Global Flight-to-Quality and Asset Pricing: Evidence from Factor Returns

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Abstract

Global flight-to-quality (FTQ) events lead to underperformance of distressed stocks which subsequently outpace the market in recovery periods. The drastic return changes of distressed stocks, concurrently observed across borders, create internationally synchronized abnormal returns of prevailing factors. By analyzing 153 factors of 13 themes in 23 developed countries, we find that the global FTQ events enhance the global quality factor's positive correlations with five themes of local factors (low risk, momentum, profit growth, profitability, and quality) and negative correlations with two themes (size and value). The changes in global quality factor exposures of local factors are orthogonal to the changes in market factor exposures. Further, the swing of global quality factor returns amplifies volatility of the seven themes of local factors across borders. Our results provide novel implications for global equity investment and asset pricing.

JEL classification: G12, G15, G23.

Keywords: flight-to-quality, international asset pricing, factor returns, factor investing

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1 Introduction

Flight-to-quality (FTQ) refers to investors' behavior of shifting their portfolios toward safer assets during a market collapse. Well-known FTQ events, which influenced global markets, include the market crash in 1987, the Russian default and sovereign debt crisis in 1998, and the global financial crisis in 2007. When these extreme events occur, investors tend to hoard safe assets out of fear of the worst-case scenario (Caballero and Krishnamurthy, 2008). Institutional investors also seek safe and liquid assets to be prepared for retail investors' redemption (Vayanos, 2004), margin constraints (Krishnamurthy, 2010), or lower capital and risk-bearing capacity (He and Krishnamurthy, 2012).[1]

This paper examines asset pricing and investment implications of global FTQ events by investigating the prevailing 153 factor returns of 23 developed markets. We first test whether and how global FTQ events influence performance of distressed stocks relative to high quality stocks across 23 developed markets. Following the methodology of Baele et al. (2020), we identify the days in which each market exhibits FTQ phenomena.[2] We then define a global FTQ period as a 12-month window starting from a month in which a majority of countries experience FTQ phenomena at least one day. In each country-month, we construct a long-short portfolio, referred to as Far-to-default-Minus-Close-to-default (FMC), which buys the top and short-sells the bottom tercile portfolios sorted by the distance-to-default measure of Merton (1974)'s model.[3]

Distressed stocks underperform at the occurrence of global FTQ events and subsequently rebound more than other stocks in the recovery periods. After the global FTQ events, the FMC portfolios on average yield 2.5% and -2.1% per month in the global market downturn and recovery periods, respectively. The pattern is observed concur-

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

[2]Strictly speaking, Baele et al. (2020) identifies Flight-to-Safety (FTS) days where investors exhibit either FTQ or Flight-to-Liquidity behavior. We run tests that help distinguish the effects of FTQ and FTL.

[3]We estimate the default probability following Bharath and Shumway (2008), who modify the procedure used by Merton (1974).

rently across borders. In the market downturn (recovery), the FMC portfolio returns are positive (negative) in all countries and statistically significant at 10% or lower level in 18 (15) countries. Notably, across borders, the returns of distressed stocks (close-to-default stocks) are aligned with the market conditions more closely than those of high quality stocks (far-to-default stocks). During non-FTQ periods, by contrast, the FMC portfolios yield on average 0.1% per month, which is statistically insignificant. Overall, the results suggest that the global FTQ events lead to a large and internationally synchronized swing of local FMC returns.

We further examine the asset pricing implications of internationally synchronized FMC factor returns by investigating whether a global FMC factor explains local FMC returns better during the global FTQ periods. In the estimations, we control for local and global market factors. The key findings are summarized as follows. First, during the FTQ periods, the local market factors become more negatively associated with the local FMC returns; by contrast, the explanatory power of the global market factor does not change significantly. The results suggest that the swing of local FMC returns is related to the local market conditions rather than the global market conditions. Further, the explanatory power of the global FMC factor over the local FMC returns increase substantially during the global FTQ periods, implying that local FMC returns become synchronized across borders more than what can be explained by the global market factor or the cross-border correlations between local market factors.

Next, we extend our analysis to the effect of global FTQ events on other prevailing factors. By analyzing 153 factors that Jensen et al. (2022) classify into 13 themes, we find that global FTQ events enhance correlations between the global FMC factor and returns of local factors whose underlying characteristics are associated with default risks or past returns. During the global FTQ periods, the global FMC factor becomes more positively correlated with five themes of local factors—low risk, momentum, profit growth, profitability, and quality—and more negatively associated with two themes—

size and value. The momentum theme exhibits the strongest average correlation (0.52), followed by low risk (0.49), quality (0.4), and profitability (0.34) themes. By contrast, during non-FTQ periods, the momentum theme features the strongest correlation (0.29), followed by quality (0.19), value (-0.18), and size (-0.17) themes. Further, during the FTQ periods, the global FMC factor exhibits significantly enhanced explanatory power over returns of other local factors after controlling for local and global market factors.

Finally, the global FMC factor explains large swings of the prevailing factors during the global FTQ periods. Momentum theme factors exhibit the largest swings by yielding on average 22.2% (-20.5%) annualized returns in months of positive (negative) global FMC factor returns, followed by low risk, quality, and profitability which yield 15.3% (-14.9%), 14.5% (-8.3%), and 9.3% (-8.2%), respectively. Among the themes negatively associated with the global FMC factor, value and size theme factors record 12.8% (-8.3%) and 11.2% (-5.2%) annualized returns, respectively, in negative (positive) global FMC return months. These themes yield much lower magnitude of returns during non-FTQ periods. Momentum factors yield the highest average return (8.1%) followed by value (4%) and low risk (3%).

The results provide several important implications for factor investments. First, after the occurrence of global FTQ events, investors may fail to manage risks by diversifying portfolios across borders or across factors. In these periods, a number of local factors exhibit cross-border synchronizations of their performances. This observation implies that the international diversification of individual factor strategies may fail to reduce investment risks during the FTQ periods. Moreover, several factors (e.g., Momentum, Low Risk, Quality, Profit Growth, or Profitability themes) comove with global FMC returns, suggesting that these factor portfolios would not provide the expected diversification effect to investors. Second, Size and Value factor portfolios may play a crucial role in the portfolio risk management because the two themes of factors are negatively correlated with global FMC returns. The factor investment risks originated from the swings of distressed stock returns can be hedged by the two themes of factors. Finally, passive investments in market portfolios could also provide hedging for the risks related to the swings of distressed stock returns.

This study contributes to the international asset pricing literature in several aspects. First, we present novel asset pricing implications of global FTQ events. Baele et al. (2020) report that financially distressed or illiquid stocks tend to underperform on days when the domiciled market exhibits phenomena of flight-to-quality or liquidity. We extend the findings by showing that the distressed stocks rather outperform in the recovery period and that the swings of distressed stocks are synchronized internationally in cases of global FTQ events. We further find that, after the occurrence of global FTQ events, the global quality factor exhibits significantly stronger explanatory power over various prevailing local factors across borders.

Next, we contribute to the ongoing discussion about the multi-dimensionality of prevailing factors. A strand of literature criticized a sheer number of factors proposed by the previous studies in that they fail to identify the actual independent factors (Cochrane, 2011; Harvey et al., 2016). In response to the criticism, Jensen et al. (2022) report substantial independence across factors within themes that classify factors based on their return correlations and economic similarities and conclude the multi-dimensionality of factors is a natural outcome of independent research for decoding the complex risk-return trade-off. Our study shows that the global FTQ events influence factor correlations within and between themes, implying that the level of multi-dimensionality may depend on economic and market conditions. Further, we find that the global FTQ periods enhance explanatory power of the global quality factor over other factors. This result suggest that the importance of factors may be assessed in consideration to the economic and market conditions.

Finally, the paper contributes to the international portfolio management literature. A substantial body of research provides evidence of gains from holding internationally diversified portfolios (Eun et al., 2010; Kroencke et al., 2014; Hollstein, 2022). Eun et al. (2010) show that the optimal portfolio including local factor funds (size, book-to-market, and momentum) outperforms the global market funds, as measured by the Sharpe ratios. Our findings suggest a limit in international diversification as a means of factor portfolio risk management. During the global FTQ periods, internationally diversified factor portfolios still face crash risks represented by international synchronization of local factor returns. On the other hand, the global FTQ events enhance negative correlations between some factor themes. The findings suggest that global equity market investors may adjust portfolios of factor funds by considering the enhanced hedging effects after the occurrence of events.

The remainder of the paper is organized as follows. Section 2 describes the data. Section 3 documents characteristics of local FMC returns during global FTQ events. Section 4 presents the relationship between global FMC returns and other local factors during the global FTQ periods. The final section concludes.

2 Data

2.1 Sample construction

We collect stock returns and corporate financial data of 23 MSCI developed countries.[4] For the US and Canada, we obtain individual stock and market return data from the Center for Research in Security Prices (CRSP) database and corporate financial information from the Compustat North America database. For other countries, we collect return and corporate financial data from the Compustat Global database. Finally, we obtain the daily flight-to-safety (FTS) measures of Baele et al. (2020) from Lieven Baele's website.

[4]The ISO country code of each stock's headquarters is obtained from Compustat.

Following Asness et al. (2013) and Fama and French (2017)), we exclude small-cap stocks that sum to 5% of total market capitalization of sample companies in each country-year. We then winsorize individual stock returns at 0.01% and 99.99% levels for each country, aiming to reduce outlier effects. Finally, we compute the US-dollar-denominated stock and market returns for all countries. As proxy for the risk-free rate, we use the one-month T-bill rate as a proxy for the risk-free rate.[5]

2.2 Summary statistics

Table 1 provides summary statistics of sample composition (Panel A), market returns (Panel B) and local FMC factor returns (Panel C) of the 23 developed countries. Panel A includes four columns that report the first and the last sample months, the number of sample months, and the average number of stocks per month, respectively. The sample period starts from March 1999, the earliest month when at the daily FTS data was attainable for a minimum of ten countries, and end in April 2021 (266 months). The last column shows that the US has the greatest average number of domiciled sample stocks (1,301 per month), followed by Japan and Hong Kong (1016 and 159 stocks per month, respectively), By contrast, Ireland and Portugal have fewer than 20 sample stocks per month on average.

Panel B contains five columns that present means, standard deviations, one-sample t-statistics, Sharpe ratios, and skewnesses of monthly excess market returns, respectively. The monthly excess market returns are computed as the value-weighted average of US dollar-denominated monthly market returns exceeding the one-month US T-bill rate. Across countries, the average excess market returns range from 0.196% (the UK) to 1.004% (Denmark) while standard deviations vary between 4.497% (the US) and 8.337% (Finland). The t-statistics indicates that the average excess market returns are significantly greater than zero in many countries. In proportion to t-statistics, Sharpe ratios

[5] T-bill rate data are obtained from Kenneth R. French's website.

are lower in the following countries—the UK (0.108), Italy (0.173), and Portugal (0.185). Denmark records the highest Sharpe ratio (0.637) followed by New Zealand (0.577), Ireland (0.567), and Switzerland (0.527). Finally, the last column shows that excess market returns are negatively skewed except for three countries—Spain (0.011), Finland (0.294). In the bottom row, we report the mean, the standard deviation, the Sharpe ratio and the skewness of market excess returns of all country-months. The t-statistics in parentheses are based on standard errors estimated from 5000 bootstrap samples. In aggregate, the market portfolios yield significantly positive excess returns (0.671%) and Sharpe ratio (0.381). The market excess returns also feature a significantly negative skewness (-0.342).

Panel C includes four columns that report means, standard deviations, t-statistics, and skewnesses of local FMC portfolio returns, respectively. The local FMC portfolios are constructed as follows: using the method of Bharath and Shumway (2008), we first compute the Merton (1974)'s distance-to-default measure for each stock-month (see appendix 5 for more details); we then sort stocks based on the distance-to-default at each country-month, and construct a long-short portfolio that buys a value-weighted portfolio of top tercile stocks (Far-to-default portfolio) and shorts that of bottom tercile stocks (Close-to-default portfolio). About a half of countries exhibit positive average local FMC returns, which range from -0.741% (Belgium) to 0.996% (Singapore). The standard deviations vary between 4.007% (the UK) and 16.795% (Singapore). The t-statistics suggest that the average local FMC returns are significantly positive (negative) only in New Zealand and Israel (Belgium). The bottom row reports the mean, the standard deviation, and the skewness of local FMC returns of all country-months. The t-statistics in parentheses are based on standard errors estimated from 5000 bootstrap samples. Both the mean and the skewness of FMC returns are statistically insignificant.

3 Global FTQ events and FMC returns

3.1 Global FTQ events and local FMC returns

We first analyze the performance of local FMC portfolios during global FTQ periods in which FTQ behavior is observed across countries. We define global FTQ periods using the Flight-to-Safety (FTS) days that Baele et al. (2020) identify for each of the 23 developed markets. As opposed to alternative methods of gauging FTQ phenomena from sovereign bond returns or exchange rates, Baele et al. (2020) measure the occurrence of FTS behavior by analyzing equity and bond market returns. In this regard, the FTS measure fits particularly well our aim to investigate the asset pricing implications of FTQ events in global equity markets. Notwithstanding the advantages, using the FTS measure may be subject to a measurement bias because it captures both FTQ and Flight-to-Liquidity (FTL) phenomena. We address the concern by running tests that rule out the effect of FTL phenomena in Section 3.2.

We set the global FTQ period to a 12-month window starting from the month in which a majority of developed countries experience an FTS day at least once. The global FTQ periods, which account for about 42% of our sample period, include on average 14.8 (11.7) local FTS days per year in the US (other countries) while the non-FTQ periods contain 1.4 (0.7) FTS days per year. The cross-border concentration of local FTS days confirms the validity of our identification strategy for the global FTQ periods. Further, we divide the global FTQ periods into two subperiods, namely, FTQ-market-down and FTQ-market-up months in which global market returns are negative and positive, respectively. The global market return is computed as the value-weighted average of individual stock returns in 23 developed countries. By comparing the two subperiods, we examine how the local FMC portfolios perform in the global market downturn and recovery after the occurrence of FTQ events.

Table 2 presents the portfolio analysis results of 23 developed countries during non-FTQ periods (Panel A), FTQ-market-down periods (Panel B), and FTQ-market-up periods (Panel C). Each panel reports the average returns of market, far-to-default, close-to-default, and FMC portfolios (the first four columns), one-sample t-statistics for local FMC returns (the fourth column), and the number of sample months (the last column). The bottom two rows present the same statistics of all country-months and non-US/Canada country-months, respectively. Panel A shows that, during non-FTQ periods, market, far-, and close-to-default portfolios yield positive average returns in all countries. The average returns of local FMC portfolios do not exhibit a specific direction, either positive or negative, and these returns are not statistically significant in all countries except for New Zealand, where the average return of FMC portfolios is significantly positive. The bottom two rows show that, in line with country-level observations, both the average local FMC returns of all country-months (0.111%) and non-US/Canada country-months (0.098%) are statistically and economically insignificant.

During the global FTQ periods, by contrast, local FMC portfolios yield significantly positive returns in global market downturn and substantial return crashes in the recovery. Panel B shows that, in the global market downturn months, all countries exhibit negative average returns of local market, far-, and close-to-default portfolios except for the far-to-default portfolio in Singapore (0.765%); however, the average local FMC returns are positive in all countries, ranging from 0.509% (Norway) to 6.692% (Singapore) per month, and statistically significant in 18 countries other than Canada, Norway, New Zealand, Finland, and Portugal. The US, on average, records 4.06% of local FMC monthly returns, which is statistically significant at 1% level. The bottom rows present that the average local FMC returns of all country-months and non-US/Canada country-months are 2.512% and 2.486%, respectively, which are also statistically significant at 1% level.

Panel C shows that, during the recovery months, low-quality stocks tend to bounce back more than high-quality stocks across borders. In every country, close-to-default portfolios outperform market or far-to-default portfolios though all the three portfolios yield positive average returns. The average local FMC returns, ranging from -4.860% (Sweden) to -0.525% (New Zealand), are statistically significant in 15 countries with the exception of Canada, the UK, Singapore, Israel, Italy, Spain, New Zealand and Portugal. The US FMC portfolios yield -2.68%, which is statistically significant at 1% level. The bottom two rows show that the average local FMC returns of all country-months and non-US/Canada country-months are -2.144% and -2.189%, respectively, which are statistically significant at 1% level.

The results indicate that the performance of local FMC portfolios varies considerably across borders, particularly during periods of global market downturn and recovery after global FTQ events. In such instances, distressed stocks tend to underperform during market downturns and subsequently rebound more during market recoveries. The results suggest that, after the occurrence of global FTQ events, the performance of local FMC portfolios is more negatively aligned with global market conditions. Consequently, local FMC portfolios exhibit return synchronicity across borders during the FTQ periods.

3.2 Global FTQ events and Flight-to-Liquidity

The FTS measures of Baele et al. (2020), used for identifying the FTQ periods, capture both FTQ and FTL phenomena and thus may create a measurement bias in the estimation for the effect of FTQ events. For a validity check, we examine the performances of liquidity-based portfolio strategies during the global FTQ perios and compare them with local FMC returns. For each country-month, we sort stocks based on the illiquidity measure of Amihud (2002) and then construct a long-short portfolio (LMI portfolio) that buys a value-weighted portfolio of bottom tercile stocks (liquid portfolio) and shortsells that of top tercile stocks (illiquid portfolio).

Table 3 presents the portfolio analysis results of 23 developed countries during non-FTQ periods (Panel A), FTQ-down market periods (Panel B), and FTQ-up market periods (Panel C). Each panel reports the average returns of liquid, illiquid, and LMI portfolios (the first three columns), one-sample t-statistics for local FMC returns (the fourth column) and the number of sample months (the last column). The bottom two rows present the same statistics of all country-months and non-US/Canada country-months, respectively.

Panel A shows that, during non-FTQ periods, the average returns of local LMI portfolios are not statistically significant in most countries. The last two rows indicate that the average local LMI return is statistically significant for all country-months (-0.114%) and non-US/Canada country-months (-0.142%), but the returns are relatively small in size.

Panel B presents the findings for FTQ and global market down periods, where local LMI returns are significantly negative in Japan (-1.537%), Germany (-3.533%), Switzerland (-0.750%), Belgium (-2.263%), and Austria (-3.170%). In contrast, local LMI returns are significantly positive in Canada (2.209%) and New Zealand (0.761%). The US LMI portfolio generates an average return of 0.244%, which is not statistically significant. The last two rows show that the average local LMI returns for all country-months and non-US/Canada country-months are -0.364% and -0.524%, respectively.

In Panel C, the results for FTQ and global market up periods are presented, where LMI returns are significantly positive in Japan (0.907%), Germany (2.334%), Norway (0.979%), Spain (1.438%), and Austria (1.105%). However, Canada (-1.326%), Australia (-0.816%), Israel (-1.314%), Denmark (-1.153%), and New Zealand (-1.009%) exhibit significantly negative average returns for LMI portfolios. The average LMI return for the US is also negative but not statistically significant (-0.237%). The last two rows show that the average local LMI returns for all country-months and non-US/Canada country-months are 0.081% and 0.169%, respectively.

LMI portfolio returns during global FTQ periods differ from FMC portfolio returns presented in Table 2 in several aspects. Firstly, global market returns are positive correlated with local FMC returns but negatively associated with local LMI returns. For instance, during the market recovery from global FTQ events, local FMC portfolios yield significantly negative returns across borders while LMI portfolios are profitable. Further, the magnitude of return swings is much greater for FMC portfolios than for LMI portfolios. The average FMC returns vary from 2.512% in market downturns to -2.144% in the recovery while the average LMI returns change from -0.364% to 0.081%. Finally, local FMC returns exhibit a higher level of global synchronicity than those of LMI returns. Overall, during the identified global FTQ periods, liquidity has a much smaller effect on stock valuations than default risks.

3.3 Global FTQ events and global FMC factor returns

We so far show that, across borders, distressed stocks tend to underperform in periods of global market downturns after FTQ events and rebound more drastically in the market recovery periods. In this subsection, we test whether a global FMC factor explains the post-FTQ swings of local FMC returns beyond the global market conditions. We compute the monthly global FMC return as a value-weighted average return of top tercile stocks less that of bottom tercile stocks, after sorting all sample stocks of 23 countries based on the distance-to-default at the end of each month.

Figure 1 presents cumulative monthly returns of global FMC portfolios (blue), the US local FMC portfolios (black) and the equal-weighted local FMC portfolios (red) over the sample period. We highlight the global FTQ periods with green- and right-colored shades that correspond to the global market downturn and recovery phases, respectively. There were seven clusters of FTQ periods, each of which represents the following financial crisis events: Asian and Russian financial crisis (1997/11–1999/09), dot-com bubble (2000/12–2002/03), 2002 stock market downturn (2002/08–2003/10), 2007–08 global financial crisis (2007/08–2009/09), European debt crisis (2011/10–2012/10), 2015 stock market selloff (2015/02–2016/01), and 2019 US-China trade tension (2019/09–2020/08). During these periods, the global FMC portfolio returns are well synchronized with those of equal-weighted local FMC returns. The US FMC portfolio returns also exhibit similar pattern with substantially higher volatility. Overall, the global FMC portfolios appear to capture the factors that create the swings of local FMC returns across borders during the FTQ periods.

Table 4 presents how local FMC portfolio returns vary with global FMC returns during the global FTQ periods. We classify FTQ periods into two subperiods, referred to as FTQ-FMC-up and FTQ-FMC-down months in which the global FMC portfolio yields positive and negative returns, respectively. Panels A and B present five statistics—time-series averages of local market, far-to-default, close-to-default, and FMC portfolios, one sample t-statistics of FMC returns, and the number of sample months—in FTQ-FMC-up and down periods, respectively. Panel A shows that local FMC returns are positive in all countries during the FTQ-FMC up period, with 17 of these countries exhibiting statistically significant results at the 10% level. The average FMC return during this period is 2.086%, with Singapore having the highest return (4.819%) and Sweden having the lowest (0.361%). In contrast, Panel B shows that the FTQ-FMC down period provides a clearer picture of the credit recovery conditions in each individual country. During this period, the returns of the FMC portfolio are negatively significant in all countries, with 19 of these countries exhibiting statistically significant results at the 10% level. The average FMC return during the FTQ-FMC down period is lowest in Norway (-4.794%) and highest in New Zealand (-0.760%). Overall, the local FMC returns of individual developed countries co-move with the global FMC returns during the FTQ periods, confirming the cross-border synchronization of local FMC returns.

We further examine whether the synchronization of local FMC returns during the global FTQ periods is fully explained by domestic and global market factors. As in

Bekaert et al. (2014), we estimate the following two models for each country:

Model 1:

$$FMC^D_{i,t} = \alpha_i + \beta^G_{mkt,i} MKT^G_t + \beta^D_{mkt,i} MKT^D_{i,t} + \beta^G_{fmc,i} FMC^G_t + \gamma^G_{fmc,i} FMC^G_t \times I_{FTQ,t} + \eta_i I_{FTQ,t} + \varepsilon_{i,t}, \quad (1)$$

Model 2:

$$FMC^D_{i,t} = \alpha_i + \beta^G_{mkt,i} MKT^G_t + \beta^D_{mkt,i} MKT^D_{i,t} + \beta^G_{fmc,i} FMC^G_t + \gamma^G_{mkt,i} MKT^G_t \times I_{FTQ,t} + \gamma^D_{mkt,i} MKT^D_{i,t} \times I_{FTQ,t} + \gamma^G_{fmc,i} FMC^G_t \times I_{FTQ,t} + \eta_i I_{FTQ,t} + \varepsilon_{i,t}. \quad (2)$$

Subscripts i and t represent a country and a month, respectively. $FMC_{i,t}$ is the return of the FMC portfolio, and $MKT_{i,t}$ is the excess market return. Superscripts G and D indicate a global and a domestic factor, respectively. I_{FTQ} is the indicator of FTQ period. The key parameter, $\gamma^G_{fmc,i}$, measures the changes in the relationship between global and local FMC returns during the global FTQ periods. After estimating the regression models for each country, we compute the averages of the coefficient estimates across countries and the corresponding t-statistics.

Table 5 present estimation results. In model 1, both estimates of β^G_{mkt} and β^D_{mkt} are negative while only the latter is statistically significant at 1% level. This result implies that the local FMC returns are negatively associated with the local market returns. Meanwhile, the estimates of β^G_{fmc} and γ^G_{fmc} are positive and statistically significant at 1% level. The positive estimate of β^G_{fmc} indicates that the cross-border synchronization of local FMC returns is not fully explained by global or local market factors. Further, the estimate of γ^G_{fmc} implies that the global synchronization of FMC returns gets stronger after the occurrence of global FTQ events. Per an 1% increase in the global FMC return, the local FMC returns increase on average by 0.71% during FTQ periods. The estimates of model 2 show that the negative relationship between local FMC and market returns is amplified during the global FTQ periods. Given that the global FTQ events influence local market returns across borders, this result is consistent with the swings of local FMC returns conditional on global market conditions reported in Table 2. Moreover, the significantly positive estimate of γ^{G}_{fmc} implies that the global syndication of local FMC returns during the FTQ periods is not fully driven by the changes in market beta of FMC portfolios.

4 Global FTQ events and factor investing

4.1 Return correlations between FMC and other local factors

The globally synchronized shifts in FMC portfolio returns after FTQ events, shown in Table 4, can influence the performance of other local factor strategies. Some factor portfolios tend to buy or shortsell distressed stocks because their underlying strategies are related to default risks. Examples are size, value, or profitability factors. Further, during the FTQ periods, the strategies based on the past return characteristics—e.g., momentum, skewness, or lottery—may increase weights of distressed stocks drastically in long or short positions because of their return swings. These strategies can also experience abnormally high return volatility or crashes in association with the performance of FMC returns. It is noteworthy that, in this case, the local factor returns would be synchronous across borders as with local FMC returns.

Using the classification of factors proposed by Jensen et al. (2022), we examine the common features of local factors of which returns are highly correlated with FMC returns during the FTQ periods. Jensen et al. (2022) classify 153 factors into the following 13 themes—Accruals, Debt Issuance, Investments, Low Leverage, Low Risk, Momentum, Profit Growth, Profitability, Quality, Seasonality, Short Term Reversal, Size, and Value—and compute each theme's portfolio returns. For each theme portfolio returns of 23 countries, we investigate their relationships with local or global FMC factor returns.[6]

Table 6 presents the correlations between 13 local factor themes and FMC returns. Local and global FMC returns are considered in Panels A and B, respectively. Each panel presents the average correlations of all countries, North America, and others regions for FTQ and non-FTQ periods. Panel A shows that several factor theme returns exhibit a stronger correlation with FMC returns during FTQ periods. Five themes—Low Risk, Momentum, Profit Growth, Profitability, and Quality factor—show a correlation greater than 0.3 while Size and Value factor themes show a large negative correlation less than -0.3. The factors are more correlated with local FMC factors in North America although the correlations are still substantial in other developed countries. Panel B shows that returns of the seven factor themes above are highly correlated with global FMC returns during the FTQ periods though the average correlation coefficients gets smaller than those in Panel A. Momentum factors exhibit the highest average correlation (0.518), followed by Low Risk (0.49), Quality (0.401), and Profitability (0.342) while Value (-0.314) is most negatively correlated. The correlations also exhibit much smaller differences between North America and other regions. Overall, both local and global FMC returns influence performances of a large number of local factors during FTQ periods. The significant correlation with global FMC returns implies that the corresponding local factor returns become synchronized across borders after the global FTQ events.

Next, we examine the changes in the correlation between global FMC returns and individual factor returns in each theme. For each local factor, we first compute its correlation with global FMC returns in each country during FTQ and non-FTQ periods. We then take average of correlations across countries in each period. Finally, for each theme, we count the number of factors in the following categories: (i) the average correlation is strictly positive (negative) in non-FTQ periods and significantly increases (decreases) in FTQ periods; (ii) the average correlation is significantly positive (negative) in FTQ

[6] Most factor-level analysis results are reported in the online appendix.

periods. For the statistical inference, we compute a pooled t-statistic of the average correlation across countries and consider the 5% significance level.

Table 7 presents the number of all factors and that of factors falling into each category for 13 themes. Regarding the five themes highly positively correlated with FMC returns, the correlations of most affiliated factors—Low Risk (16/18), Momentum (8/8), Profit Growth (6/12), Profitability (9/11), and Quality (16/17)—are positive in non-FTQ periods and increase significantly in FTQ periods. By contrast, among the 66 factors of these themes, only one factor in the Quality theme falls into the opposite category. The five themes above also contain 16, 8, 10, 9, and 16 factors that have significantly positive correlations in the FTQ periods. Only two factors (from Profit Growth and Quality themes) exhibit significantly negative correlations.

Regarding the two themes negatively correlated with FMC returns, the correlations of a majority of factors—Size (3/5) and Value (12/18)—are negative in the non-FTQ periods and decrease significantly in FTQ periods. Among 23 factors of the two themes, only five factors of the Value theme satisfy the criteria of the opposite category. The 15 and 5 factors above have significantly positive and negative correlations in the FTQ periods, respectively. Overall, the results show that the theme-level correlation with global FMC returns are observed universally at the individual factor level.

4.2 Dependence of local factor returns on global FMC factors

We now examine whether and how the theme-level returns and CAPM alphas are related to global FMC returns after the occurrence of global FTQ event. Specifically, we compare the average returns and CAPM alphas of each theme across Non-FTQ, FTQ-FMC up, and FTQ-FMC down periods. We estimate the CAPM alpha of each theme in non-FTQ and FTQ periods separately, to control for the changes in market betas after the global FTQ events.

Table 8 presents the annualized returns and CAPM alphas of each theme in the three subperiods. During the non-FTQ periods, all themes but Low Leverage and Short Term Reversal yield positive returns. Momentum themes record the highest returns (8.09%) and CAPM alpha (9.064%), followed by Low Risk and Value themes. After the occurrence of FTQ events, the seven themes highly correlated with global FMC returns exhibit substantial return swings. In the FTQ-FMC-up periods, the top five return themes are Momentum (22.21%), Low Risk (15.307%,)Quality (14.501%), Profitability (9.273%), and Profit Growth (5.165%). Meanwhile, only Size (-5.206%) and Value (-8.29%) themes record statistically significant negative returns. These abnormally high or low returns are not fully explained by the time-varying local market betas. The five outperforming themes record average CAPM alphas by 15.245%, 8.664%, 9.283%, 7.141%, and 4.270%, respectively, which are all statistically significant at 1% level. Size and Value yield significnatly negative alphas by -3.702% and -7.668%, respectively. These results are reversed in the FTQ-FMC-down periods. The bottom return themes are Momentum (-20.463%), Low Risk (-14.891%), Quality (-8.261%), Profitability (-8.174%), and Profit Growth (-5.006%). The themes also yield significantly negative alphas except for Quality. In contrast, Size and Value outperform other themes by recording returns (alphas) by 11.223% (8.837%) and 12.805% (11.819%), respectively. Overall, the results confirm that the drastic shift of distressed stock returns create globally synchronized return swings of an extensive set of local factors as well as FMC portfolios.

Next, we perform a principal component analysis using 153 factors of the US market, to derive the common factor associated with global FMC returns during the FTQ periods. In Table 9, Panel A presents the eigenvalues of each component (up to the first 10 components), the eigenvalue difference from the next component, the proportion of variance explained, and the cumulative proportion of variance explained. The first three component accounts for 33%, 19%, and 7% of the total variance, respectively. In total, 77% of the total variance is explained by the first 10 components. In Panel B, we present the estimation results of the following regression model:

$$PCA_{n,t} = \alpha_n + \beta_n FMC_t^G + \gamma_n FMC_t^G \times I_{FTQ,t} + \eta_n I_{FTQ,t} + \varepsilon_{n,t}, \tag{3}$$

where $PCA_{n,t}$ is the return of the n-th principal component in month t. Other notations are the same as in Model 2 above. The key parameter is γ_{fmc}, which measure the change in the relationship between the n-th component and global FMC returns during the FTQ periods. Among the 10 principal components, only the second component exhibits a significant increase in the relationship with global FMC returns. To figure out the economic source of the result, we examine the time-series of the first and the second component returns over the sample period. Figure 2 presents the cumulative returns of the first (blue) and the second (red) principal components. The green and red shared areas represent FTQ-market-up and down periods, respectively. The variation of the first component is concentrated around the dot-com bubble period. Meanwhile, the second component returns vary more during the FTQ periods, which is consistent with the estimation results reported in Table 9.

4.3 Global FMC factor exposure of local factors

Finally, we examine how the global FMC factor exposures of local factors vary between non-FTQ and FTQ periods. We employ the following regression model suggested by Bekaert et al. (2014):

$$\begin{aligned} R_{f,i,t} = \alpha_{f,i} + \beta^G_{mkt,f,i} MKT^G_{i,t} + \beta^D_{mkt,f,i} MKT^D_{i,t} + \beta^G_{fmc,f,i} FMC^G_{i,t} + \gamma^G_{mkt,f,i} MKT^G_{i,t} \times I_{FTQ,t} \\ + \gamma^D_{mkt,f,i} MKT^D_{i,t} \times I_{FTQ,t} + \gamma^G_{fmc,f,i} FMC^G_{i,t} \times I_{FTQ,t} + \eta_f I_{FTQ,t} + \varepsilon_{f,i,t} \end{aligned} \tag{4}$$

where the subscripts f, i and t represent a factor (or a theme), a country and a month, respectively. The dependent variable $R_{f,i,t}$ is the factor return. The independent variables, $FMC_{i,t}$and $MKT_{i,t}$, denote the FMC and the excess market returns, respectively while I_{FTQ} is the indicator of FTQ period. Superscript G and D indicate global and domestic factor, respectively. The key parameter $\gamma^G_{fmc,f,i}$ measures the change in the global FMC factor exposure after the global FTQ events. We first estimate the regression model for each country and then take averages of estimated coefficient estimates across countries. For statistical inferences, we compute pooled t-statistics for the average coefficient estimates.

Table 10 presents the theme-level estimation results. The average estimates of β^G_{fmc} suggest that returns of seven (four) themes exhibit significantly positive (negative) relationships with the global FMC returns. Further, the average estimates of γ^G_{fmc} are significantly positive for six themes (Low Risk, Momentum, Profit Growth, Profitability, Quality, and Short Term Reveral) and negative for three themes (Accruals, Size, and Value). Notably, the results contrast those reported in Table 6 which shows that Short Term Reversal and Accruals do not exhibit significant correlations with global FMC returns during the FTQ periods. The difference can be explained by the change in global market betas of the two themes after the occurrence of FTQ events. Specifically, Short Term Reversal have a significantly positive estimate of γ^G_{mkt} while Accruals have a negative estimate. Given the negative association between global FMC market returns during the FTQ periods, we can infer that the effects of global FMC returns are offset by those of the global market factor. The estimates of other seven themes are consistent with the observations in Table 6, suggesting that the enhanced effect of global FMC returns on these factors are not fully explained by the time-varying global and local market betas.

Table 11 summarizes factor-level estimation results by presenting the number of factors that have significantly positive or negative estimates of $\gamma^G_{fmc,f,i}$ in each theme. A majority of factors within the Low Risk (11/18), Momentum (5/8), Profit Growth (8/12), Profitability (7/11), and Quality (12/17) themes exhibit significantly positive estimates while only three factors of these themes (one for Low Risk, Profit Growth, and Quality themes, each) have significantly negative estimates. On the other hand, two of five Size factors and twelve of eighteen Value factors exhibit significantly negative estimates of $\gamma^G_{fmc,f,i}$. Among the 23 factors in the two themes, only one factor of the Value theme has a significantly positive estimate. Overall, our findings suggest that the theme-level estimation results are not specific to a few factors but rather generally observed in a majority of factors in these themes.

The results provide several important implications for factor investments. First, after the global FTQ events, investors may fail to manage risks by diversifying portfolios across borders or across factors. In these periods, a number of local factors exhibit cross-border synchronizations of their performances. This observation implies that the international diversification of individual factor strategies may fail to reduce investment risks during the FTQ periods. Moreover, several factors (e.g., Momentum, Low Risk, Quality, Profit Growth, or Profitability themes) comove with global FMC returns, suggesting that these factor portfolios would not provide the expected diversification effect to investors. Second, Size and Value factor portfolios may play a crucial role in the portfolio risk management because the two themes of factors are negatively correlated with global FMC returns. The factor investment risks originated from the swings of distressed stock returns can be hedged by the two themes of factors. Finally, passive investments in market portfolios could also provide hedging for the risks related to the swings of distressed stock returns.

5 Conclusion

Previous studies have explored momentum investing and its crashes in both local and international equity markets and have suggested trading methods to manage the crash risks. International studies of this kind have considered momentum crashes in each local market separately and focused on testing the universal relationship between momentum crashes and stock market conditions. By contrast, we examine momentum investing and the occurrence of its return crashes jointly across local stock markets. Our study shows that momentum crashes are sometimes clustered in global equity markets, in particular, after the occurrence of global FTQ events.

Regarding the economic reasons for the globally synchronized momentum crashes, we find that the crashes are closely related to the performance of high default-risk stocks around FTQ events. After the events take place, high default-risk stocks tend to underperform and, thus, constitute loser portfolios. When the market recovers, these stocks rebound more than the high-quality stocks do, leading to momentum crashes. These phenomena are observed across borders after global FTQ events. Indeed, US institutional investors exhibit FTQ and correcting investment flows in foreign markets: they withdraw more from high-default-risk stocks after global FTQ events and then return to these stocks to a greater extent when the market rebounds.

Our findings indicate that the alleged effectiveness of international diversification is limited for managing momentum crash risks, because of their global synchronicity. Further, globally synchronized crashes may occur in other factor strategies, depending on their association with the distress risk factor. Future research should therefore examine the effectiveness of international portfolio diversification by extending the analysis to other widely used factor portfolios.

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Figure 1: Global Flight-to-Quality Periods and FMC Returns

The graph displays the cumulative returns of the value-weighted FMC returns in the United States (black), the value-weighted global FMC returns of 23 developed countries (blue; Full Global), and the equal-weighted global FMC returns using 23 country value-weighted FMC returns (red; Average of Local). The graph uses shaded areas to indicate global flight-to-quality (FTQ) periods defined using the flight-to-safety (FTS) days of Baele et al. (2020). Specifically, the global FTQ periods are months where 50% or more of the 23 developed countries have at least 1 FTS day in the months from t to $t-11$. The green shaded area represents the FTQ-global market up (FQU) period, and the red shaded area represents the FTQ-global market down (FQD) period. The cumulative returns are from March 1993 to April 2021.

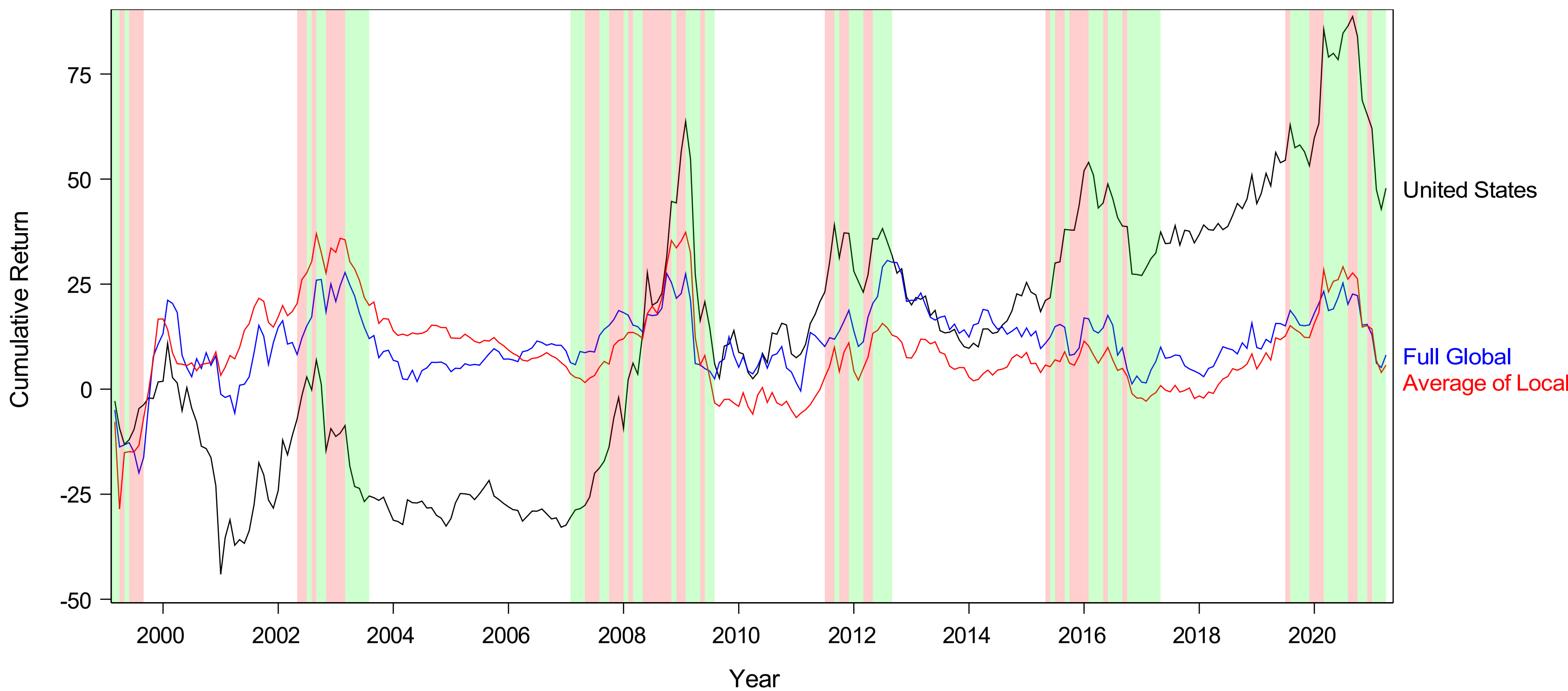

Figure 2: Principal Component Analysis of Factors and FTQ periods

The graph shows the cumulative returns of the first (blue; Prin Comp 1) and second (red; Prin Comp 2) principal components of 153 US factors. The graph uses shaded areas to indicate global flight-to-quality (FTQ) periods defined using the flight-to-safety (FTS) days of Baele et al. (2020). Specifically, the global FTQ periods are months where 50% or more of the 23 developed countries have at least 1 FTS day in the months from t to $t-11$. The green shaded area represents the FTQ-global market up (FQU) period, and the red shaded area represents the FTQ-global market down (FQD) period. The cumulative returns are from March 1993 to April 2021.

Table 1: Market and FMC Factor Returns

The table provides summary statistics of market and quality returns for 23 MSCI developed countries. Local returns are converted to US dollar returns using exchange rates. We use monthly local return data from COMPUSTAT and include only the top 95% of each country by size to remove outliers. For each country, we construct a value-weighted market portfolio and a quality (far-from-default-minus-close-to-default, FMC) portfolio. The far-from- and close-to-default portfolios represent the bottom and top tercile portfolios sorted by expected default probability, respectively, and FMC is the long-short portfolio. The table shows starting and ending periods, number of monthly observations (T), and time-series average of the number of stocks (N). Mean, standard deviation, skewness, and annualized Sharpe ratio of the market and quality portfolios are reported in the table. Additionally, the last row displays pooled statistics of country returns and t-statistics.

	Panel A. Sample Composition				Panel B. Market (Value-Weighted)					Panel C. FMC			
Country	Start	Finish	T	N	Mean (%)	St Dev (%)	*t Stat*	Skew	Sharpe	Mean (%)	St Dev (%)	*t Stat*	Skew
United States	199903	202104	266	1,301.3	0.612	4.497	2.22	-0.523	0.471	0.180	5.298	0.55	-0.549
Canada	199903	202104	266	66.8	0.790	5.994	2.15	-0.571	0.457	0.346	6.457	0.87	-0.530
Japan	199903	202104	266	1,016.8	0.360	4.694	1.25	-0.162	0.266	-0.122	5.147	-0.39	-0.228
United Kingdom	199903	202104	266	109.5	0.196	6.272	0.51	-0.073	0.108	-0.052	4.007	-0.21	-0.501
Australia	199903	202104	266	158.3	0.846	6.100	2.26	-0.806	0.480	0.020	4.857	0.06	-0.450
France	199903	202104	266	98.7	0.605	5.728	1.72	-0.379	0.366	0.433	5.525	1.28	0.205
Germany	199903	202104	266	108.9	0.576	6.072	1.55	-0.385	0.329	-0.106	5.595	-0.31	-1.299
Hong Kong	199903	202104	266	159.1	0.695	6.173	1.84	-0.083	0.390	0.111	7.259	0.25	-1.842
Singapore	199903	202104	266	109.6	0.830	5.695	2.38	-0.281	0.505	0.996	16.795	0.96	4.024
Sweden	199903	202104	266	53.8	0.736	7.195	1.67	-0.218	0.354	-0.326	7.980	-0.67	0.168
Israel	199903	202104	266	104.3	0.809	6.246	2.11	-0.566	0.449	0.831	7.960	1.70	0.283
Italy	199903	202104	266	64.2	0.314	6.299	0.81	-0.099	0.173	0.288	6.789	0.69	-0.250
Switzerland	199903	202104	266	46.5	0.724	4.760	2.48	-0.317	0.527	-0.078	5.846	-0.22	-0.160
Norway	199903	202104	266	45.9	0.929	7.287	2.08	-0.572	0.442	-0.228	7.426	-0.50	-0.935
Netherlands	199903	202104	266	31.8	0.706	6.083	1.89	-0.504	0.402	-0.149	6.506	-0.37	-0.328
Denmark	199903	202104	266	32.9	1.004	5.458	3.00	-0.624	0.637	0.047	7.805	0.10	-0.341
Belgium	199903	202104	266	41.5	0.456	5.729	1.30	-0.831	0.276	-0.741	5.776	-2.03	-0.551
Spain	199903	202104	266	39.4	0.447	6.599	1.10	0.011	0.235	-0.311	5.397	-0.93	0.038
New Zealand	199903	202104	266	40.8	0.936	5.618	2.72	-0.545	0.577	0.612	4.686	2.09	0.072
Finland	199903	202104	257	22.2	0.876	8.337	1.68	0.294	0.364	-0.561	8.177	-1.05	-0.223
Austria	199903	202104	266	29.9	0.710	6.764	1.71	-0.738	0.364	0.011	7.050	0.03	1.006
Ireland	199903	202104	266	15.3	0.975	5.958	2.67	-0.323	0.567	-0.706	8.479	-1.32	-0.919
Portugal	199903	202104	266	16.1	0.318	5.960	0.87	-0.607	0.185	-0.084	6.876	-0.19	-0.218
Total					0.671	6.112	8.59	-0.342	0.381	0.023	7.269	0.25	1.959
					(7.18)	(70.96)	(7.03)	(-3.98)	(7.03)	(0.41)	(14.98)	(0.40)	(0.96)
Total Ex					0.669	6.185	8.07	-0.328	0.375	0.000	7.390	0.00	2.078
US and Canada					(7.22)	(67.00)	(6.91)	(-3.68)	(6.91)	(-0.02)	(15.98)	(-0.04)	(0.55)

Table 2: Quality Portfolios in Flight-to-Quality Periods

This table displays the average monthly returns of all portfolios, including far-from-default, close-to-default, and far-from-default-minus-close-to-default (FMC) portfolios, for three different time periods. These periods are non-flight-to-quality (non-FTQ) market periods, FTQ and global market down periods, and FTQ and global market up periods. A global FTS month is defined as a month where the majority of countries have an FTS day, which is defined by Baele et al. (2020), and a global FTQ period is a one-year period beginning from that FTS month. The far-from- and close-to-default portfolios represent the bottom and top tercile portfolios sorted by expected default probability, respectively. The fourth, fifth, and sixth columns of each period display the FMC portfolios' average returns, t-statistics, and the number of monthly observations. The returns of all, far-from-default, and close-to-default portfolios are the excess returns after one-month T-bill rates, while the returns of FMC portfolios are the long-short returns. The last row shows the pooled statistics of country returns and their corresponding t-statistics.

	Panel A. Non-FTQ period						Panel B. FTQ and global market down period						Panel C. FTQ and global market up period					
Country	All	Far	Close	FMC	*t Stat*	T	All	Far	Close	FMC	*t Stat*	T	All	Far	Close	FMC	*t Stat*	T
United States	0.750	0.743	0.646	0.097	(0.31)	155	-3.977	-3.134	-7.195	4.061	(5.24)	49	3.970	3.436	6.117	-2.680	(-3.30)	62
Canada	0.913	1.123	0.726	0.397	(0.79)	155	-4.649	-4.175	-5.662	1.488	(1.64)	49	4.780	4.388	5.072	-0.684	(-0.77)	62
Japan	0.491	0.477	0.495	-0.018	(-0.04)	155	-3.065	-2.411	-3.968	1.556	(2.81)	49	2.993	2.303	4.013	-1.710	(-3.08)	62
United Kingdom	0.561	0.578	0.944	-0.366	(-1.28)	155	-4.070	-3.490	-5.176	1.686	(3.02)	49	3.171	3.072	3.710	-0.638	(-1.06)	62
Australia	1.237	1.251	1.089	0.162	(0.47)	150	-5.112	-4.368	-6.540	2.172	(3.32)	45	5.104	4.480	6.464	-1.984	(-2.59)	59
France	0.992	0.974	0.519	0.454	(1.14)	155	-5.034	-4.307	-6.676	2.369	(2.44)	49	4.345	3.856	5.005	-1.149	(-1.70)	62
Germany	0.777	0.628	0.661	-0.033	(-0.09)	155	-5.890	-4.380	-6.921	2.541	(3.08)	49	5.243	4.161	6.543	-2.382	(-2.81)	62
Hong Kong	0.863	0.607	0.236	0.371	(0.62)	155	-4.619	-3.304	-6.234	2.930	(4.05)	49	4.140	3.228	5.995	-2.767	(-2.93)	62
Singapore	1.237	1.290	0.343	0.947	(1.00)	149	-2.462	0.765	-5.927	6.692	(1.79)	49	5.041	4.124	7.512	-3.388	(-1.56)	62
Sweden	0.304	0.660	0.307	0.353	(0.57)	155	-5.658	-4.376	-7.638	3.262	(3.26)	49	5.730	4.075	8.935	-4.860	(-5.04)	62
Israel	0.980	1.652	0.717	0.935	(1.55)	155	-3.328	-2.090	-5.605	3.515	(2.89)	49	4.632	3.926	5.515	-1.589	(-1.55)	61
Italy	0.740	0.837	0.920	-0.083	(-0.16)	155	-5.141	-4.546	-7.355	2.809	(3.01)	48	4.650	4.430	5.219	-0.789	(-0.79)	59
Switzerland	1.004	0.908	0.875	0.034	(0.08)	155	-3.316	-3.258	-5.867	2.608	(3.07)	49	2.850	2.465	4.945	-2.480	(-2.96)	62
Norway	1.295	1.573	1.092	0.481	(0.85)	155	-5.888	-5.775	-6.284	0.509	(0.46)	49	5.638	4.516	7.101	-2.585	(-2.64)	62
Netherlands	1.102	0.909	1.142	-0.233	(-0.50)	152	-5.027	-4.124	-6.857	2.733	(2.74)	45	4.739	4.021	6.153	-2.132	(-2.20)	59
Denmark	0.903	1.403	0.964	0.439	(0.66)	155	-3.532	-2.847	-4.624	1.777	(1.75)	45	4.254	3.304	5.604	-2.301	(-2.55)	59
Belgium	1.110	0.724	1.120	-0.396	(-1.08)	146	-3.979	-2.865	-4.859	1.994	(2.33)	45	3.335	2.092	5.773	-3.681	(-3.85)	59
Spain	0.739	0.597	1.319	-0.722	(-1.67)	155	-5.209	-4.494	-6.449	1.954	(2.63)	46	4.492	4.344	5.341	-0.997	(-1.43)	59
New Zealand	1.110	1.428	0.455	0.973	(2.68)	149	-3.468	-3.019	-3.916	0.897	(1.23)	47	4.271	4.261	4.786	-0.525	(-0.81)	59
Finland	0.956	0.748	0.979	-0.231	(-0.33)	129	-5.574	-4.261	-6.276	2.015	(1.55)	45	5.344	3.877	7.173	-3.297	(-3.35)	58
Austria	1.289	1.598	1.505	0.093	(0.16)	146	-5.173	-3.966	-6.368	2.402	(2.47)	45	4.904	4.207	6.221	-2.014	(-2.17)	59
Ireland	1.449	1.194	2.216	-1.022	(-1.62)	149	-4.438	-2.931	-7.122	4.191	(3.52)	45	4.220	3.298	6.939	-3.641	(-3.03)	59
Portugal	0.822	0.708	0.895	-0.187	(-0.34)	137	-4.128	-3.732	-5.145	1.413	(1.49)	45	3.648	3.905	4.892	-0.987	(-0.95)	59
Total	0.937	0.983	0.872	0.111	(1.01)	3,477	-4.461	-3.520	-6.032	2.512	(9.97)	1,089	4.411	3.726	5.870	-2.144	(-10.43)	1,391
Ex US & Canada	0.947	0.988	0.891	0.098	(0.84)	3,167	-4.476	-3.506	-5.993	2.486	(9.20)	991	4.415	3.708	5.897	-2.189	(-10.06)	1,267

Table 3: Liquidity Portfolios in Flight-to-Quality Periods

This table displays the average monthly returns of all portfolios, including Liquid, Illiquid, and Liquid minus Illiquid (LMI) portfolios, for three different time periods. These periods are non-flight-to-quality (non-FTQ) market periods, FTQ and global market down periods, and FTQ and global market up periods. A global FTS month is defined as a month where the majority of countries have an FTS day, which is defined by Baele et al. (2020), and a global FTQ period is a one-year period beginning from that FTS month. The Liquid and Illiquid portfolios represent the bottom and top tercile portfolios sorted by Amihud's Illiquidity, respectively. The fourth, fifth, and sixth columns of each period display the FMC portfolios' average returns, t-statistics, and the number of monthly observations. The returns of all, Liquid, and Illiquid portfolios are the excess returns after one-month T-bill rates, while the returns of LMI portfolios are the long-short returns. The last row shows the pooled statistics of country returns and their corresponding t-statistics.

	Panel A. Non-FTQ period					Panel B. FTQ and global market down period					Panel C. FTQ and global market up period				
Country	Liquid	Illiquid	LMI	*t Stat*	T	Liquid	Illiquid	LMI	*t Stat*	T	Liquid	Illiquid	LMI	*t Stat*	T
United States	0.737	0.816	-0.080	(-0.30)	155	-3.938	-4.182	0.244	(0.51)	49	3.935	4.172	-0.237	(-0.48)	62
Canada	0.918	0.500	0.418	(1.03)	155	-4.538	-6.747	2.209	(3.01)	49	4.732	6.058	-1.326	(-1.87)	62
Japan	0.406	0.263	0.143	(0.61)	155	-3.229	-1.691	-1.537	(-4.04)	49	3.122	2.215	0.907	(2.95)	62
United Kingdom	0.472	0.449	0.023	(0.07)	155	-5.587	-6.457	0.870	(1.35)	49	4.345	4.560	-0.215	(-0.30)	62
Australia	1.018	0.928	0.090	(0.43)	155	-4.940	-4.886	-0.053	(-0.11)	49	4.829	5.645	-0.816	(-2.11)	62
France	0.729	1.155	-0.426	(-1.79)	155	-5.374	-5.018	-0.357	(-0.73)	49	4.760	4.441	0.319	(0.79)	62
Germany	0.648	0.600	0.048	(0.15)	155	-6.549	-3.016	-3.533	(-5.60)	49	5.549	3.215	2.334	(4.03)	62
Hong Kong	0.815	1.057	-0.242	(-0.75)	155	-4.471	-4.836	0.365	(0.65)	49	4.214	4.580	-0.366	(-0.68)	62
Singapore	0.835	1.089	-0.254	(-1.03)	155	-4.451	-4.339	-0.112	(-0.21)	49	4.851	4.701	0.149	(0.33)	62
Sweden	0.748	1.011	-0.262	(-0.95)	155	-5.395	-5.575	0.181	(0.29)	49	5.289	5.741	-0.452	(-0.85)	62
Israel	1.087	1.823	-0.736	(-2.22)	122	-4.343	-4.298	-0.045	(-0.08)	44	4.043	5.357	-1.314	(-2.46)	59
Italy	0.475	0.841	-0.367	(-1.44)	155	-5.747	-5.434	-0.313	(-0.66)	49	4.456	4.091	0.366	(0.71)	62
Switzerland	1.177	1.175	0.002	(0.01)	155	-4.250	-3.500	-0.750	(-2.02)	49	3.414	3.599	-0.185	(-0.46)	62
Norway	1.331	1.294	0.037	(0.14)	155	-5.855	-5.239	-0.615	(-1.05)	49	5.578	4.599	0.979	(1.76)	62
Netherlands	0.896	0.931	-0.036	(-0.09)	155	-5.486	-6.134	0.648	(0.68)	49	5.020	4.607	0.413	(0.65)	62
Denmark	1.173	1.387	-0.214	(-0.64)	155	-3.288	-3.140	-0.148	(-0.16)	49	3.963	5.116	-1.153	(-1.81)	62
Belgium	0.894	0.921	-0.027	(-0.11)	155	-5.632	-3.368	-2.263	(-5.18)	49	3.588	3.126	0.462	(1.07)	62
Spain	0.609	1.033	-0.424	(-1.47)	155	-5.551	-4.533	-1.017	(-1.51)	49	4.705	3.267	1.438	(2.97)	62
New Zealand	1.195	1.064	0.130	(0.42)	155	-3.692	-4.453	0.761	(1.68)	49	4.029	5.038	-1.009	(-1.89)	62
Finland	1.121	1.437	-0.316	(-0.93)	96	-6.244	-5.647	-0.597	(-0.87)	38	5.240	4.643	0.597	(1.01)	51
Austria	1.072	1.234	-0.163	(-0.45)	153	-6.504	-3.334	-3.170	(-5.26)	49	5.477	4.372	1.105	(1.79)	60
Ireland	1.505	1.377	0.128	(0.24)	120	-5.394	-5.869	0.475	(0.35)	30	4.592	5.137	-0.545	(-0.34)	27
Portugal	0.584	0.862	-0.278	(-0.58)	118	-3.798	-5.106	1.308	(1.10)	31	3.586	3.418	0.168	(0.16)	27
Total	0.880	0.993	-0.114	(-1.72)	3,399	-4.970	-4.606	-0.364	(-2.63)	1,074	4.506	4.425	0.081	(0.67)	1,340
Ex US & Canada	0.885	1.027	-0.142	(-2.07)	3,089	-5.043	-4.519	-0.524	(-3.61)	976	4.524	4.355	0.169	(1.36)	1,216

Table 4: Global Synchonization of Quality Portfolio Returns

This table displays the average monthly returns of all portfolios, including far-from-default, close-to-default, and far-from-default-minus-close-to-default (FMC) portfolios, for three different time periods. These periods are non-flight-to-quality (non-FTQ) market periods, FTQ and global FMC up periods, and FTQ and global FMC down periods. A global FTS month is defined as a month where the majority of countries have an FTS day, which is defined by Baele et al. (2020), and a global FTQ period is a one-year period beginning from that FTS month. We define the global FMC down (up) market if the global FMC return is negative (positive). The far-from- and close-to-default portfolios represent the bottom and top tercile portfolios sorted by expected default probability, respectively. The fourth, fifth, and sixth columns of each period display the FMC portfolios' average returns, t-statistics, and the number of monthly observations. The returns of all, far-from-default, and close-to-default portfolios are the excess returns after one-month T-bill rates, while the returns of FMC portfolios are the long-short returns. The last row shows the pooled statistics of country returns and their corresponding t-statistics.

	Panel A. Non-FTQ period						Panel B. FTQ and global FMC up period						Panel C. FTQ and global FMC down period					
Country	All	Far	Close	FMC	*t Stat*	T	All	Far	Close	FMC	*t Stat*	T	All	Far	Close	FMC	*t Stat*	T
United States	0.750	0.743	0.646	0.097	(0.31)	155	-1.300	-0.675	-3.730	3.055	(4.62)	58	2.390	1.860	4.585	-2.725	(-2.72)	53
Canada	0.913	1.123	0.726	0.397	(0.79)	155	-1.705	-0.966	-3.496	2.530	(3.56)	58	3.159	2.331	4.525	-2.193	(-2.18)	53
Japan	0.491	0.477	0.495	-0.018	(-0.04)	155	-1.883	-1.058	-3.222	2.163	(5.57)	58	2.729	1.623	4.552	-2.929	(-4.95)	53
United Kingdom	0.561	0.578	0.944	-0.366	(-1.28)	155	-1.240	-0.616	-2.477	1.861	(3.76)	58	1.303	1.041	2.264	-1.223	(-1.87)	53
Australia	1.237	1.251	1.089	0.162	(0.47)	150	-1.926	-1.345	-3.622	2.277	(4.62)	55	3.612	2.892	5.843	-2.950	(-3.32)	49
France	0.992	0.974	0.519	0.454	(1.14)	155	-1.554	-0.943	-3.156	2.213	(3.19)	58	2.129	1.561	3.137	-1.576	(-1.73)	53
Germany	0.777	0.628	0.661	-0.033	(-0.09)	155	-2.104	-0.938	-2.720	1.781	(2.06)	58	2.991	1.845	4.232	-2.387	(-2.79)	53
Hong Kong	0.863	0.607	0.236	0.371	(0.62)	155	-2.316	-1.230	-3.288	2.057	(2.60)	58	3.107	2.067	4.847	-2.780	(-2.78)	53
Singapore	1.237	1.290	0.343	0.947	(1.00)	149	-0.332	2.313	-2.506	4.819	(1.51)	58	3.984	3.001	6.050	-3.050	(-1.19)	53
Sweden	0.304	0.660	0.307	0.353	(0.57)	155	-2.048	-1.781	-2.143	0.361	(0.31)	58	3.713	2.670	5.735	-3.065	(-3.00)	53
Israel	0.980	1.652	0.717	0.935	(1.55)	155	-0.380	0.616	-2.180	2.797	(2.97)	58	2.721	1.949	3.620	-1.671	(-1.27)	52
Italy	0.740	0.837	0.920	-0.083	(-0.16)	155	-1.286	-0.562	-3.656	3.094	(3.05)	56	1.954	1.463	3.130	-1.666	(-1.90)	51
Switzerland	1.004	0.908	0.875	0.034	(0.08)	155	-0.926	-0.790	-3.224	2.434	(3.05)	58	1.281	0.736	3.889	-3.153	(-3.61)	53
Norway	1.295	1.573	1.092	0.481	(0.85)	155	-2.344	-1.658	-3.705	2.047	(2.58)	58	3.717	1.758	6.551	-4.794	(-4.29)	53
Netherlands	1.102	0.909	1.142	-0.233	(-0.50)	152	-1.490	-0.682	-2.590	1.908	(2.09)	55	2.762	1.819	4.018	-2.199	(-1.99)	49
Denmark	0.903	1.403	0.964	0.439	(0.66)	155	-0.216	0.298	-0.831	1.128	(1.25)	55	2.121	1.029	3.434	-2.405	(-2.33)	49
Belgium	1.110	0.724	1.120	-0.396	(-1.08)	146	-1.439	-0.606	-2.201	1.595	(1.96)	55	1.977	0.569	4.960	-4.391	(-4.26)	49
Spain	0.739	0.597	1.319	-0.722	(-1.67)	155	-1.787	-1.107	-3.034	1.927	(2.94)	56	2.561	2.277	3.844	-1.567	(-2.04)	49
New Zealand	1.110	1.428	0.455	0.973	(2.68)	149	-1.215	-0.746	-1.624	0.878	(1.52)	56	3.141	3.026	3.786	-0.760	(-0.96)	50
Finland	0.956	0.748	0.979	-0.231	(-0.33)	129	-0.716	-0.256	-1.132	0.876	(0.81)	55	2.051	0.984	4.082	-3.098	(-2.54)	48
Austria	1.289	1.598	1.505	0.093	(0.16)	146	-1.835	-0.876	-2.780	1.904	(2.37)	55	3.213	2.406	4.762	-2.355	(-2.11)	49
Ireland	1.449	1.194	2.216	-1.022	(-1.62)	149	-1.312	-0.270	-3.268	2.999	(3.08)	55	2.478	1.583	5.484	-3.901	(-2.61)	49
Portugal	0.822	0.708	0.895	-0.187	(-0.34)	137	-1.276	-0.627	-1.736	1.109	(1.17)	55	2.035	1.979	3.115	-1.136	(-1.03)	49
Total	0.937	0.983	0.872	0.111	(1.01)	3,477	-1.421	-0.631	-2.717	2.086	(9.55)	1,304	2.662	1.848	4.371	-2.522	(-10.76)	1,176
Ex US & Canada	0.947	0.988	0.891	0.098	(0.84)	3,167	-1.413	-0.613	-2.630	2.017	(8.58)	1,188	2.651	1.824	4.353	-2.529	(-10.20)	1,070

Table 5: Global FMC Exposure for Local Quality Portfolio Returns

This table presents the estimates of the following two models for the local FMC return (FMC^D) of each country as a dependent variable: Model 1 includes, as independent variables, the global (MKT^G)/local (MKT^D) market returns, the global FMC return (FMC^G), the global FTQ period (I_{FTQ}), and the interaction term between the global FMC return and the global FTQ period. Model 2 includes the additional interaction terms between the global/local market returns and the global FTQ period, respectively. Specifically, Model 1 estimates

$$FMC^D_{i,t} = \alpha_i + \beta^G_{mkt,i} MKT^G_t + \beta^D_{mkt,i} MKT^D_{i,t} + \beta^G_{fmc,i} FMC^G_t + \gamma^G_{fmc,i} FMC^G_t \times I_{FTQ,t} + \eta_i I_{FTQ,t} + \varepsilon_{it},$$

and Model 2 estimates

$$\begin{aligned} FMC^D_{i,t} = \alpha_i + \beta^G_{mkt,i} MKT^G_t + \beta^D_{mkt,i} MKT^D_{i,t} + \beta^G_{fmc,i} FMC^G_t + \gamma^G_{mkt,i} MKT^G_t \times I_{FTQ,t} \\ + \gamma^D_{mkt,i} MKT^D_{i,t} \times I_{FTQ,t} + \gamma^G_{fmc,i} FMC^G_t \times I_{FTQ,t} + \eta_i I_{FTQ,t} + \varepsilon_{it} \end{aligned}.$$

A global FTS month is defined as a month where the majority of countries have an FTS day, which is defined by Baele et al. (2020), and a global FTQ period is a one-year period beginning from that FTS month. The determination of FTS day is based on the method outlined by Baele et al. (2020). For each country, the two time-series regressions above are estimated, and the unweighted averages of the estimates across countries are presented, respectively. The pooled t-statsitics of the unweighted averages are in parentheses. The significance levels are indicated by asterisks: * for 10%, ** for 5%, and *** for 1%.

Theme	β^G_{mkt}		β^D_{mkt}		β^G_{fmc}		γ^G_{mkt}		γ^D_{mkt}		γ^G_{fmc}		η_t	
	est.	t-stat	est.	t-stat	est.	t-stat	est.	t-stat	est.	t-stat	est.	t-stat	est.	t-stat
Model 1	-0.070	(-1.54)	-0.146***	(-3.27)	0.330***	(5.99)					0.380***	(6.39)	-0.003**	(-2.20)
Model 2	-0.115*	(-1.77)	-0.041	(-0.81)	0.345***	(6.27)	0.128	(1.53)	-0.225***	(-3.79)	0.315***	(5.17)	-0.002	(-1.53)

Table 6: Factor Theme Correlation with FMC returns in FTQ Periods

This table presents the correlations between factor theme returns and FMC returns in FTQ and non-FTQ periods. The correlations are reported for all countries, the US and Canada, and excluding the US and Canada. Panel A shows the correlation between local factor theme returns and local FMC returns, while Panel B shows the correlation between local factor theme returns and global FMC return. A global FTS month is defined as a month where the majority of countries experience an FTS day, and a global FTQ period is defined as a one-year period starting from the FTS month. FTS day is estimated following the method of Baele et al. (2020).

Panel A.

Country	Period	Accruals	Debt Issuance	Investment	Low Leverage	Low Risk	Momentum	Profit Growth	Profitability	Quality	Seasonality	Short Term Reversal	Size	Value
All	Non-FTQ	-0.076	0.082	-0.047	0.080	0.208	0.169	0.157	0.267	0.272	0.007	0.019	-0.220	-0.133
	FTQ	-0.070	0.021	-0.139	0.243	0.510	0.535	0.320	0.395	0.494	0.057	0.062	-0.315	-0.394
US & Canada	Non-FTQ	-0.023	0.199	-0.044	0.058	0.190	0.592	0.397	0.140	0.473	0.014	-0.018	-0.378	-0.193
	FTQ	0.045	-0.141	-0.439	0.273	0.386	0.734	0.488	0.548	0.785	0.312	0.029	-0.503	-0.584
Ex US & Canada	Non-FTQ	-0.081	0.071	-0.048	0.082	0.210	0.128	0.134	0.280	0.253	0.006	0.022	-0.205	-0.128
	FTQ	-0.081	0.036	-0.110	0.241	0.521	0.516	0.304	0.381	0.466	0.032	0.065	-0.298	-0.375

Panel B.

Country	Period	Accruals	Debt Issuance	Investment	Low Leverage	Low Risk	Momentum	Profit Growth	Profitability	Quality	Seasonality	Short Term Reversal	Size	Value
All	Non-FTQ	0.006	0.055	-0.044	0.105	0.090	0.285	0.157	0.146	0.185	0.022	-0.060	-0.174	-0.176
	FTQ	-0.065	0.006	-0.051	0.120	0.490	0.518	0.285	0.342	0.401	0.052	0.047	-0.246	-0.314
US & Canada	Non-FTQ	0.029	0.068	-0.019	0.064	0.006	0.272	0.162	0.006	0.139	0.114	-0.070	-0.186	-0.147
	FTQ	-0.041	-0.036	-0.128	-0.053	0.402	0.483	0.290	0.351	0.348	0.115	0.162	-0.370	-0.251
Ex US & Canada	Non-FTQ	0.002	0.049	-0.047	0.107	0.097	0.278	0.151	0.159	0.184	0.008	-0.058	-0.166	-0.174
	FTQ	-0.065	0.015	-0.038	0.141	0.491	0.509	0.274	0.328	0.396	0.042	0.028	-0.219	-0.314

Table 7: Factor Correlation with FMC returns in FTQ Periods

This table summarizes the correlations between 153 factor returns and FMC returns in FTQ and non-FTQ periods, with a focus on the correlation between local factor returns and global FMC returns. The table reports the number of factors in 13 factor themes that fall into the following categories: (i) the correlation with the global FMC returns is positive (negative) in non-FTQ periods and significantly increases(decreases) in FTQ periods; (ii) the correlation with the global FMC returns is significantly positive (negative) in FTQ periods. A global FTS month is defined as a month where the majority of countries experience an FTS day, and a global FTQ period is defined as a one-year period starting from the FTS month. The method outlined in Baele et al. (2020) is used to estimate the FTS day. For each factor and period, we compute the correlation between the local factor of each country and the global FMC returns and then take average of the correlations across 23 countries. The correlation of the factor is regarded significant if the pooled t-statistic of the unweighted average above is significant at a 5% level.

Number of Factors	Accruals	Debt Issuance	Investment	Low Leverage	Low Risk	Momentum	Profit Growth	Profitability	Quality	Seasonality	Short Term Reversal	Size	Value
Total	6	7	22	11	18	8	12	11	17	12	6	5	18
Postive in Non-FTQ & significantly increase in FTQ	2	2	3	5	16	8	6	9	16	4	3	0	5
Negative in Non-FTQ & significantly decrease in FTQ	2	0	12	1	0	0	0	0	1	3	0	3	12
Significantly positive in FTQ	2	3	6	6	16	8	10	9	16	4	4	0	5
Significantly negative in FTQ	2	3	13	2	0	0	1	0	1	5	1	3	12

Table 8: Factor Theme Returns and FTQ Periods

This table presents the factor theme returns for FTQ and non-FTQ periods, both at the pooled level and for individual countries. The table reports the average raw and CAPM alpha for each factor theme. The mean and t-statistics of the factor theme returns at the pooled level are shown in Panel A. Panel B report the number of countries with significantly positive or negative returns from individual country estimation. The CAPM model is separately computed using local market returns for the FTQ and non-FTQ periods, and then the CAPM alpha is further separated into two sub-periods: FTQ-FMC up and FTQ-FMC down. For each factor in each country, the time-series regression above is estimated, and the unweighted averages of the estimates across countries are presented. The pooled t-statsitics of the unweighted averages are in parentheses, and the numbers of country-wise estimates that are either positively or negatively significant are counted, respectively. The returns are annualized and expressed in percent.

Panel A

Periods	Non-FTQ				FTQ-FMC Up				FTQ-FMC Down			
	Return		CAPM α		Return		CAPM α		Return		CAPM α	
Theme	mean	t-stat	mean	t-stat	mean	t-stat	mean	t-stat	mean	t-stat	mean	t-stat
Accruals	0.986	(1.62)	1.734	(2.77)	-1.363	(-1.06)	-3.128	(-1.63)	3.630	(2.95)	6.430	(3.44)
Debt Issuance	1.842	(4.01)	1.590	(3.27)	2.421	(2.61)	3.218	(2.43)	3.203	(3.57)	1.939	(1.49)
Investment	2.075	(3.50)	3.138	(4.92)	-1.072	(-1.17)	-1.436	(-1.48)	3.089	(2.98)	3.666	(3.34)
Low Leverage	-2.148	(-3.66)	-3.188	(-5.15)	4.448	(4.93)	2.832	(2.73)	-2.490	(-2.62)	0.074	(0.07)
Low Risk	2.991	(4.52)	6.680	(11.40)	15.307	(13.07)	8.664	(9.21)	-14.891	(-11.29)	-4.351	(-4.16)
Momentum	8.090	(9.95)	9.064	(10.75)	22.210	(12.75)	15.245	(7.01)	-20.463	(-10.99)	-9.413	(-4.36)
Profit Growth	2.633	(6.65)	2.346	(5.68)	5.163	(8.13)	4.270	(6.69)	-5.006	(-6.43)	-3.590	(-4.60)
Profitability	1.902	(3.18)	2.075	(3.28)	9.273	(8.94)	7.141	(6.12)	-8.174	(-7.20)	-4.791	(-3.88)
Quality	2.442	(4.19)	3.412	(5.56)	14.501	(10.28)	9.283	(4.91)	-8.261	(-6.39)	0.018	(0.01)
Seasonality	1.127	(3.72)	1.641	(5.09)	0.958	(1.77)	0.001	(0.00)	1.560	(2.77)	3.078	(4.84)
Short Term Reversal	-1.007	(-1.79)	-0.789	(-1.38)	-0.238	(-0.25)	-0.057	(-0.06)	-0.785	(-0.74)	-1.073	(-1.05)
Size	1.523	(2.42)	2.590	(4.05)	-5.206	(-4.10)	-3.702	(-2.15)	11.223	(8.63)	8.837	(5.26)
Value	3.962	(5.78)	5.820	(8.17)	-8.290	(-7.07)	-7.668	(-4.85)	12.805	(10.31)	11.819	(7.49)

Table 9: Principal Component Analysis of Factors and FTQ periods

This table presents the results of a principal component analysis (PCA) of 153 US factors in two panels. Panel A displays the PCA results, including the eigenvalue, its difference compared to the next eigenvalue, its proportion of variance explained, and the cumulative proportion explained for the top 10 principal components. Panel B reports the results of a regression using the top 10 principal component returns as a dependent variable. The regression equation is as follows:

$$R_{PCA,i,t} = \alpha_i + \beta_{fmc,i} FMC_t^G + \gamma_{fmc,i} FMC_t^G \times I_{FTQ,t} + \eta_i I_{FTQ,t} + \varepsilon_{it},$$

where $R_{PCA,i}$ represents each PCA component, I_{FTQ} is the global flight-to-quality (FTQ) indicator, and FMC_t^G represents the global FMC return, with the subscripts i and t representing each component and month, respectively. Each column presents the coefficient estimate and corresponding t-statistics. A global FTS month is defined as a month where the majority of countries experience an FTS day, and a global FTQ period is defined as a one-year period starting from the FTS month.

Panel A. PCA result

Number	Eigenvalue	Difference	Proportion	Cumulative
1	50.225	21.597	0.328	0.328
2	28.628	18.203	0.187	0.515
3	10.425	3.551	0.068	0.584
4	6.873	1.071	0.045	0.628
5	5.802	1.436	0.038	0.666
6	4.367	1.166	0.029	0.695
7	3.201	0.062	0.021	0.716
8	3.139	0.298	0.021	0.736
9	2.840	0.422	0.019	0.755
10	2.419	0.340	0.016	0.771

Panel B. Regression of principal component returns

Principal Component	α (%)	$t(\alpha)$	β_{fmc}	$t(\beta_{fmc})$	γ_{fmc}	$t(\gamma_{fmc})$	η	$t(\eta)$
1	0.393	(0.57)	-16.111	(-0.46)	37.308	(1.02)	-0.917	(-1.12)
2	-0.200	(-0.78)	35.563	(4.25)	83.774	(4.39)	0.483	(0.77)
3	0.160	(0.59)	32.492	(2.06)	-15.328	(-0.86)	-0.414	(-1.22)
4	-0.316	(-1.71)	-2.833	(-0.41)	-12.165	(-0.93)	0.756	(2.38)
5	0.042	(0.24)	-17.173	(-2.12)	7.460	(0.75)	-0.085	(-0.29)
6	0.061	(0.39)	-9.039	(-1.72)	4.260	(0.52)	-0.138	(-0.51)
7	0.014	(0.10)	-6.667	(-1.64)	-1.053	(-0.15)	-0.029	(-0.12)
8	-0.057	(-0.46)	0.716	(0.12)	-8.155	(-0.98)	0.133	(0.61)
9	0.000	(-0.00)	-2.024	(-0.48)	9.071	(1.57)	0.005	(0.03)
10	-0.036	(-0.34)	-0.048	(-0.01)	-3.688	(-0.54)	0.086	(0.46)

Table 10: Global FMC Exposure for Factor Theme Returns

The table presents the estimated coefficients for factor theme returns using the following model:

$$R_{i,t} = \alpha_i + \beta^G_{mkt,i} MKT^G_t + \beta^D_{mkt,i} MKT^D_{i,t} + \beta^G_{fmc,i} FMC^G_t + \gamma^G_{mkt,i} MKT^G_t \times I_{FTQ,t} \\ + \gamma^D_{mkt,i} MKT^D_{i,t} \times I_{FTQ,t} + \gamma^G_{fmc,i} FMC^G_t \times I_{FTQ,t} + \eta_i I_{FTQ,t} + \varepsilon_{it},$$

where $R_{i,t}$ is the factor theme return, FMC^G_t represents the global FMC return, MKT^G_t is the global market return, $MKT^D_{i,t}$ is the domestic market return, and $I_{FTQ,t}$ is the indicator variable of global FTQ period. A global FTS month is a month where the majority of countries have an FTS day, and a global FTQ period is a one-year span starting from that FTS month. The determination of FTS day is based on the method outlined by Baele et al. (2020). For each country, the aforementioned time-series regression is estimated, and the unweighted averages of the estimates across countries are presented, respectively. The pooled t-statsitics of the unweighted averages are in parentheses. The significance levels are indicated by asterisks: * for 10%, ** for 5%, and *** for 1%.

Theme	β^G_{mkt}		β^D_{mkt}		β^G_{fmc}		γ^G_{mkt}		γ^D_{mkt}		γ^G_{fmc}		η	
	est.	t-stat	est.	t-stat	est.	t-stat	est.	t-stat	est.	t-stat	est.	t-stat	est.	t-stat
Accruals	0.057**	(2.57)	-0.071***	(-4.57)	-0.002	(-0.14)	-0.104***	(-3.20)	0.068***	(2.97)	-0.084***	(-3.11)	0.000	(-0.17)
Debt Issuance	-0.016	(-0.98)	0.020*	(1.79)	0.026**	(2.01)	0.056**	(2.35)	-0.054***	(-3.18)	-0.014	(-0.71)	0.001	(1.37)
Investment	-0.057***	(-3.04)	-0.043***	(-3.21)	-0.056***	(-3.80)	-0.002	(-0.07)	0.041**	(2.08)	-0.025	(-1.10)	-0.002**	(-2.26)
Low Leverage	0.096***	(5.33)	0.032**	(2.45)	0.091***	(6.49)	-0.041	(-1.53)	-0.122***	(-6.25)	-0.030	(-1.37)	0.004***	(5.74)
Low Risk	-0.136***	(-7.14)	-0.237***	(-16.71)	0.035**	(2.43)	0.165***	(5.83)	-0.063***	(-2.97)	0.227***	(10.05)	-0.003***	(-4.71)
Momentum	0.014	(0.48)	-0.065***	(-3.16)	0.340***	(15.21)	0.028	(0.67)	-0.163***	(-5.34)	0.187***	(5.41)	-0.005***	(-4.10)
Profit Growth	0.047***	(3.56)	-0.012	(-1.28)	0.095***	(9.12)	-0.058***	(-2.92)	-0.017	(-1.23)	0.034**	(2.15)	-0.001***	(-2.70)
Profitability	-0.107***	(-5.59)	0.024*	(1.77)	0.115***	(7.60)	0.108***	(3.84)	-0.091***	(-4.50)	0.118***	(5.08)	-0.001	(-1.35)
Quality	-0.014	(-0.69)	-0.074***	(-4.89)	0.136***	(8.11)	0.060*	(1.94)	-0.116***	(-5.21)	0.111***	(4.29)	0.001	(1.17)
Seasonality	0.002	(0.21)	-0.029***	(-4.01)	0.002	(0.29)	0.020	(1.38)	-0.017	(-1.60)	-0.005	(-0.42)	0.000	(0.31)
Short Term Reversal	-0.063***	(-3.23)	0.018	(1.27)	-0.054***	(-3.48)	0.102***	(3.55)	-0.028	(-1.35)	0.095***	(4.01)	0.000	(-0.14)
Size	0.086***	(4.00)	-0.140***	(-9.11)	-0.172***	(-10.09)	-0.019	(-0.60)	0.103***	(4.54)	-0.048*	(-1.82)	0.000	(-0.06)
Value	-0.123***	(-5.68)	-0.055***	(-3.54)	-0.181***	(-10.69)	0.093***	(2.91)	0.113***	(4.90)	-0.080***	(-3.08)	-0.003***	(-4.13)

Table 11: Global FMC Exposure for Factor Returns

The table reports the number of factors in 13 themes that have significantly positive or negative $\gamma^G_{fmc,i}$ from the estimated coefficients for factor returns using the following model:

$$R_{i,t} = \alpha_i + \beta^G_{mkt,i} MKT^G_t + \beta^D_{mkt,i} MKT^D_{i,t} + \beta^G_{fmc,i} FMC^G_t + \gamma^G_{mkt,i} MKT^G_t \times I_{FTQ,t} \\ + \gamma^D_{mkt,i} MKT^D_{i,t} \times I_{FTQ,t} + \gamma^G_{fmc,i} FMC^G_t \times I_{FTQ,t} + \eta_i I_{FTQ,t} + \varepsilon_{it},$$

where $R_{i,t}$ is the factor return, FMC^G_t represents the global FMC return, MKT^G_t is the global market return, $MKT^D_{i,t}$ is the domestic market return, and $I_{FTQ,t}$ is the indicator variable of global FTQ period. A global FTS month is a month where the majority of countries have an FTS day, and a global FTQ period is a one-year span starting from that FTS month. The determination of FTS day is based on the method outlined by Baele et al. (2020). For each factor in each country, the time-series regression above is estimated, and the unweighted averages of the estimates across countries are estimated, respectively. The estimate is regarded significant if the pooled t-statistic of the aforementioned unweighted average is significant at a 5% level.

Theme	Accruals	Debt Issuance	Investment	Low Leverage	Low Risk	Momentum	Profit Growth	Profitability	Quality	Seasonality	Short Term Reversal	Size	Value
Number of Factors	6	7	22	11	18	8	12	11	17	12	6	5	18
Number of Factors with γ^G_{fmc} significantly positive	0	1	0	4	11	5	8	7	12	1	2	0	1
Number of Factors with γ^G_{fmc} significantly negative	5	1	3	2	1	0	1	0	1	2	0	2	12

Appendix A Merton Distance to Default (DD) Model

We measure default risk by estimating the expected default frequency (EDF) of Merton (1974) via the DD model of Bharath and Shumway (2008).[7] The DD model, with the Black–Scholes–Merton formula, considers the equity of a firm as a call option on the underlying value of the firm with a strike price equal to the face value of the firm's debt. Specifically, we obtain the EDF π_{Merton} of Equation (7) in Bharath and Shumway (2008) as follows.

$$\pi_{\text{Merton}} = \mathcal{N}\left(-\frac{\ln\left(V/F\right) + \left(\mu - 0.5\sigma_V^2\right)T}{\sigma_V\sqrt{T}}\right),$$

where $\mathcal{N}$ is the cumulative standard normal distribution function, V is the total value of the firm, F is the face value of the firm's debt,[8] μ is the expected continuously compounded return on V, σ_V is the volatility of the firm value, and T is the time-to-maturity, which is an assumed forecasting horizon of one year. With the DD model, in addition, the firm's equity value E and its volatility σ_E satisfy

$$E = V\mathcal{N}\left(d_1\right) - e^{-rT}F\mathcal{N}\left(d_2\right)$$
$$\sigma_E = \left(\frac{V}{E}\right)\mathcal{N}\left(d_1\right)\sigma_V,$$

where d_1 and d_2 are $\frac{\ln(V/F)+\left(r+0.5\sigma_V^2\right)T}{\sigma_V\sqrt{T}}$ and $d_1 - \sigma_V\sqrt{T}$, respectively. Two unobservable (V and σ_V) and hence π_{Merton} can be iteratively solved as there are two equations (E and σ_E) and other observables (E, F, r, T, and σ_E).

For the US and Canada, we use (i) Debt in Current Liabilities and Long-Term Debt - Total values from Compustat and (ii) stock return data from CRSP following Bharath and Shumway (2008). For the other 21 MSCI developed countries, we use (i) the sum of Total Current Liabilities and Short-Term Debt (Including Current Portion of Long-Term Debt) and Long-Term Debt, respectively, from FactSet Fundamentals and (ii) stock return data from Datastream. We follow other criteria imposed by Bharath and Shumway (2008) for consistency, but iterate with the initial σ_V obtained from monthly rather than daily returns considering the better availability of data and for stabler convergence. For the risk-free rate r, we use the three-month T-bill's secondary market rate from FRED.

[7] The authors' original code is available at Tyler Shumway's website (`http://www-personal.umich.edu/~shumway/`).

[8] Specifically, F is the sum of debt in current liabilities and one-half of long-term debt (Vassalou and Xing 2004 and Bharath and Shumway 2008).