.02	0.9	1.07	-0.17***	0.89	1.07	-0.18***	1.01	0.9	0.11***	0.91	1.15	-0.23***	0.9	1.08	-0.18***
United Kingdom	1.05	1.02	0.02	0.95	1.11	-0.17**	1.02	1.12	-0.1*	1.1	1.01	0.09***	1.03	1.19	-0.16**	1.04	1.14	-0.1**
Australia	0.97	1	-0.03	0.9	1.02	-0.13**	0.89	1.01	-0.12***	1.01	0.94	0.08***	0.94	1.09	-0.15***	0.89	1.06	-0.17***
France	1.05	1	0.05*	0.89	1.14	-0.26***	0.85	1.09	-0.24***	1.05	0.95	0.11***	0.94	1.14	-0.19***	0.88	1.09	-0.21***
Germany	0.86	0.86	0	0.53	0.89	-0.36***	0.69	0.94	-0.25***	1	0.78	0.22***	0.68	0.89	-0.2***	0.81	0.95	-0.14***
Hong Kong	1.03	0.99	0.04	0.77	1.09	-0.32***	0.98	1.06	-0.08	1.03	0.89	0.14***	0.85	1.07	-0.22***	0.91	1.03	-0.12**
Singapore	1.08	1.17	-0.09***	0.86	0.98	-0.12**	0.91	1.02	-0.11**	1.04	1.05	-0.01	0.92	1.32	-0.4***	1.01	1.3	-0.3***
Sweden	0.98	0.89	0.09***	0.59	1.01	-0.38***	0.65	0.97	-0.31***	0.93	0.8	0.13***	0.72	1.31	-0.59***	0.87	1.21	-0.33***
Israel	1.01	1.06	-0.06*	0.8	1.04	-0.24***	0.75	1.04	-0.29***	1.13	0.99	0.13***	0.79	0.98	-0.19**	0.86	0.96	-0.09*
Italy	1.03	0.89	0.14***	0.87	1.07	-0.19***	0.81	1.13	-0.32***	0.98	1.01	-0.02	0.83	1.25	-0.42***	0.8	1.26	-0.45***
Switzerland	0.98	0.95	0.03	0.97	1.08	-0.11	1.11	1.06	0.05	1.05	0.91	0.14***	1	1.15	-0.15	1.08	1.08	0
Norway	1.02	1.03	-0.02	0.86	1.28	-0.42***	0.87	1.1	-0.23***	1.02	0.93	0.09***	0.97	1.29	-0.32***	0.86	1.16	-0.3***
Netherlands	0.99	0.99	0	0.83	1.05	-0.22**	0.93	0.97	-0.04	1.01	0.83	0.17***	0.96	1.09	-0.13	0.96	1.11	-0.15**
Denmark	1.06	0.98	0.08***	0.91	1.07	-0.17*	0.96	1.1	-0.15**	0.89	0.95	-0.06**	1	1.18	-0.18*	0.97	1.05	-0.08*
Belgium	0.88	0.77	0.11***	0.74	0.88	-0.14**	0.83	0.9	-0.06	0.86	0.83	0.03	0.85	0.94	-0.1	0.92	0.9	0.02
Spain	0.78	0.79	-0.01	0.79	1.07	-0.3***	0.85	1.14	-0.3***	0.9	0.89	0	0.79	1.72	-0.93**	0.83	1.41	-0.54***
New Zealand	0.9	0.85	0.05***	0.8	1.03	-0.23***	0.76	1	-0.24***	0.86	0.9	-0.03*	0.81	0.96	-0.15**	0.78	1.01	-0.22***
Finland	0.83	0.71	0.12***	0.71	0.85	-0.14**	0.83	0.89	-0.06	0.77	0.62	0.16***	0.65	0.95	-0.3***	0.73	0.98	-0.25***
Austria	1.01	0.87	0.15***	0.96	1.07	-0.11	0.96	0.97	-0.02	1.01	0.92	0.09**	0.9	1.36	-0.46***	0.95	1.03	-0.08
Ireland	0.88	0.87	0	0.77	0.95	-0.19**	0.75	0.95	-0.2***	0.92	0.81	0.12***	0.88	1.01	-0.13	0.87	0.93	-0.06
Portugal	1.03	1	0.03	0.87	1.26	-0.39***	0.92	1.11	-0.2**	1.05	0.91	0	0.76	1.15	-0.39***	0.84	1.2	-0.36***
Total	0.97***	0.94***	0.03**	0.82***	1.05***	-0.23***	0.87***	1.03***	-0.16***	0.98***	0.90***	0.08***	0.87***	1.15***	-0.29***	0.89***	1.09***	-0.20***
	(53.47)	(39.60)	(2.55)	(33.38)	(45.41)	(-10.45)	(35.91)	(60.97)	(-7.06)	(51.15)	(42.74)	(4.84)	(37.21)	(28.07)	(-6.63)	(47.51)	(38.34)	(-6.21)

Table 5: Time-Varying Maximum Sharpe Ratio Momentum Strategies with the GARCH Forecasts by Country

Following Daniel and Moskowitz (2016), I implement the constant and dynamic volatility strategies in addition to plain WML strategy. I estimate full-sample GJR-GARCH(1,1)-M using the plain momentum portfolio, and apply the scaling factor, $1/\left(2\lambda\sigma_{t-1}\right)$ for the constant volatility strategy and $\mu_{t-1}/\left(2\lambda\sigma_{t-1}^2\right)$ for the dynamic volatility strategy, respectively. I scale the constant and dynamic strategies using the time-invariant scalar λ, so that the full sample volatilities of the plain, constant, and dynamic strategies are equal. The specification of the GARCH model estimated by the maximum likelihood method is as follow:

$$\begin{aligned} R_t &= \mu + \delta h_t + \varepsilon_t \\ h_t &= \omega + \left(\alpha + \gamma I_{t-1}\right)\varepsilon_{t-1}^2 + \beta h_{t-1}. \end{aligned}$$

R_t is the return of the plain momentum portfolio, h_t is the time-varying volatility, and I_t is the indicator variable for negative ε_t. ω, α, and β govern the GARCH process. The parameters γ and δ reflect the asymmetric effect and the volatility-to-return effect, respectively. WML, CVOL, and DVOL are the average monthly returns of the plain, constant volatility, and dynamic volatility portfolios, respectively. The numbers in the sqaure brackets are annualized Sharpe ratios from the three momentum portfolios and the numbers in the parentheses are the t-statistics of GARCH parameter estimates. The last row, Total, displays the pooled statistics and estimates from all countries and their t-statistics. This table includes 23 MSCI developed countries - other emerging and unclassified countries are also available in the appendix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Country	WML	CVOL	DVOL	μ	ω	α	γ	β	δ
United States	1.0455	1.5070	1.6416	0.0135***	0.0001***	0.3748***	-0.3390***	0.7730***	-1.1249*
	[0.596]	[0.859]	[0.936]	(7.542)	(3.983)	(6.815)	(-5.669)	(34.204)	(-1.683)
Canada	1.1380	1.2688	1.2945	0.0118*	0.0003***	0.1521***	-0.1404***	0.8951***	-0.1129
	[0.376]	[0.419]	[0.427]	(1.875)	(2.816)	(4.922)	(-4.242)	(-43.663)	(-0.170)
Japan	0.1948	0.3676	0.5691	0.0078**	0.0003***	0.3020***	-0.2740***	0.7831***	-1.4265
	[0.106]	[0.199]	[0.308]	(2.263)	(2.680)	(4.039)	(-3.939)	(14.266)	(-1.346)
United Kingdom	0.5706	0.7387	0.7941	0.0116***	0.0002***	0.1765***	-0.1234***	0.8280***	-2.0606*
	[0.334]	[0.433]	[0.466]	(3.633)	(3.470)	(4.310)	(-3.209)	(23.773)	(-1.815)
Australia	0.6803	0.7925	0.8404	0.0079	0.0004***	0.2745***	-0.1785**	0.7126***	-0.2213
	[0.383]	[0.446]	[0.473]	(1.495)	(2.603)	(3.858)	(-2.530)	(10.062)	(-0.136)
France	0.4797	0.6489	0.7993	0.0089*	0.0004***	0.3675***	-0.3317***	0.7327***	-0.7871
	[0.240]	[0.324]	[0.399]	(1.859)	(3.198)	(3.841)	(-3.383)	(15.318)	(-0.648)
Germany	0.8101	1.1905	1.5066	0.0159***	0.0010***	0.4978***	0.0086	0.5748***	-0.5263
	[0.285]	[0.418]	[0.529]	(3.049)	(4.771)	(6.516)	(0.092)	(14.821)	(-1.028)
Hong Kong	0.8297	1.3068	1.7546	0.0176***	0.0002***	0.2639***	-0.2181***	0.8253***	-1.3529
	[0.355]	[0.560]	[0.752]	(3.715)	(3.144)	(5.310)	(-4.382)	(43.591)	(-1.417)
Singapore	0.4174	0.8255	1.4634	0.0164***	0.0004***	0.3509***	-0.2894***	0.7807***	-1.5718*
	[0.180]	[0.357]	[0.632]	(3.079)	(3.390)	(5.100)	(-4.388)	(20.427)	(-1.646)
Sweden	0.9658	1.5714	1.5810	0.0111**	0.0003***	0.3052***	-0.3052***	0.8310***	-0.2677
	[0.288]	[0.468]	[0.471]	(2.266)	(2.625)	(5.309)	(-5.309)	(34.302)	(-0.514)
Israel	1.6906	2.4004	2.7618	0.0150***	0.0002	0.2918***	-0.1520*	0.8053***	0.0296
	[0.411]	[0.583]	[0.671]	(2.596)	(1.514)	(3.566)	(-1.897)	(20.031)	(0.072)
Italy	0.7777	1.1357	1.3932	0.0066	0.0001	0.2459***	-0.1587***	0.8602***	0.0664
	[0.253]	[0.370]	[0.454]	(1.408)	(1.355)	(7.250)	(-4.137)	(52.772)	(0.123)
Switzerland	0.5753	0.7459	0.8496	0.0105**	0.0002**	0.1995***	-0.1499**	0.8238***	-0.9567
	[0.284]	[0.369]	[0.420]	(2.183)	(2.276)	(2.900)	(-2.346)	(15.669)	(-0.822)
Norway	1.1321	1.1967	1.2231	0.0094	0.0007*	0.1982***	-0.1469**	0.8055***	0.2759
	[0.421]	[0.445]	[0.455]	(0.877)	(1.847)	(2.754)	(-2.041)	(11.663)	(0.205)
Netherlands	0.7699	1.0371	1.1343	0.0117**	0.0005***	0.2793***	-0.2706***	0.8089***	-0.4887
	[0.283]	[0.381]	[0.417]	(2.046)	(2.687)	(4.409)	(-4.649)	(17.415)	(-0.613)
Denmark	1.3156	1.6527	1.7616	0.0138**	0.0006***	0.2982***	-0.1666*	0.7272***	-0.2219
	[0.496]	[0.623]	[0.664]	(2.074)	(3.442)	(3.535)	(-1.757)	(13.600)	(-0.238)
Belgium	0.0009	0.2559	0.8383	0.0166***	0.0008***	0.3522***	-0.2312***	0.6407***	-2.7491**
	[0.000]	[0.114]	[0.375]	(2.999)	(3.975)	(4.595)	(-3.122)	(12.439)	(-2.376)
Spain	-0.2765	0.4764	1.6956	0.0132***	0.0001	0.4482***	-0.1515	0.7246***	-0.9493
	[-0.105]	[0.180]	[0.642]	(3.017)	(1.169)	(4.557)	(-1.498)	(15.846)	(-1.175)
New Zealand	0.8367	0.9088	0.9295	0.0034	0.0001***	0.1382***	-0.0343	0.8479***	1.0355
	[0.408]	[0.443]	[0.453]	(0.786)	(2.656)	(3.696)	(-0.860)	(30.437)	(0.914)
Finland	1.0967	1.1256	1.0985	0.0020	0.0003**	0.1784***	-0.0883*	0.8261***	1.0353
	[0.411]	[0.421]	[0.411]	(0.229)	(2.066)	(4.140)	(-1.837)	(15.819)	(0.912)
Austria	0.8367	0.9520	1.0185	0.0115**	0.0004***	0.2223***	-0.1496***	0.7551***	-0.8106
	[0.442]	[0.503]	[0.538]	(2.046)	(2.772)	(4.812)	(-3.028)	(14.020)	(-0.562)
Ireland	1.3047	1.3840	1.4169	0.0112	0.0004***	0.1236***	-0.0582*	0.8672***	0.1916
	[0.481]	[0.510]	[0.522]	(1.235)	(2.656)	(3.705)	(-1.692)	(30.427)	(0.177)
Portugal	1.1417	1.6473	2.0376	0.0157**	0.0002**	0.1753***	-0.1687***	0.8927***	-0.6355
	[0.352]	[0.508]	[0.628]	(2.533)	(2.297)	(3.532)	(-3.134)	(35.316)	(-0.878)
Total	0.8067***	1.0880***	1.2933***	0.0098***	0.0002***	0.2772***	-0.1848***	0.8053***	-0.2381
	[0.321]	[0.432]	[0.514]	(11.876)	(21.304)	(31.921)	(-21.695)	(196.847)	(-1.751)

Table 6: Institutional Ownership Changes and Stock Returns

In this table, I examine the effect of flight-to-quality, which is proxied by US institutional ownership changes, on stock returns. I use the following panel regression specification.

$$R_{cit+1} = \alpha_t + (\beta + (\gamma + \delta I_{Uct+1}) I_{Bct}) \Delta IO_{it} + \varepsilon_{cit+1},$$

where R is the dollar return, I_B is the bear market indicator, I_U is the up market indicator, and ΔIO is the U.S. institutional ownership change for each stock. For the up market indicator (I_{Uct+1}), I use the beginning month of the quarter (I_{U1}) or the same quarter $\left(I_{U(1,3)}\right)$ relative to the quarter of stock return. The subscripts c, i, and t imply each country, stock, and quarter, respectively. Monthly dollar return data are collected from Datastream. Quarterly investment flow data of institutional investors are collected from Global Ownership. I employ time fixed effects and clustered standard errors by country. For each country each quarter, I include the stocks that consist the top 90% market capitalization of the country. For each country also, I winsorize the top and bottom 1% of the ΔIO observations to prevent any outlier effect. ΔIO+ is equal to ΔIO if positive or zero otherwise. ΔIO- is equal to ΔIO if negative or zero otherwise. Panel A shows the results of return on ΔIO. Panel B contains the results of interaction between ΔIO and momentum loser portfolio. The asterisks indicate the significance at 10% (*), 5% (**), and 1% (***) levels.

Panel A: Regressions of return on ΔIO, changes in institutional ownership								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔIO	2.879***		2.943***		2.943***		2.943***	
	(13.10)		(9.04)		(9.04)		(9.04)	
ΔIO+		-0.274		-0.521		-0.520		-0.520
		(-0.64)		(-0.57)		(-0.57)		(-0.57)
ΔIO-		4.923***		5.021***		5.021***		5.021***
		(14.00)		(12.49)		(12.49)		(12.49)
$I_B \times$ ΔIO			-1.178		0.811		0.739	
			(-1.54)		(0.82)		(0.79)	
$I_B \times$ ΔIO+				-4.780***		-7.116***		-8.763***
				(-2.86)		(-3.11)		(-3.79)
$I_B \times$ ΔIO-				0.650		9.433***		8.062***
				(0.61)		(6.41)		(5.39)
$I_B \times I_{U1} \times$ ΔIO					-3.900***			
					(-4.48)			
$I_B \times I_{U1} \times$ ΔIO+						7.007**		
						(2.02)		
$I_B \times I_{U1} \times$ ΔIO-						-14.45***		
						(-6.95)		
$I_B \times I_{U(1,3)} \times$ ΔIO							-5.197***	
							(-4.83)	
$I_B \times I_{U(1,3)} \times$ ΔIO+								15.60***
								(3.52)
$I_B \times I_{U(1,3)} \times$ ΔIO-								-17.16***
								(-6.54)
N Observations	130648	130648	127912	127912	127904	127904	127883	127883
Adjusted R-Sq	0.242	0.242	0.241	0.241	0.241	0.241	0.241	0.242
Fixed Effects	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter
Clustered SE	Country	Country	Country	Country	Country	Country	Country	Country

Table 6-Continued

Panel B: Regressions of return on interaction between ΔIO and momentum loser								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ΔIO	2.108***		1.214***		1.214***		1.214***	
	(10.74)		(4.12)		(4.12)		(4.12)	
ΔIO × Loser	11.09***		23.08***		23.08***		23.08***	
	(16.86)		(28.11)		(28.11)		(28.11)	
ΔIO+		-1.263***		-1.636*		-1.635*		-1.636*
		(-2.96)		(-1.91)		(-1.91)		(-1.91)
ΔIO-		4.585***		2.998***		2.998***		2.999***
		(19.23)		(7.81)		(7.81)		(7.81)
ΔIO+ × Loser		11.64		10.66*		10.66*		10.66*
		(1.52)		(1.80)		(1.80)		(1.80)
ΔIO- × Loser		8.871***		23.36***		23.36***		23.36***
		(8.12)		(29.73)		(29.73)		(29.73)
I_B × ΔIO			2.288***		1.231**		1.345***	
			(5.08)		(2.43)		(3.15)	
I_B × ΔIO × Loser			-30.64***		-9.708***		-6.342**	
			(-3.42)		(-3.84)		(-2.54)	
I_B × ΔIO+				-4.732***		-6.000***		-8.117***
				(-2.75)		(-2.79)		(-3.65)
I_B × ΔIO-				7.938***		11.50***		9.593***
				(7.72)		(8.52)		(7.19)
I_B × ΔIO+ × Loser				14.12		-40.17**		-159.7
				(0.37)		(-2.55)		(-1.05)
I_B × ΔIO- × Loser				-38.95***		-18.02***		-15.37***
				(-4.04)		(-4.17)		(-3.70)
I_B × I_{U1} × ΔIO					2.438***			
					(3.82)			
I_B × I_{U1} × ΔIO × Loser					-30.60***			
					(-16.15)			
I_B × I_{U1} × ΔIO+						4.540		
						(1.56)		
I_B × I_{U1} × ΔIO-						-6.523***		
						(-3.70)		
I_B × I_{U1} × ΔIO+ × Loser						272.3***		
						(2.69)		
I_B × I_{U1} × ΔIO- × Loser						-27.54***		
						(-7.83)		
I_B × $I_{U(1,3)}$ × ΔIO							4.544***	
							(4.29)	
I_B × $I_{U(1,3)}$ × ΔIO×Loser							-37.35***	
							(-23.29)	
I_B × $I_{U(1,3)}$ × ΔIO+								19.67***
								(3.73)
I_B × $I_{U(1,3)}$ × ΔIO-								-7.042**
								(-2.31)
I_B × $I_{U(1,3)}$ × ΔIO+×Loser								172.9
								(1.22)
I_B × $I_{U(1,3)}$ × ΔIO-×Loser								-28.69***
								(-7.14)
N Observations	120834	120834	119895	119895	119895	119895	119874	119874
Adjusted R-Sq	0.247	0.247	0.247	0.247	0.247	0.247	0.247	0.247
Fixed Effects	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter	Quarter
Clustered SE	Country	Country	Country	Country	Country	Country	Country	Country

Table 7: Institutional Ownership Changes of Momentum Portfolio over Different Time Periods

This table reports value-weighted average of institutional ownership changes of winner and loser portfolios for three different time periods: (i) normal periods, (ii) bear down market periods, and (iii) bear up market periods. Institutional ownership changes are changes of institutional ownership for each stock during the quarter before the portfolio formation period. I_B is the bear market indicator, I_{BD} is the bear down market indicator, and I_{BU} is the bear market and up market indicator. I define the bear market if the 2-year excess market return is negative, or 0 otherwise. I define the down (up) market if the contemporaneous excess market return is negative (positive), or 0 otherwise. The loser and winner portfolios are the bottom and top quintile—or tercile if less than 300 stocks are available—portfolios. This table only includes 21 MSCI developed countries - other emerging and unclassified countries are also available in the appendix.

	Panel A								
	$\Delta IO_{(t-3,t-1)}$								
	$I_B = 0$			$I_{BD} = 1$			$I_{BU} = 1$		
Country	W	L	Diff	W	L	Diff	W	L	Diff
Japan	0.52	0.30	0.23***	0.08	-0.15	0.23***	0.12	-0.21	0.33***
United Kingdom	0.50	0.34	0.16***	0.09	0.04	0.05	0.27	0.12	0.15
Australia	0.41	0.23	0.18***	0.04	-0.06	0.09	0.07	0.10	-0.03
France	0.40	0.34	0.06	0.03	-0.14	0.17	0.06	-0.11	0.17**
Germany	0.26	0.26	0.00	0.00	-0.05	0.05	0.01	-0.11	0.12
Hong Kong	0.43	0.30	0.13**	0.02	-0.09	0.11**	0.13	-0.09	0.22***
Singapore	1.47	0.45	1.02***	0.11	-0.32	0.42	0.56	0.04	0.52**
Sweden	0.28	0.44	-0.16**	0.05	0.09	-0.05	0.04	0.18	-0.14
Israel	1.65	0.15	1.40***	0.59	-1.93	2.52**	0.90	-1.60	2.50***
Italy	0.23	0.31	-0.09	0.22	0.00	0.22**	0.09	0.01	0.08*
Switzerland	0.62	0.77	0.01	0.38	2.13	-1.75	0.49	0.03	0.46
Norway	0.63	0.05	0.57***	-0.33	-0.22	-0.13	0.10	-0.39	0.44**
Netherlands	0.23	0.39	-0.16	0.05	0.22	-0.17	-0.06	0.18	-0.24
Denmark	0.60	0.21	0.33**	0.47	-0.59	1.07**	0.39	-0.20	0.58**
Belgium	0.40	0.30	0.11	0.12	-0.12	0.24**	0.51	-0.11	0.62***
Spain	0.20	0.12	0.08	0.08	0.00	0.08	0.18	0.00	0.18**
New Zealand	0.20	0.40	-0.21***	-0.31	0.04	-0.36**	0.00	0.06	-0.06
Finland	0.32	0.41	-0.09	-0.18	-0.06	-0.12	0.24	-0.17	0.40***
Austria	0.27	0.17	0.10	0.27	-0.22	0.49***	0.36	-0.21	0.58***
Ireland	1.35	0.53	0.77***	0.18	0.31	-0.16	-0.36	-0.49	0.16
Portugal	0.41	0.38	0.02	0.17	-0.15	0.32	0.14	0.11	0.03
Total	0.54***	0.33***	0.21**	0.10*	-0.06	0.16	0.20***	-0.14	0.34**
	(5.90)	(9.55)	(2.38)	(2.07)	(-0.40)	(0.98)	(3.46)	(-1.66)	(2.79)

Table 7-Continued

	Panel B									Panel C								
	$\Delta IO_{(t-3,t-2)}$									$\Delta IO_{(t-2,t-1)}$								
	$I_B = 0$			$I_{BD} = 1$			$I_{BU} = 1$			$I_B = 0$			$I_{BD} = 1$			$I_{BU} = 1$		
Country	W	L	Diff	W	L	Diff	W	L	Diff	W	L	Diff	W	L	Diff	W	L	Diff
Japan	0.26	0.14	0.13***	0.06	-0.05	0.11***	0.09	-0.11	0.21***	0.26	0.16	0.10***	0.02	-0.10	0.12***	0.06	-0.09	0.15***
United Kingdom	0.27	0.18	0.09***	0.12	0.08	0.04	0.10	0.02	0.08	0.24	0.16	0.08**	-0.03	-0.04	0.01	0.18	0.10	0.08
Australia	0.21	0.13	0.08**	0.03	-0.04	0.07	0.02	-0.01	0.03	0.21	0.11	0.10***	0.00	-0.02	0.02	0.04	0.10	-0.06
France	0.18	0.15	0.03	0.13	-0.05	0.18**	0.04	-0.10	0.14***	0.22	0.19	0.04	-0.10	-0.09	-0.01	0.01	-0.02	0.03
Germany	0.17	0.08	0.10	-0.07	0.29	-0.36	0.03	0.03	0.00	0.09	0.19	-0.09**	0.07	-0.34	0.41***	-0.02	-0.14	0.12
Hong Kong	0.23	0.14	0.08***	0.04	-0.02	0.06	0.10	-0.05	0.15***	0.21	0.17	0.04	-0.03	-0.08	0.05*	0.04	-0.04	0.07**
Singapore	0.87	0.24	0.63***	0.24	-0.08	0.32	0.11	-0.03	0.14	0.61	0.21	0.40***	-0.09	-0.23	0.14	0.50	0.06	0.44
Sweden	0.16	0.21	-0.05	0.10	0.20	-0.10	0.09	-0.06	0.15*	0.13	0.23	-0.10**	-0.05	-0.11	0.06	-0.05	0.22	-0.27***
Israel	0.83	0.11	0.72***	0.05	-0.61	0.66	0.19	-1.24	1.43***	0.81	0.04	0.75***	0.54	-1.31	1.85**	0.70	-0.37	1.07*
Italy	0.15	0.17	-0.02	0.10	0.03	0.07	0.06	0.00	0.06	0.09	0.13	-0.06	0.12	-0.03	0.15**	0.03	0.01	0.02
Switzerland	0.25	0.42	-0.08	0.55	2.26	-1.71	-0.15	-0.09	-0.06	0.37	0.34	0.08	-0.13	-0.12	-0.01	0.64	0.12	0.52
Norway	0.34	0.07	0.28***	-0.15	-0.03	-0.12	0.15	-0.26	0.38**	0.34	0.00	0.33***	-0.19	-0.20	0.00	-0.03	-0.14	0.08
Netherlands	0.17	0.20	-0.02	0.01	0.17	-0.16	-0.09	0.06	-0.14	0.07	0.23	-0.16	0.03	0.05	-0.02	0.02	0.12	-0.10
Denmark	0.28	0.08	0.24**	0.24	-0.33	0.57**	0.17	-0.14	0.30*	0.32	0.12	0.21*	0.23	-0.27	0.50**	0.22	-0.06	0.27
Belgium	0.20	0.18	0.02	0.06	-0.02	0.08*	0.30	-0.09	0.39***	0.20	0.11	0.09*	0.07	-0.10	0.17**	0.21	-0.03	0.23
Spain	0.11	0.06	0.05	0.08	0.02	0.06	0.09	-0.04	0.13**	0.11	0.06	0.05	-0.01	-0.02	0.02	0.09	0.03	0.05
New Zealand	0.12	0.20	-0.09**	-0.08	0.03	-0.11	-0.02	0.03	-0.05	0.08	0.20	-0.12**	-0.21	0.01	-0.22*	0.02	0.03	-0.01
Finland	0.18	0.17	0.01	-0.05	0.00	-0.04	0.10	-0.07	0.16	0.16	0.24	-0.08	-0.13	-0.05	-0.08	0.14	-0.10	0.24*
Austria	0.16	0.11	0.05	0.10	-0.06	0.16***	0.16	-0.15	0.31***	0.13	0.07	0.07	0.18	-0.16	0.34***	0.20	-0.07	0.27***
Ireland	0.84	0.27	0.56***	0.12	0.31	-0.19	-0.24	-0.35	0.13	0.60	0.26	0.34**	0.35	0.01	0.35**	0.03	-0.62	0.68
Portugal	0.18	0.18	0.00	0.14	-0.10	0.24**	0.02	-0.03	0.06	0.23	0.21	0.02	0.03	-0.05	0.07	0.11	0.13	-0.02
Total	0.29***	0.17***	0.13**	0.09**	0.10	-0.01	0.06**	-0.13**	0.19**	0.26***	0.16***	0.10**	0.03	-0.16**	0.19*	0.15***	-0.03	0.18***
	(5.65)	(9.37)	(2.64)	(2.80)	(0.82)	(-0.08)	(2.47)	(-2.12)	(2.75)	(6.10)	(9.21)	(2.14)	(0.82)	(-2.52)	(2.05)	(3.26)	(-0.85)	(2.85)

Table 8: Default Risk of Momentum Portfolio for Different Time Periods

This table reports equal-weighted average of book leverage of winner and loser portfolios for three different time periods: (i) normal periods, (ii) bear down market periods, and (iii) bear up market periods. Market leverage is a proxy for default risk and is defined by two different ways: Total Liabilities/Shareholder's Equity and Current Liabilities/Shareholder's Equity, which is based on the previous accounting year-end total liabilities and the previous calendar year december month-end market capitalizations. Total liabilities (max(WC03999-WC03995,0)), current liabilities (WC03101), and Shareholder's Equity (WC03995) are collected from Datastream. I_B is the bear market indicator, I_{BD} is the bear down market indicator, and I_{BU} is the bear market and up market indicator. I define the bear market if the 2-year excess market return is negative, or 0 otherwise. I define the down (up) market if the contemporaneous excess market return is negative (positive), or 0 otherwise. The loser and winner portfolios are the bottom and top quintile—or tercile if less than 300 stocks are available—portfolios. This table only includes 21 MSCI developed countries - other emerging and unclassified countries are also available in the appendix.

	Total Liabilities/Shareholder's Equity									Current Liabilities/Shareholder's Equity								
	$I_B = 0$			$I_{BD} = 1$			$I_{BU} = 1$			$I_B = 0$			$I_{BD} = 1$			$I_{BU} = 1$		
Country	W	L	Diff	W	L	Diff	W	L	Diff	W	L	Diff	W	L	Diff	W	L	Diff
Japan	4.96	4.93	0.03	4.60	4.99	-0.39	4.54	5.34	-0.80***	1.87	1.89	-0.02	1.74	2.12	-0.38***	1.62	2.17	-0.54***
United Kingdom	4.86	4.12	0.75***	4.01	5.40	-1.38*	4.18	5.19	-1.00	1.13	1.24	-0.11**	1.05	1.11	-0.06	0.95	1.32	-0.38***
Australia	2.36	2.06	0.32**	2.56	1.77	0.79**	2.18	1.84	0.34*	0.59	0.57	0.02	0.54	0.54	0.00	0.58	0.57	0.01
France	6.05	5.29	0.75**	5.38	6.47	-1.09	4.53	6.41	-1.88***	2.33	2.01	0.32***	2.07	2.34	-0.27**	1.92	2.55	-0.63***
Germany	8.74	9.96	-1.22*	11.35	11.59	0.24	10.21	9.96	0.58	1.99	2.19	-0.23*	1.38	2.20	-0.36*	1.42	2.62	-0.80***
Hong Kong	2.07	1.98	0.05	1.64	2.55	-0.90*	1.79	2.47	-0.68**	0.78	0.70	0.09***	0.62	0.76	-0.14*	0.77	0.71	0.07
Singapore	1.66	1.32	0.34***	1.37	1.32	0.06	1.59	1.42	0.17	0.65	0.60	0.06***	0.61	0.57	0.03	0.72	0.60	0.11***
Sweden	6.13	3.93	2.20***	2.93	9.76	-6.83***	2.87	10.04	-7.17***	1.36	1.24	0.14*	1.25	1.86	-0.75***	1.17	1.68	-0.44***
Israel	5.56	4.43	1.13***	4.42	6.29	-1.87	4.36	5.37	-0.96	1.40	1.17	0.23**	1.31	1.99	-0.68*	1.27	1.41	-0.13
Italy	5.81	5.60	0.32	4.88	5.35	-0.41	4.44	5.74	-1.23***	1.17	1.74	-0.62***	1.61	1.56	0.02	1.42	1.51	-0.08
Switzerland	3.71	4.41	-0.65**	3.14	7.33	-4.14***	2.51	5.08	-2.54***	0.80	0.79	0.02	0.67	2.66	-2.16***	0.69	1.74	-1.05***
Norway	7.84	6.77	1.06	6.81	5.82	0.99	6.48	6.65	-0.09	1.40	1.11	0.25**	1.03	0.80	0.23**	1.64	2.02	-0.44
Netherlands	4.42	4.87	-0.52	2.44	3.89	-1.27**	2.64	5.60	-2.87***	1.32	1.32	0.02	1.09	1.23	-0.13	1.15	1.46	-0.27***
Denmark	3.71	3.78	-0.13	3.21	3.74	-0.52	3.70	3.51	0.22	1.05	1.11	-0.05	0.99	1.24	-0.21	0.79	1.35	-0.44***
Belgium	13.30	10.09	2.68**	5.65	7.70	-2.61	6.59	8.14	-1.30	1.46	0.91	0.32***	1.39	1.16	0.20	1.31	1.29	0.08
Spain	6.42	6.10	0.32	5.56	4.76	-0.61	6.42	5.45	0.33	1.26	1.21	0.05	1.23	0.91	0.13	1.55	0.88	0.60***
New Zealand	1.17	1.36	-0.19***	1.76	4.19	-2.43***	1.44	3.39	-1.95***	0.50	0.55	-0.05***	0.46	0.55	-0.09	0.47	0.60	-0.13***
Finland	3.22	2.63	0.58**	3.47	3.60	-0.14	3.10	4.23	-1.13***	0.94	0.93	0.01	1.13	1.31	-0.18**	1.18	1.28	-0.10
Austria	6.32	6.76	-0.45	7.88	9.06	-1.27	5.58	6.51	-0.93	1.06	1.12	-0.06	0.96	1.27	-0.29**	0.96	1.24	-0.27***
Ireland	4.17	6.10	-1.65**	2.69	2.09	0.83	2.95	2.54	0.66	0.95	1.44	-0.49***	0.88	0.90	-0.03	0.94	0.89	0.05
Portugal	5.84	7.34	-1.70***	6.44	4.86	1.63**	7.82	7.21	0.53	1.63	1.44	0.47***	1.42	1.43	0.01	2.16	1.92	0.27
Total	2.72***	3.06***	-0.38*	2.84***	4.36***	-1.52***	2.98***	5.07***	-2.12***	0.55***	0.61***	-0.06**	0.59***	0.89***	-0.31***	0.65***	0.95***	-0.30***
	(11.63)	(10.43)	(-1.98)	(8.12)	(8.00)	(-3.25)	(10.80)	(8.77)	(-4.20)	(11.46)	(9.62)	(-2.31)	(9.99)	(7.21)	(-3.32)	(12.20)	(9.42)	(-3.93)

Table 9: Daily Return Correlations Between Stock and Bond Markets for Different Time Periods

This table displays the daily return correlations between each country's stock market and bond market. The daily return data for stock markets (TOT**MK) and bond markets (BM**10Y) are from Datastream return indices. The table contains the statistics from MSCI developed countries except the United States, Canada, Hong Kong, and Israel. The start and end dates of each country's time-series are in the second and third columns, respectively. The first four partitions are for the (1) non-bear, (2) bear, (3) bear-up, and (4) bear-down markets, respectively. Each partition exhibits the (i) average stock market returns, (ii) average bond market returns, (iii) stock standard deviations, (iv) bond standard deviations, and (v) the stock-bond correlation coefficients. The last partition is for the decrease in the correlations during the (a) bear, (b) bear-up, and (c) bear-down markets compared to the non-bear markets. Each statistic displays the respective t-statistic in the parenthesis below estimated from 5,000 bootstraps.

			$I_B = 0$			$I_{BD} = 1$			$I_{BU} = 1$			Correlation Difference	
Country	Start	Finish	$\bar{r}_{\text{Stock}}$	$\bar{r}_{\text{Bond}}$	Corr	$\bar{r}_{\text{Stock}}$	$\bar{r}_{\text{Bond}}$	Corr	$\bar{r}_{\text{Stock}}$	$\bar{r}_{\text{Bond}}$	Corr	$I_{BD} = 1$	$I_{BU} = 1$
United States	19800101	20181231	0.05	0.03	0.04	-0.24	0.09	-0.39	0.22	-0.01	-0.27	0.43	0.31
			(5.52)	(5.65)	(2.19)	(-3.14)	(4.03)	(-6.56)	(3.66)	(-0.19)	(-5.50)	(6.83)	(5.81)
Canada	19850101	20181231	0.04	0.03	-0.02	-0.07	0.05	-0.37	0.14	0.00	-0.24	0.35	0.22
			(3.78)	(7.11)	(-0.99)	(-1.54)	(3.68)	(-10.62)	(4.96)	(0.34)	(-4.83)	(8.43)	(3.95)
Japan	19840102	20150731	0.04	0.02	-0.08	-0.23	0.03	-0.03	0.16	0.02	-0.09	-0.04	0.01
			(2.68)	(3.58)	(-2.44)	(-5.65)	(3.81)	(-1.02)	(5.18)	(2.49)	(-3.24)	(-0.98)	(0.35)
United Kingdom	19800101	20150731	0.05	0.03	0.08	-0.15	0.05	-0.22	0.17	0.05	0.04	0.30	0.05
			(5.15)	(6.55)	(3.54)	(-2.46)	(2.84)	(-5.10)	(5.71)	(3.98)	(0.96)	(6.27)	(1.11)
Australia	19870302	20150731	0.03	0.04	0.03	-0.09	0.04	-0.08	0.15	0.04	-0.10	0.11	0.13
			(2.24)	(5.80)	(0.90)	(-2.21)	(1.47)	(-1.66)	(5.62)	(2.33)	(-2.86)	(1.78)	(2.56)
France	19850201	20150630	0.05	0.03	0.09	-0.23	0.05	-0.27	0.17	0.04	-0.04	0.36	0.13
			(2.93)	(5.00)	(4.26)	(-4.08)	(3.80)	(-7.16)	(6.89)	(4.94)	(-0.97)	(8.49)	(2.92)
Germany	19800101	20150630	0.04	0.02	-0.03	-0.16	0.04	-0.21	0.15	0.04	-0.10	0.18	0.07
			(3.17)	(4.82)	(-1.22)	(-4.21)	(4.26)	(-5.46)	(7.85)	(4.93)	(-2.76)	(4.08)	(1.85)
Singapore	20090101	20150731	0.02	0.01	-0.10	-0.36	0.04	-0.16	0.19	0.04	-0.03	0.06	-0.06
			(0.88)	(1.21)	(-2.28)	(-1.92)	(0.35)	(-0.84)	(3.81)	(1.30)	(-0.55)	(0.34)	(-0.81)
Sweden	19890102	20150630	0.06	0.03	0.02	-0.24	0.04	-0.04	0.23	0.05	-0.10	0.07	0.12
			(3.56)	(5.24)	(1.23)	(-3.33)	(2.13)	(-0.66)	(4.29)	(2.84)	(-1.46)	(0.92)	(1.75)
Italy	19910401	20150630	0.03	0.02	0.26	-0.19	0.03	0.19	0.16	0.07	0.26	0.07	0.00
			(1.78)	(3.27)	(9.10)	(-4.56)	(2.04)	(4.38)	(4.61)	(5.51)	(7.96)	(1.41)	(0.08)
Switzerland	19810101	20150630	0.05	0.02	-0.11	-0.12	0.02	-0.15	0.10	0.03	-0.17	0.05	0.06
			(3.78)	(5.29)	(-4.53)	(-2.86)	(1.61)	(-2.96)	(5.64)	(3.90)	(-6.01)	(0.90)	(1.83)
Norway	19921201	20150630	0.04	0.02	-0.03	-0.24	0.08	-0.30	0.18	0.03	-0.06	0.27	0.03
			(2.44)	(3.97)	(-1.49)	(-2.60)	(4.28)	(-4.48)	(4.85)	(2.73)	(-1.66)	(3.60)	(0.64)
Netherlands	19880101	20150731	0.05	0.02	-0.10	-0.21	0.05	-0.41	0.13	0.03	-0.28	0.32	0.18
			(3.85)	(5.37)	(-4.19)	(-3.60)	(5.13)	(-8.36)	(4.70)	(4.19)	(-9.17)	(5.62)	(4.69)
Denmark	19890201	20150630	0.04	0.03	0.02	-0.15	0.05	-0.13	0.14	0.03	-0.06	0.15	0.08
			(3.04)	(6.47)	(1.12)	(-2.14)	(2.75)	(-2.49)	(5.63)	(3.21)	(-1.91)	(2.62)	(2.15)
Belgium	19890703	20150630	0.05	0.03	0.00	-0.12	0.03	-0.11	0.12	0.04	-0.08	0.12	0.09
			(4.15)	(4.74)	(0.16)	(-2.26)	(2.34)	(-2.98)	(4.40)	(4.64)	(-2.67)	(2.73)	(2.22)
Spain	19901203	20121130	0.05	0.02	0.02	-0.20	0.03	0.08	0.15	0.06	0.10	-0.06	-0.08
			(2.46)	(2.83)	(0.78)	(-3.47)	(1.61)	(1.34)	(5.16)	(5.78)	(3.12)	(-0.93)	(-1.82)
New Zealand	19910401	20150630	0.04	0.03	0.03	-0.16	0.06	-0.02	0.13	0.03	-0.07	0.05	0.10
			(3.87)	(4.63)	(0.82)	(-3.65)	(3.99)	(-0.34)	(6.23)	(3.03)	(-2.52)	(0.68)	(2.03)
Finland	19910902	20150630	0.08	0.02	-0.06	-0.33	0.04	-0.25	0.24	0.04	-0.20	0.19	0.14
			(2.49)	(4.04)	(-2.91)	(-4.20)	(3.16)	(-6.50)	(6.10)	(4.86)	(-6.34)	(4.03)	(3.82)
Austria	19850101	20150630	0.04	0.03	-0.11	-0.17	0.03	-0.09	0.15	0.03	-0.06	-0.03	-0.06
			(2.74)	(5.17)	(-5.45)	(-4.89)	(3.27)	(-2.13)	(9.20)	(5.14)	(-2.22)	(-0.58)	(-1.86)
Ireland	19850101	20150731	0.07	0.04	0.07	-0.27	0.03	-0.02	0.18	0.04	0.01	0.09	0.06
			(4.92)	(6.16)	(4.95)	(-4.19)	(1.93)	(-0.19)	(5.58)	(3.44)	(0.36)	(0.96)	(1.34)
Portugal	19930802	20150630	0.03	0.03	0.16	-0.21	-0.02	0.22	0.11	0.08	0.11	-0.06	0.05
			(1.94)	(2.88)	(4.75)	(-3.24)	(-0.46)	(2.45)	(3.73)	(4.94)	(3.03)	(-0.60)	(0.91)
Total	19800101	20181231	0.05	0.03	0.02	-0.19	0.04	-0.09	0.16	0.04	-0.04	0.10	0.06
			(15.40)	(21.07)	(3.04)	(-15.49)	(10.67)	(-5.08)	(24.34)	(15.27)	(-4.63)	(5.42)	(6.23)

Table 10: Flights to Quality and Daily Momentum Returns in the US

This table reports daily return regressions of value-weighted US momentum decile portfolios on Flight to Quality (FTQ) and Flight to Risk (FTR) events as well as other factors. Consistent with Boudry et al. (2019), daily FTQ events are identified as $I\left\{r_t^b > \kappa\sigma_t^b\right\} \times I\left\{r_t^e < -\kappa\sigma_t^e\right\}$ where r_t^b and r_t^e are daily bond and stock market returns, respectively. κ is 1.5 following also Boudry et al. (2019). σ_ts are estimated with a one-sided normal kernel density with a bandwidth of 250 days that skips nearest 5 days to exclude potential influence by the FTQ events. FTR events are identified similarly with opposite inequalities. The daily benchmark stock and bond (10-year government) market returns are from Datastream. Daily momentum decile (and the winner-minus-loser) returns are regressed on FTQ and FTR events without other factors (first partition) and with Fama and French (2015) five factors (second and third partitions) from Kenneth French. Both estimates and their Newey–West t-statistics (parentheses) are reported.

Variable	Lose	2	3	4	5	6	7	8	9	Win	WML
Intercept	0.018	0.043	0.048	0.051	0.046	0.048	0.049	0.056	0.051	0.067	0.048
	(0.97)	(2.99)	(3.96)	(4.73)	(4.64)	(5.12)	(5.33)	(6.00)	(5.15)	(5.19)	(2.86)
FTQ	-4.249	-3.679	-3.281	-3.163	-3.034	-2.920	-2.804	-2.829	-2.956	-3.363	0.887
	(-11.18)	(-11.16)	(-12.49)	(-12.32)	(-12.63)	(-11.58)	(-11.94)	(-11.35)	(-11.75)	(-11.40)	(2.60)
FTR	3.989	3.524	2.988	2.670	2.539	2.367	2.177	2.112	2.140	2.674	-1.315
	(9.99)	(10.88)	(12.43)	(15.37)	(13.29)	(17.40)	(18.00)	(17.98)	(19.62)	(14.07)	(-3.32)
Intercept	-0.035	-0.015	-0.010	-0.007	-0.010	-0.007	-0.006	0.001	-0.002	0.026	0.062
	(-3.34)	(-2.04)	(-1.83)	(-1.51)	(-2.62)	(-2.19)	(-1.70)	(0.38)	(-0.43)	(4.06)	(4.12)
MKTRF	1.244	1.145	1.058	1.028	0.999	0.980	0.982	0.992	1.016	1.077	-0.167
	(51.19)	(54.40)	(72.14)	(88.13)	(69.31)	(114.60)	(153.49)	(100.67)	(75.58)	(54.66)	(-4.13)
SMB	0.371	0.147	0.067	0.021	0.010	-0.009	-0.011	-0.009	0.072	0.276	-0.096
	(10.25)	(5.16)	(2.72)	(1.18)	(0.70)	(-0.56)	(-1.18)	(-0.56)	(4.65)	(11.16)	(-1.81)
HML	0.890	0.614	0.445	0.320	0.258	0.133	0.037	-0.040	-0.120	-0.406	-1.296
	(9.08)	(10.85)	(11.16)	(11.07)	(8.32)	(6.59)	(2.46)	(-2.09)	(-5.43)	(-11.64)	(-10.49)
RMW	-0.530	-0.039	0.139	0.199	0.255	0.251	0.235	0.242	0.191	-0.171	0.359
	(-6.34)	(-0.71)	(3.61)	(6.18)	(7.88)	(10.47)	(12.45)	(11.66)	(7.45)	(-3.60)	(3.07)
CMA	-0.915	-0.466	-0.174	-0.022	0.047	0.188	0.278	0.344	0.219	-0.103	0.813
	(-9.33)	(-7.64)	(-4.14)	(-0.67)	(1.03)	(6.61)	(12.79)	(12.66)	(6.31)	(-1.85)	(5.82)
FTQ	-0.353	-0.256	-0.465	-0.081	-0.122	0.315	0.113	0.222	0.052	0.090	0.444
	(-1.18)	(-0.76)	(-1.65)	(-0.58)	(-1.29)	(2.55)	(0.72)	(1.82)	(0.56)	(0.60)	(1.13)
FTQ×MKTRF	-0.143	-0.094	-0.155	-0.010	-0.022	0.123	0.026	0.071	0.022	0.058	0.201
	(-1.35)	(-0.73)	(-1.43)	(-0.19)	(-0.65)	(2.85)	(0.44)	(1.57)	(0.75)	(1.03)	(1.40)
FTR	-0.870	-0.987	-0.724	-0.162	-0.494	0.114	0.407	0.337	0.394	0.357	1.227
	(-2.02)	(-2.51)	(-2.61)	(-0.61)	(-1.19)	(0.64)	(3.24)	(1.70)	(2.46)	(1.36)	(2.08)
FTR×MKTRF	0.446	0.544	0.391	0.113	0.235	-0.027	-0.205	-0.204	-0.260	-0.210	-0.656
	(2.36)	(3.04)	(3.16)	(0.93)	(1.23)	(-0.37)	(-4.09)	(-2.36)	(-3.86)	(-1.78)	(-2.52)

Table 11: Flights to Quality and Monthly Momentum Returns Around the World

This table reports monthly return regressions of momentum portfolios on Flight to Quality (FTQ) and Flight to Risk (FTR) variables by country. Consistent with the daily FTQ events identified following Boudry et al. (2019), monthly FTQ (FTR) variables are one in month t if one or more daily FTQ (FTR) events are identified in month t. Similarly, monthly NFTQ (NFTR) variables in month t count the number of daily FTQ (FTR) events in month t. Monthly winner-minus-loser returns from momentum quintiles or terciles (†) are regressed on monthly FTQ and FTR (first partition) or NFTQ and NFTR (second partition) variables. Countries have different starting points as the FTQ and FTR identification requires Datastream stock and bond (10-year government) market returns simultaneously. Both estimates and their t-statistics (parentheses) are reported.

Country	Start	Intercept		FTQ		FTR		Intercept		NFTQ		NFTR	
United States	195007	0.007	(1.92)	0.025	(2.67)	-0.019	(-1.85)	0.008	(2.37)	0.011	(2.03)	-0.016	(-2.08)
Canada	195101	0.021	(3.04)	-0.010	(-0.54)	0.002	(0.08)	0.019	(2.77)	0.003	(0.23)	0.002	(0.11)
Japan	198312	0.002	(0.55)	-0.003	(-0.28)	0.002	(0.19)	0.002	(0.60)	0.002	(0.26)	-0.005	(-0.55)
United Kingdom	197912	0.006	(1.80)	0.026	(2.64)	-0.014	(-1.30)	0.007	(2.20)	0.011	(1.94)	-0.011	(-1.36)
Australia	198702	0.010	(2.87)	0.002	(0.20)	-0.011	(-0.92)	0.010	(2.99)	0.008	(1.26)	-0.022	(-2.20)
France	198501	0.002	(0.50)	0.020	(1.68)	-0.032	(-2.43)	0.001	(0.34)	0.013	(2.01)	-0.021	(-2.26)
Germany	198012	0.007	(1.46)	0.017	(1.36)	-0.013	(-0.91)	0.008	(1.68)	0.009	(1.52)	-0.014	(-1.38)
Singapore	200812	0.006	(0.93)	0.002	(0.10)	-0.030	(-0.60)	0.006	(0.93)	0.002	(0.13)	-0.030	(-0.60)
Sweden	198012	0.012	(1.48)	-0.007	(-0.32)	-0.034	(-1.47)	0.012	(1.56)	0.016	(1.23)	-0.058	(-2.96)
Italy	199103	0.006	(0.95)	0.024	(1.16)	-0.023	(-1.08)	0.005	(0.83)	0.021	(1.47)	-0.015	(-0.91)
Switzerland	198012	0.005	(1.32)	0.022	(1.76)	-0.016	(-1.33)	0.006	(1.60)	0.019	(2.97)	-0.028	(-2.99)
Norway	199211	0.008	(1.28)	0.032	(2.01)	-0.032	(-1.85)	0.007	(1.19)	0.022	(2.17)	-0.020	(-1.50)
Netherlands	198712	0.009	(1.40)	0.019	(1.17)	-0.025	(-1.40)	0.006	(1.06)	0.011	(1.26)	-0.005	(-0.39)
Denmark	198901	0.010	(1.56)	0.017	(0.90)	0.006	(0.25)	0.011	(1.84)	0.004	(0.34)	0.004	(0.23)
Belgium†	199006	-0.001	(-0.14)	-0.005	(-0.33)	0.010	(0.58)	0.000	(0.06)	-0.012	(-1.34)	0.011	(0.98)
Spain†	199011	0.003	(0.48)	0.001	(0.07)	-0.020	(-1.17)	0.002	(0.41)	0.004	(0.38)	-0.015	(-1.36)
New Zealand†	199103	0.007	(2.04)	0.002	(0.21)	-0.017	(-1.19)	0.007	(2.05)	0.005	(0.70)	-0.021	(-1.63)
Finland†	199108	0.010	(1.54)	-0.001	(-0.06)	-0.004	(-0.26)	0.013	(2.02)	0.000	(0.02)	-0.017	(-1.34)
Austria†	198412	0.002	(0.49)	0.020	(1.79)	-0.024	(-1.98)	0.001	(0.37)	0.011	(1.77)	-0.013	(-1.41)
Ireland†	198412	0.012	(2.29)	-0.001	(-0.03)	0.004	(0.24)	0.012	(2.22)	0.003	(0.25)	0.004	(0.32)
Portugal†	199307	0.013	(1.90)	0.039	(1.93)	-0.037	(-1.58)	0.014	(2.03)	0.018	(1.58)	-0.025	(-1.36)
All		0.008	(6.69)	0.012	(3.62)	-0.015	(-4.07)	0.008	(6.94)	0.009	(4.61)	-0.014	(-5.11)

Table A1: Difference Tests for Time-Varying Betas of Momentum Portfolios

This table reports the F-statistics that test the difference among the time-varying betas estimated in Table 3. The time-series regression specification by Daniel and Moskowitz (2016) is used for the quintile or tercile winner-minus-loser portfolios by country. The non-bear beta β, the bear-down beta β_{BD}, and the bear-up beta β_{BU} are estimated using the bear-down and bear-up indicators I_{BD} and I_{BU} and the significance of their difference is tested. The asterisks indicate the significance at the 10% (*), 5% (**), and 1% (***), respectively.

Country	$\beta = \beta_{BD}$	$\beta = \beta_{BU}$	$\beta_{BD} = \beta_{BU}$
United States	9.93***	40.36***	6.32**
Canada	39.54***	39.54***	7.16***
Japan	37.47***	70.88***	2.71
United Kingdom	2.83*	15.22***	4.15**
Australia	6.77***	26.50***	2.08
France	6.00**	28.86***	7.31***
Germany	1.90	9.00***	2.30
Hong Kong	29.58***	36.39***	0.01
Singapore	12.91***	35.63***	1.52
Sweden	27.26***	52.71***	1.50
Israel	0.17	15.75***	19.23***
Italy	0.30	0.91	0.14
Switzerland	20.54***	16.19***	1.39
Norway	6.59**	3.55*	1.02
Netherlands	11.33***	25.40***	2.36
Denmark	0.36	9.92***	6.53**
Belgium	32.33***	32.62***	0.27
Spain	4.15**	2.48	0.53
New Zealand	2.49	10.61***	3.29*
Finland	14.74***	27.99***	1.00
Austria	2.96*	15.22***	4.69**
Ireland	6.26**	17.05***	1.59
Portugal	1.00	9.99***	9.65***

Table A2: Further Backward Market Beta of Momentum Portfolio for Different Time Periods

This table, in addition to Table 4, reports the equal-weighted average of market beta (β) of winner-minus-loser (WML) portfolios for three different time periods: (i) normal periods, (ii) bear down market periods, and (iii) bear up market periods. As in Table 4, market beta is measured from rolling regressions but three additional horizons for each stock: from -59 to -48 months ($\beta_{(-59,-48)}$), from -47 to -36 months ($\beta_{(-47,-36)}$), from -35 to -24 months ($\beta_{(-35,-24)}$), relative to the portfolio formation period. The winner and the loser portfolios are the top and bottom quintile—or tercile if less than 300 stocks are available—portfolios. The asterisks indicate the significance at 10% (*), 5% (**), and 1% (***), respectively.

	$\beta_{(-59,-48)}$			$\beta_{(-47,-36)}$			$\beta_{(-35,-24)}$		
Country	$I_B = 0$	$I_{BD} = 1$	$I_{BU} = 1$	$I_B = 0$	$I_{BD} = 1$	$I_{BU} = 1$	$I_B = 0$	$I_{BD} = 1$	$I_{BU} = 1$
Japan	-0.0162	-0.0830**	-0.0779***	0.0368**	-0.0617**	-0.1194***	-0.0273	-0.0886***	-0.0935***
United Kingdom	-0.0245**	-0.1176**	-0.0156	-0.0264**	-0.0497	0.0062	0.0428***	0.0132	-0.0513
Australia	-0.0604***	-0.0598	-0.1364***	-0.0074	-0.1341***	-0.1284***	0.0084	-0.1445***	-0.0701**
France	0.0108	0.0210	-0.0226	0.0284	-0.1224**	-0.0902***	-0.0094	-0.1300**	-0.1596***
Germany	-0.0307	-0.1541***	-0.2346***	-0.1152***	-0.2366***	-0.3781***	-0.0860***	-0.2188***	-0.2756***
Hong Kong	0.0639***	-0.1317*	0.0136	-0.0173	-0.1143*	-0.0626	0.0174	-0.1302**	-0.0682
Singapore	-0.1336***	-0.0918*	0.0313	-0.0368	-0.1659**	-0.0070	-0.1270***	-0.1224**	-0.0253
Sweden	0.0222	-0.0681	-0.1157**	-0.0852**	-0.3840***	-0.2026***	0.0958***	-0.3549***	-0.1289
Israel	-0.0692***	-0.0931	-0.0804**	-0.0200	-0.1411**	-0.1067**	-0.0692***	-0.1469***	-0.2092***
Italy	-0.0699*	0.1239*	-0.0213	-0.1170***	0.0454	-0.1388***	-0.1058***	0.0167	-0.0546
Switzerland	-0.0370	-0.2108***	-0.1485***	-0.0091	-0.1421**	-0.1646***	-0.0118	-0.0308	0.0373
Norway	0.1553***	-0.1837*	-0.3427***	0.0662**	-0.0877	-0.2322***	0.0762***	-0.4191***	-0.3560***
Netherlands	0.0372	-0.0789	-0.0086	0.1956	-0.0424	0.0416	0.1500***	-0.2429***	-0.1505***
Denmark	-0.0161	-0.0560	-0.0489	0.0994***	-0.1979**	-0.1649***	-0.0976***	-0.0133	-0.1504***
Belgium	0.1353***	-0.1425***	-0.0993**	0.1478***	0.0949*	-0.0016	-0.0220	-0.1589**	-0.1705***
Spain	-0.0933***	0.0289	-0.1602**	-0.0585	-0.1901**	-0.2158***	-0.1595***	-0.2754***	-0.1290**
New Zealand	0.0115	-0.0382	0.0009	-0.0240	0.1293**	-0.0134	-0.0284	0.0166	-0.0689
Finland	0.0428	-0.1985***	-0.0724**	0.0755***	-0.3443***	-0.2081***	0.0659**	-0.3079***	-0.1707***
Austria	0.2209***	-0.1523	-0.0320	0.0438	-0.2177	0.1132*	0.1498***	0.0367	-0.0013
Ireland	-0.0540	-0.2679***	-0.1116**	-0.0610**	-0.1938**	-0.2805***	-0.0479	-0.0887	-0.1630***
Portugal	-0.0596	-0.0287	-0.0580	0.1258***	-0.1265	-0.0928**	0.0765*	-0.3077***	-0.1671**

Table A3: Flights to Quality and Monthly Momentum Returns Around the World During Recessions

This table reports monthly return regressions of momentum portfolios on Flight to Quality (FTQ), Flight to Risk (FTR), and their respective interaction terms with the bear market indicator (I_B) by country. Consistent with the daily FTQ events identified following Boudry et al. (2019), monthly FTQ (FTR) variables are one in month t if one or more daily FTQ (FTR) events are identified in month t. Similarly, monthly NFTQ (NFTR) variables in month t count the number of daily FTQ (FTR) events in month t. The bear market indicator I_B is 1 if the 2-year excess market return is negative or 0 otherwise. Monthly winner-minus-loser returns from momentum quintiles or terciles (†) are regressed on monthly FTQ, FTR, and their I_B-interaction terms (first partition) or NFTQ, NFTR, and their I_B-interaction terms (second partition). Countries have different starting points as the FTQ and FTR identification requires Datastream stock and bond (10-year government) market returns simultaneously. Both estimates and their t-statistics (parentheses) are reported.

Country	Intercept	FTQ	FTR	FTQ · I_B	FTR · I_B	Intercept	NFTQ	NFTR	NFTQ · I_B	NFTR · I_B
United States	0.007 (1.95)	0.021 (2.03)	-0.012 (-1.03)	0.019 (0.80)	-0.023 (-1.05)	0.008 (2.39)	0.008 (1.34)	-0.012 (-1.29)	0.026 (1.11)	-0.021 (-0.95)
Canada	0.021 (3.03)	0.003 (0.13)	0.012 (0.46)	-0.036 (-0.96)	-0.036 (-0.75)	0.020 (2.93)	0.010 (0.73)	0.009 (0.43)	-0.044 (-1.28)	-0.036 (-0.77)
Japan	0.002 (0.64)	-0.022 (-1.60)	0.018 (1.08)	0.047 (2.29)	-0.038 (-1.67)	0.002 (0.61)	-0.008 (-0.80)	0.001 (0.05)	0.035 (1.78)	-0.020 (-0.93)
United Kingdom	0.006 (1.83)	0.017 (1.43)	0.012 (0.91)	0.027 (1.38)	-0.076 (-3.41)	0.007 (2.25)	0.005 (0.89)	0.005 (0.51)	0.034 (1.92)	-0.072 (-3.41)
Australia	0.009 (2.85)	0.016 (1.27)	-0.013 (-0.99)	-0.040 (-1.86)	-0.012 (-0.37)	0.010 (3.12)	0.014 (2.07)	-0.024 (-2.35)	-0.040 (-2.08)	-0.009 (-0.28)
France	0.003 (0.69)	-0.004 (-0.25)	0.011 (0.63)	0.063 (2.67)	-0.099 (-3.89)	0.002 (0.52)	0.004 (0.60)	0.006 (0.55)	0.051 (2.29)	-0.097 (-4.03)
Germany	0.009 (1.74)	0.012 (0.74)	0.016 (0.91)	0.011 (0.43)	-0.113 (-3.44)	0.010 (2.00)	0.005 (0.68)	0.007 (0.58)	0.015 (0.66)	-0.110 (-3.27)
Sweden	0.012 (1.54)	-0.016 (-0.63)	0.007 (0.25)	0.038 (0.77)	-0.109 (-2.37)	0.012 (1.67)	0.012 (0.91)	-0.038 (-1.64)	0.011 (0.25)	-0.064 (-1.46)
Italy	0.007 (1.14)	-0.008 (-0.27)	0.017 (0.52)	0.056 (1.44)	-0.066 (-1.61)	0.006 (1.02)	0.007 (0.39)	0.012 (0.53)	0.037 (1.06)	-0.065 (-1.72)
Switzerland	0.005 (1.35)	-0.010 (-0.72)	0.001 (0.07)	0.113 (4.36)	-0.068 (-2.50)	0.006 (1.48)	0.005 (0.72)	-0.017 (-1.58)	0.092 (3.61)	-0.042 (-1.48)
Norway	0.008 (1.41)	0.007 (0.38)	0.001 (0.03)	0.074 (2.16)	-0.067 (-2.00)	0.008 (1.39)	0.006 (0.46)	0.005 (0.30)	0.070 (2.02)	-0.073 (-2.27)
Netherlands	0.009 (1.44)	0.020 (0.99)	-0.022 (-0.91)	-0.006 (-0.17)	-0.007 (-0.20)	0.007 (1.18)	0.009 (0.91)	0.006 (0.40)	-0.001 (-0.02)	-0.035 (-1.03)
Denmark	0.011 (1.74)	-0.031 (-1.30)	0.062 (1.93)	0.120 (3.18)	-0.114 (-2.56)	0.011 (1.83)	-0.024 (-1.85)	0.051 (1.97)	0.128 (3.50)	-0.113 (-2.55)
Belgium†	0.000 (-0.06)	-0.027 (-1.46)	0.026 (1.07)	0.063 (2.04)	-0.033 (-0.99)	0.000 (0.09)	-0.028 (-2.65)	0.023 (1.60)	0.081 (2.69)	-0.038 (-1.27)
Spain†	0.004 (0.62)	-0.009 (-0.40)	0.004 (0.18)	0.012 (0.40)	-0.053 (-1.59)	0.003 (0.60)	0.002 (0.16)	-0.005 (-0.37)	0.001 (0.02)	-0.042 (-1.40)
New Zealand†	0.007 (2.07)	-0.011 (-0.97)	-0.003 (-0.21)	0.048 (2.27)	-0.058 (-1.66)	0.007 (1.96)	-0.002 (-0.22)	-0.010 (-0.72)	0.040 (1.97)	-0.046 (-1.29)
Finland†	0.011 (1.61)	-0.002 (-0.07)	0.013 (0.58)	-0.004 (-0.11)	-0.027 (-0.81)	0.013 (2.13)	-0.001 (-0.11)	-0.014 (-0.98)	-0.001 (-0.04)	0.000 (0.01)
Austria†	0.002 (0.53)	0.006 (0.47)	-0.002 (-0.16)	0.046 (2.01)	-0.064 (-2.63)	0.002 (0.42)	0.005 (0.69)	0.003 (0.25)	0.044 (1.99)	-0.070 (-3.02)
Ireland†	0.013 (2.39)	-0.006 (-0.28)	0.004 (0.16)	0.013 (0.37)	-0.002 (-0.05)	0.013 (2.31)	0.001 (0.10)	0.004 (0.27)	0.004 (0.14)	-0.003 (-0.08)
Portugal†	0.015 (2.09)	-0.015 (-0.43)	0.016 (0.41)	0.103 (2.27)	-0.087 (-1.71)	0.015 (2.11)	-0.003 (-0.17)	0.002 (0.08)	0.093 (2.28)	-0.073 (-1.73)
All	0.008 (6.91)	0.000 (0.03)	0.006 (1.40)	0.032 (4.89)	-0.055 (-7.62)	0.008 (7.14)	0.004 (1.67)	-0.001 (-0.43)	0.027 (4.38)	-0.047 (-6.86)

Table A4: FTQ and FTR Days in Bull, Bear-Down, and Bear-Up Markets

This table reports percents of the FTQ and FTR days out of trading days in the bull, bear-down, and bear-up markets, respectively, by country. The FTQ and FTR days are identified following Boudry et al. (2019), and the bull and bear months are identified following Daniel and Moskowitz (2016). The percents and their differences are calculated from MSCI developed countries except Hong Kong, Singapore, and Israel due to the lack of data. Dif. in each partition reports the difference between FTQ % and FTR %. Dif.-Dif. in the right partition reports the difference between the Bear-Down Dif. and the Bear-Up Dif. t-Stat.s in parentheses correspond to the Dif. or Dif.-Dif. The bottom line reports the pooled statistics from all the countries.

Market	Bull				Bear-Down				Bear-Up				Dif.	
Country	FTQ %	FTR %	Dif.	t-Stat.	FTQ %	FTR %	Dif.	t-Stat.	FTQ %	FTR %	Dif.	t-Stat.	Dif.-Dif.	t-Stat.
United States	1.032	0.596	0.436	(3.19)	3.089	1.737	1.351	(1.40)	0.737	2.065	-1.327	(-2.07)	2.679	(2.31)
Canda	0.972	0.537	0.435	(2.94)	2.564	1.080	1.484	(2.12)	1.118	0.711	0.407	(0.94)	1.078	(1.31)
Japan	0.780	0.535	0.245	(1.43)	1.394	0.767	0.627	(1.62)	0.678	0.969	-0.291	(-1.03)	0.918	(1.91)
United Kingdom	0.872	0.547	0.325	(2.25)	3.234	1.437	1.796	(2.41)	0.421	0.631	-0.210	(-0.77)	2.007	(2.53)
Australia	0.969	0.633	0.336	(1.89)	1.330	0.266	1.064	(2.32)	0.443	0.222	0.222	(1.00)	0.842	(1.65)
France	1.039	0.582	0.457	(2.49)	2.965	1.254	1.710	(2.47)	0.348	0.746	-0.398	(-1.71)	2.108	(2.89)
Germany	1.268	0.722	0.546	(2.92)	1.741	0.348	1.393	(3.28)	0.681	0.681	0.000	(0.00)	1.393	(2.83)
Sweden	0.960	0.613	0.347	(1.94)	2.038	1.223	0.815	(1.23)	0.381	0.951	-0.571	(-1.60)	1.386	(1.84)
Italy	0.641	0.452	0.188	(0.93)	1.224	1.020	0.204	(0.43)	0.372	0.495	-0.124	(-0.53)	0.328	(0.62)
Switzerland	0.772	0.630	0.142	(0.95)	2.459	0.820	1.639	(2.46)	0.178	0.474	-0.297	(-1.51)	1.936	(2.78)
Norway	0.883	0.493	0.389	(2.06)	2.748	1.691	1.057	(1.09)	0.229	0.686	-0.457	(-1.73)	1.514	(1.51)
Netherlands	1.345	0.694	0.651	(3.10)	2.729	1.364	1.364	(1.83)	0.500	1.063	-0.563	(-1.80)	1.927	(2.38)
Denmark	0.826	0.344	0.482	(2.94)	3.140	0.826	2.314	(2.87)	0.358	0.716	-0.358	(-1.41)	2.672	(3.17)
Belgium	0.928	0.526	0.401	(2.10)	1.610	0.905	0.704	(1.40)	0.255	0.638	-0.383	(-1.60)	1.087	(1.95)
Spain	0.845	0.812	0.034	(0.14)	1.683	0.601	1.082	(2.07)	0.407	0.640	-0.233	(-0.94)	1.315	(2.27)
New Zealand	0.813	0.325	0.488	(3.00)	2.194	0.366	1.828	(2.69)	0.080	0.161	-0.080	(-0.58)	1.908	(2.75)
Finland	1.022	0.834	0.188	(0.84)	2.128	0.760	1.368	(2.07)	0.630	1.385	-0.756	(-2.12)	2.123	(2.83)
Austria	1.184	0.725	0.459	(2.14)	1.730	0.659	1.071	(2.42)	0.255	0.426	-0.170	(-1.00)	1.241	(2.62)
Ireland	0.607	0.417	0.190	(1.36)	2.144	1.016	1.129	(1.89)	0.319	0.830	-0.511	(-1.89)	1.639	(2.50)
Portugal	0.738	0.544	0.194	(0.87)	1.447	0.434	1.013	(1.95)	0.592	0.518	0.074	(0.26)	0.939	(1.58)
All	0.939	0.578	0.361	(9.09)	2.081	0.891	1.190	(8.86)	0.435	0.715	-0.280	(-4.61)	1.470	(9.97)

Figure A1: Monthly Market Betas of Daily Momentum and Other Factors

This figure shows the market betas of the momentum, size, value, profitability, and investment factors from June 1964 to January 2020. Each daily factor is regressed on the daily market factor in each month. The one-year moving averages of these betas are plotted. Shaded areas indicate US recessions by NBER.

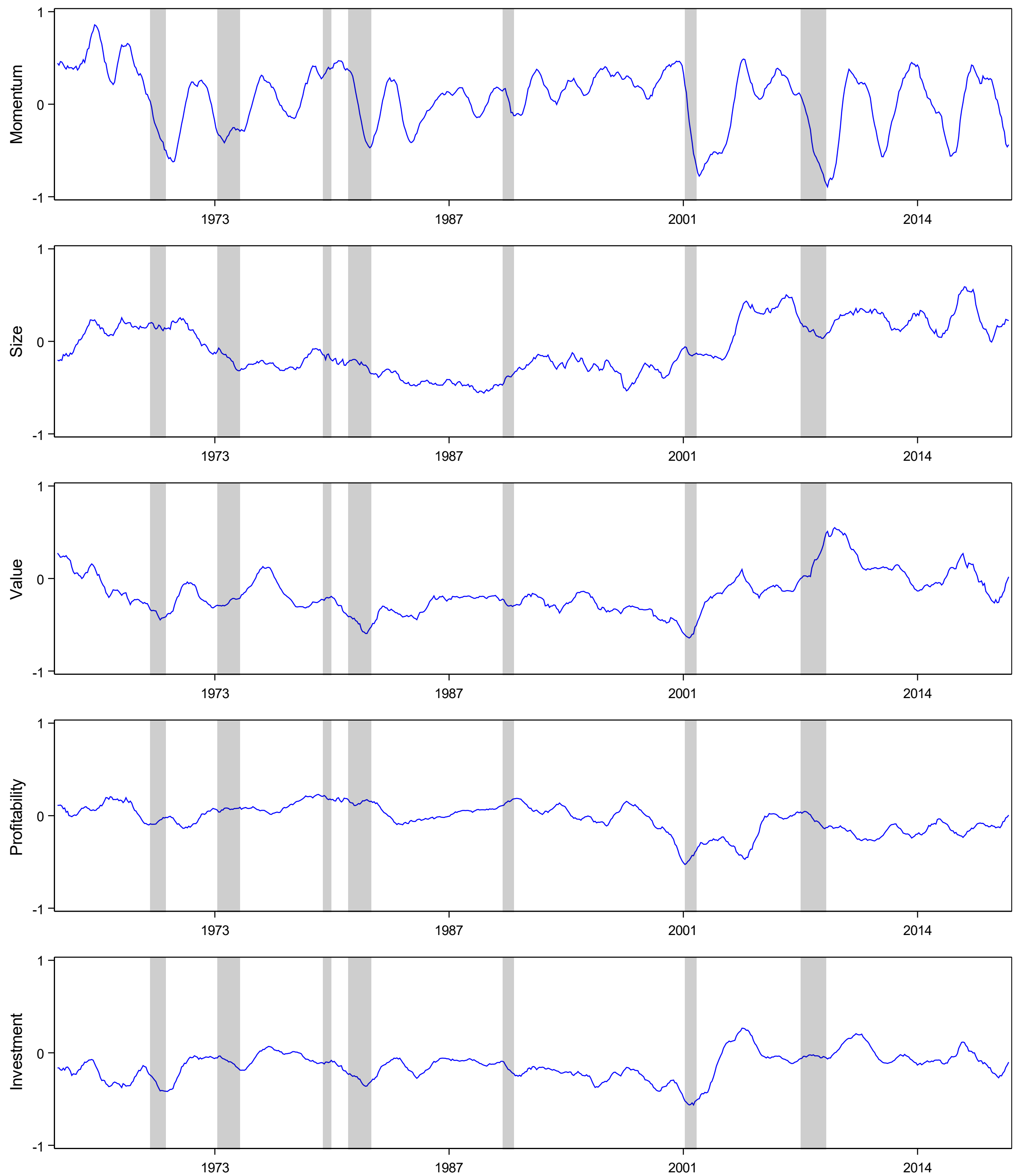

Figure A2: Backward, Central, Forward Betas of WML Portfolios

This figure reports equal-weighted average of market beta (β) of winner-minus-loser (WML) portfolios for three different time periods: (i) normal periods, (ii) bear down market periods, and (iii) bear up market periods. Market beta (β) is measured from rolling regressions for three different horizons for each stock: from -59 to -48 months $\left(\beta_{(-59,-48)}\right)$ (upper left), from -23 to -12 months $\left(\beta_{(-23,-12)}\right)$ (upper right), from -5 to 6 months $\left(\beta_{(-5,6)}\right)$ (lower left), and from 13 to 24 months $\left(\beta_{(13,24)}\right)$ (lower right) relative to the portfolio formation period. I define the bear market if the 2-year excess market return is negative, or 0 otherwise. I define the down (up) market if the contemporaneous excess market return is negative (positive), or 0 otherwise. The loser and winner portfolios are the bottom and top quintile—or tercile if less than 300 stocks are available—portfolios. This figure includes 21 MSCI developed countries.

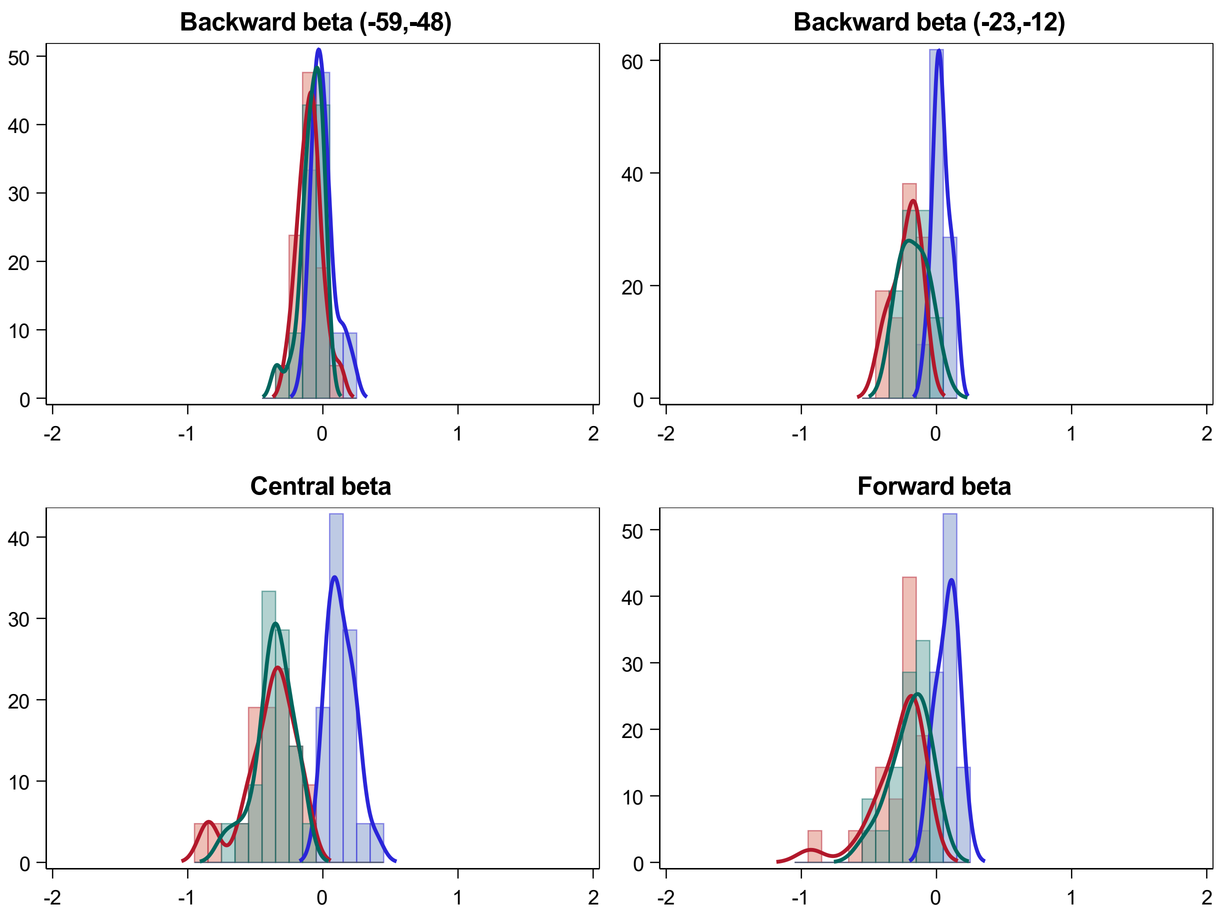

Figure A3: Annual Number of FTQs and FTRs from Stock–Bond Market Disagreement

This figure reports the annual distribution of FTQ and FTR days that are defined using the disagreement between stock and bond markets, following the literature (Baele et al., 2019; Boudry et al., 2019). FTQ (FTR) days in the first (second) plot are identified as the periods with large negative (positive) stock market returns and large positive (negative) bond market returns together. Each plot displays the annual number of FTQ or FTR days in the United States (blue) and outside the United States (red).