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Understanding the Performance of the Equity Value Factor

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Abstract

After decades of sound performance, doubts have been raised on the ability of the equity value factor to continue to deliver a positive performance in the aftermath of the 2008 Global Financial Crisis. Indeed, in a context dominated by low yields, sluggish growth and subdued inflation combined with an accelerating digitalization of the economy, the performance of value strategies struggled over the past decade. In this paper, we investigate potential drivers behind this performance lag, such as macroeconomic and microeconomic determinants, ESG characteristics or credit-borrowed components. Based on European and American data, we find that inflation and tightening credit spread levels are the most supportive factors for value stocks. As far as interest rates are concerned, their sustained low levels prevented the value stock universe from clearing its most distressed issuers, also known as "deep value", and thus dampened value performance. As a matter of fact, we show that value has not been systematically an investment strategy bearing a heightened default risk. Our ESG analysis corroborates the "transatlantic divide", the historical gap between the U.S. and Europe on this front, and shows that value and growth stocks are not necessarily all brown and green stocks. In addition, we demonstrate that the small cap segment has not been the magical cure to value underperformance. Finally, we conclude that value is not dead yet, and might even have bright days ahead considering the current improvements in market sentiment, especially if inflation does materialize. Nevertheless, we also emphasize that the current value risk factor is probably different in nature from the one we observed during the golden age of value investing at the beginning of the 2000s. Indeed, trading facilities, ease of access to fundamental data for a large number of investors, ESG investing and the digitalization of the economy may have changed the rules of the game.

Keywords: Value, risk factor, risk premium, factor investing, valuation, deep value, inflation, interest rates, ESG, carbon risk.

JEL classification: C50, G11, G12.

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Bruno Taillardat joined Amundi in September 2016 as Global Head of Smart Beta & Factor Investing. Bruno started his career at Paribas Asset Management in 1998 as a Quantitative Analyst on North-American equities management. He was then appointed Head of Quantitative Research within the International Equities team at BNP Paribas Asset Management. Then, Bruno joined Unigestion in March 2007 as Senior Portfolio Manager in the Equity team, where he managed Equity portfolios on the different markets covered (Europe, US, Japan, Global, Asia-Pacific and Emerging Markets) and developed the risk-based management process. At Unigestion, he was then appointed Investment director within the Equity team and was responsible for quantitative and fundamental research. Bruno also strongly contributed to the Unigestion Equity management expertise promotion with international investors.

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1 Introduction

First advocated by Graham and Dodd (1934), formalized later by Basu (1983) with his work on the empirical relationship between price-to-earnings ratios and stock returns, and then by Fama and French (1992) with their research on book-to-price in the 1990s, the popularity of the value factor has been increasing ever since among both academics and practitioners. Value investors buy securities that trade below their own perceived "*intrinsic value*". The differential between an investor's opinion on the firm's intrinsic value and the market price usually resides in diverging views on the company's ability to generate cash-flows in the future. Metrics commonly used to make such an assessment can be divided into two approaches: (1) comparing the fundamentals to market value such as book-to-market, price-to-earnings or price-to-cash-flows (Fama and French, 1992, 1993), or (2) more standalone measures such as dividend yield, dividend growth, operating cash-flows, earnings growth, cash flow yield (Chan *et al.*, 1991). In this framework, a value investor then bets on the future outperformance of such stocks.

Different explanations compete to elucidate the value premium or the value anomaly. The first explanation is behavioral, and postulates that investors may tend to believe that past winners will remain ahead of the losers. Investors would tend to over-react and would make errors when forecasting future growth path, undermining value stocks' earnings paths and inflating those of "*glamour*" stocks, which in turn drives the gap between value and growth performance. Therefore, according to this theory, value investors would simply be contrarian (Lakonishok *et al.*, 1994). The second explanation is rather risk-based and lies in the idea that value firms would be fundamentally riskier. Hence an investor would require a higher premium, because the riskiest firms being priced lower would have a lower price-to-book ratio, and would therefore appear more appealing in terms of valuation (Fama and French, 1998). In this approach, value is a skewness risk premium, for which an investor should be rewarded for bearing default risk.

Nevertheless, the value premium has been under close scrutiny in the past decade. With sustained underperformance since the 2008 Global Financial Crisis (GFC), it has been thrown under the bus by an increasing number of academics and practitioners. Even Eugene Fama and Kenneth French, its famous proponents, attempted to verify if the value premium still exists (Fama and French, 2020). Such questioning is legitimate, because the value factor (as defined by Fama and French) lost 32% in the U.S. and 25% in Europe between December 2019 and September 2020. And this lousy performance was the straw that has broken the camel's back. Indeed, cumulative performance has exhibited a severe downward trend since the GFC, dropping to levels reached as far back as in 2001. Then one could wonder if value is dead yet.

The paper is organized as follows. In Section 2, we detail what we mean by value and its statistical characteristics. We precisely define the differences between value investing, value style, valuation, value risk factor and value risk premium. We also touch on recent changes in the market micro-structure, and their possible impact on the value premium. In Section 3, we focus on both its macroeconomic and microeconomic determinants. We estimate the empirical relationships between the value performance and the standard economic risk factors such as interest rates, inflation and the credit environment. Moreover, we focus on the specific behavior of deep value stocks. Section 4 highlights the market factors that could be held responsible for the recent poor performance of value investing. Thus, we explore the impact of ESG investing, carbon risk, small cap effects and intangible assets. Section 5 offers some concluding remarks.

2 What does value mean?

2.1 Interconnectedness between value investing, valuation and the value risk factor

In this paper, we want to grasp the drivers behind the recent underperformance of the value risk factor *per-se*. Improving our understanding may teach a lesson going forward. To achieve this goal, we must nevertheless define precisely what we would like to measure. This is because value covers many concepts that are related and different. For instance, value investors encompass asset managers and asset owners that believe in value investing. This means that they apply a stock picking style, where they compare the fundamental value of the stock with its market value. Therefore, value investors should buy stocks that are undervalued and sell stocks that are overvalued. This definition reflects the *raison d'être* of active management. Indeed, active managers think that the market is not efficient. They then buy some stocks because they hope that their prices will go up. In this case, we notice that value investing and active management are highly related.

However, the academic literature shows that the value style is not unique for building a stock picking process. Indeed, there are other management styles, such as the low-volatility, quality or growth styles. In particular, one investment style seems to attract many investors and dominates the other. This is the momentum style, which has been exposed by Jegadeesh and Titman (1993). According to Grinblatt *at al.* (1995), the momentum style far dominates the value style, since more than 70% of equity mutual funds are in fact momentum investors. Nevertheless, when we ask investors if they are value or momentum investors, most of them would pick the first answer. This is normal since value investing is more rational than momentum investing. Nobody wants to invest in stocks that are overvalued.

The concept of valuation is then central when we refer to value. Valuation is also extensively used by commodity investors, currency investors or bond investors to understand if the asset is overvalued or undervalued by the market. Therefore, we must think that value is everywhere, whereas in fact, this is not exactly true. When we refer to value, we implicitly refer to the stock market, because of the opposition between value stocks and growth stocks. In other asset classes, we may define undervalued and overvalued securities, but we do not define value and growth assets. For instance, the concept of value/growth bonds or value/growth currencies does not exist. Therefore, value is very specific to the stock market. And even though value and valuation are related, they cover two different things. Given the performance of value these last ten years, the question of the death of value investing is justified. However, the question of the death of valuation is inappropriate and irrelevant since financial markets and active management exist because of valuation.

We may wonder why equity value investing is so unique or singular. We have partially answered this question because of the value/growth opposition. Another piece of the puzzle is the academic consensus of the value definition around the Fama-French model. As we have already said in the introduction, we need a model or some metrics to define a firm's intrinsic or fair value. In the case of equity, the Fama-French model based on the book-to-market statistic has become widely accepted as the benchmark model. It has been accepted not only by academics, but also by professionals. Furthermore, many investment portfolios are based on the Fama-French model or an extended version of the Fama-French approach with several criteria and metrics. If we consider corporate bonds for instance, the Merton model may also be seen as a reference model for defining overvalued and undervalued bonds. Nevertheless, the calibration of the Merton model is so difficult that it is not a widely accepted benchmark model by professionals.

Among investment portfolios managed with the Fama-French value factor, factor invest-

ing portfolios take a special place within value investing. The underlying idea of factor investing is to assume that there is not only one common risk factor, but several common risk factors that explain the systematic part of stock returns. Since the specific part (or the alpha) of investment portfolios decreases with diversification, it does make sense to directly build a diversified equity portfolio using these common risk factors. Thus, the professional consensus considers that the common risk factors are the traditional beta defined by the CAPM and alternative betas such as size, value, momentum, low-volatility and quality. We notice that the concept of beta only makes sense with respect to a risk factor. Therefore, value refers to the value risk factor in factor investing.

Again, we may wonder whether the issue is the death of the value risk factor, meaning that the value risk factor is not significant when explaining the cross-section of stock returns. This is not the case since the explanatory power of the value risk factor continues to be relatively high. According to Drei *et al.* (2019), the value risk factor is behind the quality risk factor in North America, but at the same level as the momentum risk factor between 2014 and 2019. In the Eurozone, the value risk factor has the largest explanatory power among the alternative betas.

Nevertheless, there is a clear difference between the traditional beta and the alternative betas. The traditional beta corresponds to the long-only market portfolio, whereas alternative betas are defined with respect to long/short portfolios. The market risk premium is then defined as the expected return of the market portfolio. In order to define the value risk premium, the risk factor must be long on the value stocks and short on the anti-value (or growth) stocks. While switching the long and short exposures has no impact when considering a risk factor analysis, the choice of the long and short legs is crucial when defining the risk premium associated with an alternative beta. When we speak about the value risk premium, we explicitly assume that value stocks outperform growth (or anti-value) stocks. We face the same issue with the size, momentum, low-volatility and quality risk premia. These choices are at the core of the construction of factor investing portfolios. Therefore, the underlying question does not concern the value style, the valuation approach, or the value risk factor, but the equity value premium as used in a factor investing framework.

2.2 The value risk premium

In the sequel, we mainly based our analysis on the Fama-French definition of the value risk factor, namely using the book-to-market and called HML[1]. Therefore, when referring to growth stocks, we actually allude to anti-value stocks (the ones with the lowest book-to-market). We have deliberately decided to take such an agnostic view because it is the benchmark. Even though the value risk factor may be differently implemented in factor investing portfolios, we think that the well-known HML factor is representative of its average performance. Contrary to academic research, we focus on a shorter period corresponding to the last 20 years, and more specifically in the last decade corresponding to the value crisis.

There is no doubt that value 30 years ago is not the same as today. Indeed, in the last decade, alongside the developments in the electronic trading market thanks to advances in the internet, transaction costs substantially shrank, easing investors' ability to arbitrage in the short-term. For example, Chordia *et al.* (2001) showed that the average bid-ask spread was practically cut by half for U.S. equities between 1988 and 1998, and the average

[1]The Fama French factor is built using the value-weight portfolios on book-to-market:

$$\text{HML} = \frac{1}{2}(\text{Small Value} + \text{Big Value}) - \frac{1}{2}(\text{Small Growth} + \text{Big Growth}) \tag{1}$$

Thus it should be noted that the HML factor is not sector neutral.

Table 1: Empirical moments of the HML monthly returns

Europe	2000-2020	2000-2009	2010-2020	5th	
Mean	0.29%	1.04%	−0.39%	−2.19%	
Median	0.27%	0.73%	−0.54%	−2.24%	
Variance	7.87%	7.73%	7.02%	13.04%	
Skewness	0.30	0.29	0.30	−0.99	
Kurtosis	2.72	3.06	3.30	2.41	
USA	2000-2020	2000-2009	2010-2020	5th	5th*
Mean	0.08%	0.65%	−0.44%	−0.12%	−1.27%
Median	−0.10%	0.32%	−0.47%	−2.13%	−2.37%
Variance	10.55%	13.86%	6.98%	53.91%	42.95%
Skewness	0.12	0.15	−0.53	0.29	−1.27
Kurtosis	3.11	1.88	4.98	0.18	1.33

Source: Authors' calculations based on Kenneth French data from 31/12/2000 to 31/12/2020.

Note: 5th corresponds to the lowest 5th percentile of the distribution of the respective market factor returns, that is Nov. 2000, Feb. 2001, Sep. 2001, Jul. 2002, Sep. 2002, Jun. 2008, Sep. 2008, Oct. 2008, Feb. 2009, Dec. 2018, Feb. 2020 and Mar. 2020 for the U.S. In Europe, it corresponds to Sep. 2001, Jul. 2020, Sep. 2002, Jan. 2008, Sep. 2008, Oct. 2008, Jan. 2009, May 2010, Aug. 2011, Sep. 2011, May 2012 and Mar. 2020. For USA 5th*, we discard the monthly return of Nov. 2000.

trading daily volume per stock doubled. This trend has continued in the 21st century. This is key for a mean-reverting strategy such as value. Therefore, one could wonder whether the investment horizon of value investors has shortened over the years and if the long-term horizon of value investors is compatible with this short-term arbitrage. On top of that, internet development has also democratized access to knowledge and data, and the financial world is no exception. Thanks to data providers, a rising share of fund managers has gained access to corporate financial statements with a click of a mouse. A phenomenon that also might have increased short-term arbitrage of value in the past decades.

Within the factor investing literature, value belongs to the "*pure risk premia*" category. This is not a market anomaly. More specifically, it is considered as a skewness risk premium, that is supposed to pay off in good market conditions but would suffer a performance drag in case of market downturns. Indeed, as an alternative risk premium, it implies that a value investor bears the risk in bad times. This type of strategy can therefore be compared to the payoff of a short put + long call option (Roncalli, 2017). In Figure 20 in Appendix A.1, we have plotted the distribution of the monthly returns from HML Europe and HML USA. We worked on the full sample and split it into two sub-periods (up to December 2009 and since January 2010). In addition, keen to analyze the payoff in turbulent markets, we isolated the returns in periods of market downturns. Table 1 highlights the main characteristics of these distributions. For both the U.S. and Europe, we observe a slight positive skew for the full sample. Average returns were higher for the first decade of our analysis, both in Europe and the U.S. These results highlight the deterioration of value since 2010, corroborating stylized facts. Finally, the analysis of market downturns highlights the negative skewness of the distribution of HML returns in Europe, a property expected of a skewness risk premium such as the value premium. In the U.S., oddly we do not observe such an effect. However, we should bear in mind that the periods of market downturn in the U.S. include the bursting of the tech bubble, where the value risk factor has strongly rallied. When discarding the data from November 2000, we do find a negative skewness. These results confirm the pure risk premium feature of the value risk factor.

3 Economic analysis of the value risk factor

3.1 Macroeconomic determinants of the value strategy

In this section, we are keen to assess the macroeconomic determinants of the value factor[2]. We recall that Fama and French (1993) used book-to-market sorting portfolios to build the High Minus Low or HML risk factor. More specifically, we will study its relationship with interest rates (distinguishing between the level and slope of the yield curve), inflation dynamics, volatility regimes, periods of recession and credit market conditions.

Figure 1: Cumulative performance of the HML factor (long value, short growth)

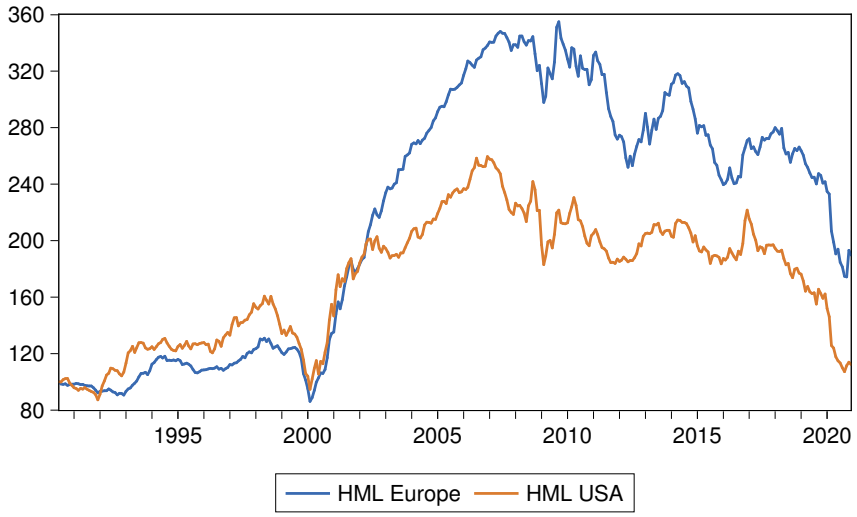


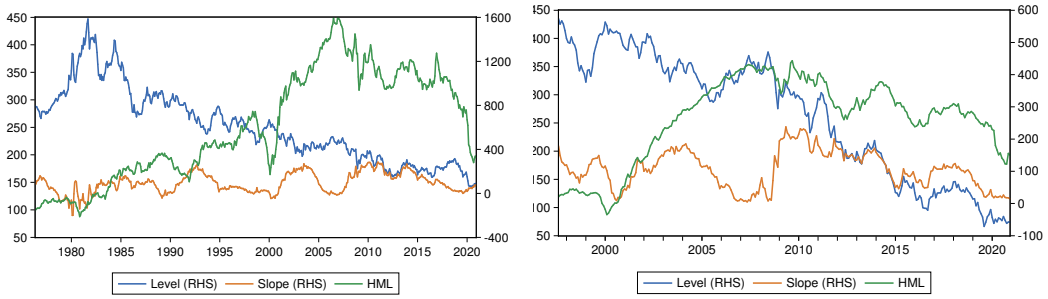
Figure 1 represents the cumulative performance of the HML factor in the U.S. and Europe since the beginning of the 1990s. Since then, and up to the late 2000s, the value risk factor has enjoyed strong performance, although it certainly suffered when it became clear that the dot-com bubble was forming. However, when the bubble bursts in March 2000, value experienced one of its most powerful rallies. This is driven by the nature of this crisis marked by the polarization between Technology and Telecom sector stocks that were crushed by market players, and the other sectors of the economy that withstood. Being long value and short on growth stocks was without any doubt detrimental between 1998 and 2000, but then a sound turnaround played out for HML. Merely at that time, being a value or growth investor actually meant betting on a sector's performance, rather than on true "*valueness*" of underlying stocks. In that matter, the dot-com bubble remains an atypical event for value, which is not expected to display such outperforming returns during a crisis. In a sense, the dot-com bubble is a pure financial crisis of valuation and its impact on the economy has been limited compared to the 1929 Great Depression or the 2008 Global Financial Crisis. However, after peaking in the wake of the dot-com bubble burst until the beginning of 2007 (mid-2008 in Europe, but to a lesser extent), value has plummeted sharply. Until last September, 2020 was about to be coined the worst year for value, but a small turnaround was triggered. These findings apply both in the U.S. and Europe. As a matter of fact, performances on both sides of the Atlantic seem to co-move, although the

[2]The analysis has been conducted with the Kenneth French library data available at the following website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. We use the monthly Fama-French three factors (MKT, SMB and HML) for the U.S. and Europe, both in USD with historical data starting from July 1926 and July 1990, respectively.

U.S. has not managed to catch up with the outperformance Europe accumulated at the beginning of the 2000s, where they were clearly de-correlated.

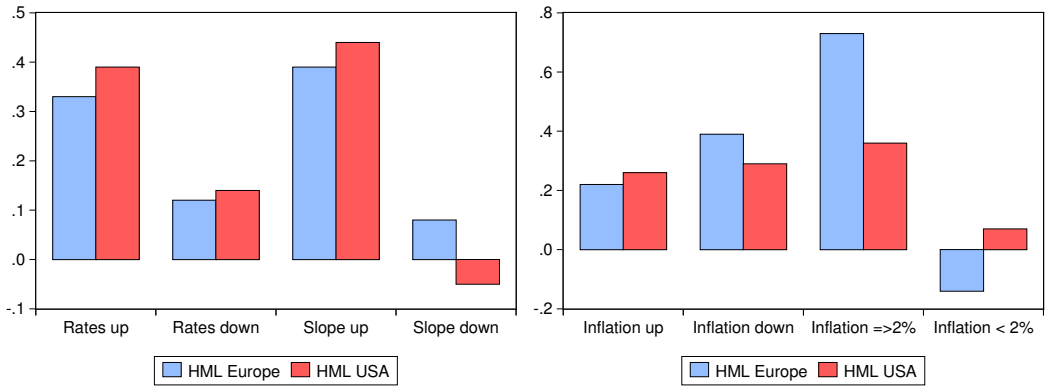
In order to understand the performance drag on value returns in recent decades, we investigated its ties to the interest rate environment and monetary policy stance. First, based on data for 10Y interest rates and the 10Y-2Y yield curve slope, we cannot establish a strong conviction on the co-movements of the value risk factor with interest rates[3] as shown in Figure 2. Indeed, interest rates have experienced a continuous downward trend, but the value premium was much more volatile.

Figure 2: Historical interest rates movements in bps (level and slope)



(a) USA (b) Europe

Figure 3: Average monthly return of the value risk factor (in %) across interest rates and inflation regimes



(a) Interest rates regimes (b) Inflation regimes

In Figure 3, we extend the previous analysis by investigating the average performance of the value factor across different yield curve movements. We find similar patterns in the U.S. and Europe. Value tended to outperform when the level of interest rates increased and when the yield curve steepened. This is consistent with the economic theory. When the economy is growing at a solid pace, this generally translates into an upward movement in interest rates, combined with a steepening yield curve. Therefore, value stocks usually perform well in such an environment, where earnings of value stocks grow faster than growth stocks. Actually, because of their cash flow structure, the equity duration of value stocks

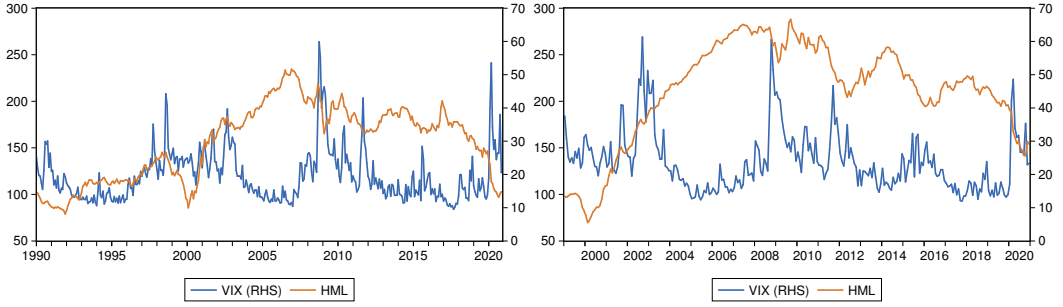
[3]For the U.S., we use the monthly 10Y and 2Y Treasury constant maturity rate from the Federal Reserve Bank of St. Louis database. The sample starts in July 1976. For Europe, we chose the monthly German 10Y and 2Y benchmark bond. Data was retrieved from Factset, and the sample starts in August 1997.

is often considered as shorter than the equity duration of growth stocks, because the latter have cash flows that pay out in the distant future (Schröder and Esterer, 2016). Thus, when interest rates are high, value stocks are priced higher than growth stocks, since a lower share of their earnings is deeply discounted in the future. Conversely, growth stocks are generally favored in a low-interest rate regime, where such a discount is very low. However, value stocks also have a higher cash flow beta (Campbell and Vuolteenaho, 2004). This makes them fluctuate with the economy's health and therefore they tend to be concentrated in cyclical sectors such as Financials or Industrials. It should be noted that such interaction with a rising interest rate regime illustrates the antagonistic payoff profile of the value risk factor compared to the low-volatility factor. Indeed, the latter usually shows the strongest performance when rates are on a downward trend (Stagnol and Taillardat, 2017).

In a similar manner, we examine whether an inflationary environment (usually fueled by a growing economy) is conducive to the value premium[4]. Specifically, we analyze how value returns historically behaved when inflation was rising or high (equal or above to 2%). In Figure 3, we notice that value outperformed when inflation was in high regime, both in the U.S. and Europe. Still, judging by the close performance for increasing or decreasing inflation, HML performance seems more sensitive to the level of inflation rather than its direction. This is in line with the essence of value stocks, which have a higher expected profit in the short term than growth stocks, for which profits are much further down the road.

In Figure 1 we have seen that market turmoil seems to have a significant impact on the value premium, as suggested by the sharp rise after the dot-com bubble burst, but also the drops from the GFC, the European debt crisis or the COVID-19 breakout. In Figure 4, we note that value tended to track the VIX in the U.S. before 2004. However, the relationship seems to have reversed since this period. Periods of low volatility appear to have coincided with the outperformance of the value risk factor.

Figure 4: Relationship between the historical volatility (in %) and the HML performance



(a) USA

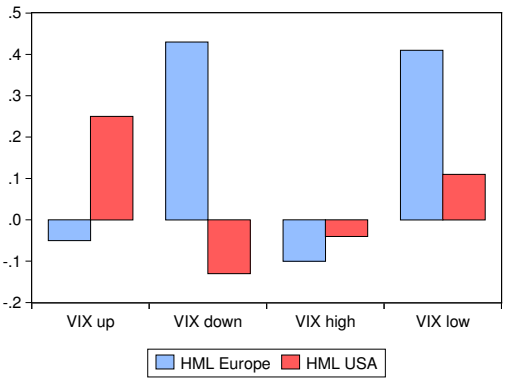
(b) Europe

European data (VSTOXX for the Eurostoxx volatility), graphically conveys the same idea[5]. However, from Figure 5, we cannot draw any clear conclusions on the impact of

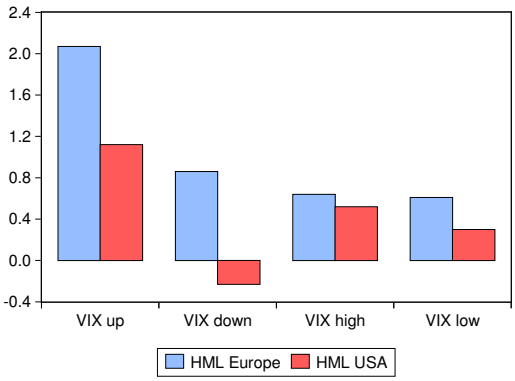
[4]For the U.S., we use the monthly Consumer Price Index (CPI) for All Urban Consumers (All Items in U.S. City Average since January 1948 from the Federal Reserve Bank of St. Louis database) while we use the Euro Area HICP from the OECD in Europe (series starting in January 1997). Both time-series are percentage change from the same period of the previous year.

[5]VIX data for the U.S is from the Chicago Board Options Exchange, corresponds to the implied volatility on the S&P 500, and starts in January 1990. For Europe, we used the VSTOXX index based on the Euro Stoxx 50, whose inception date goes back to January 1999. We split the sample between high and low regimes based on the average volatility index value over the whole sample.

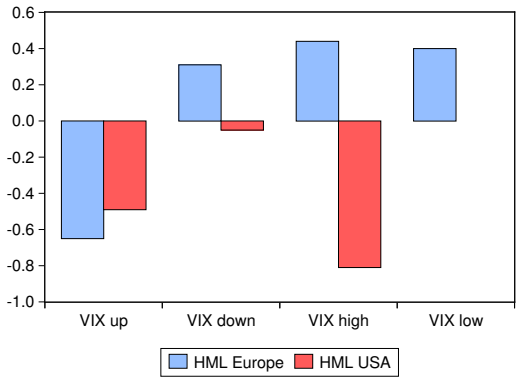
Figure 5: Average monthly return of the value risk factor (in %) across volatility regimes



(a) Full sample



(b) Before 2004



(c) After 2004

volatility index's direction for the whole sample, witnessing antagonistic return patterns between Europe and the U.S. Therefore, we split the sample between the period up to the end of December 2003 and after. We note that before 2004, value returns were higher in periods of rising volatility. However, since then, the value risk factor underperformed during the same periods of uncertainty. This result is in line with the changing correlation hinted in Figure 4.

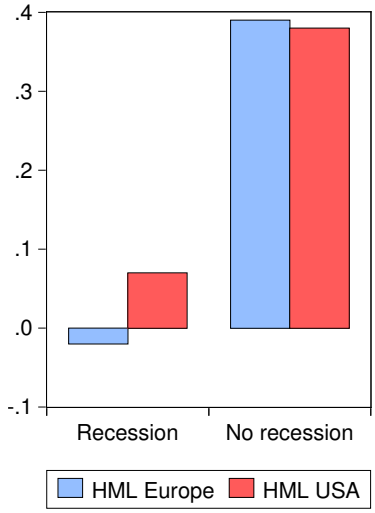
Although value has tended to underperform in turbulent market environments since 2004, we may wonder if the value risk factor also suffers a performance drag during subsequent periods of recession. In Figure 6, when isolating recession periods from our sample, we observe that value indeed tends to underperform during those difficult periods, both in the U.S. and in Europe[6]. This result is in line with our previous finding. Value outperforms when the slope of the yield curve increases, which implies an acceleration of economic growth.

Finally, considering that recession periods tend to be synchronized with widening credit spreads, we would like to analyze the relationship between value and credit market conditions. In Figure 7, we report the relationship between the credit spread[7] and the HML risk factor for both Europe and the U.S. This figure suggests that narrowing credit spreads seem

[6]We use monthly NBER based recession indicators for the United States and OECD based recession indicators for Euro area from the Federal Reserve Bank of St. Louis database. Data is available for the whole sample for both HML factors.

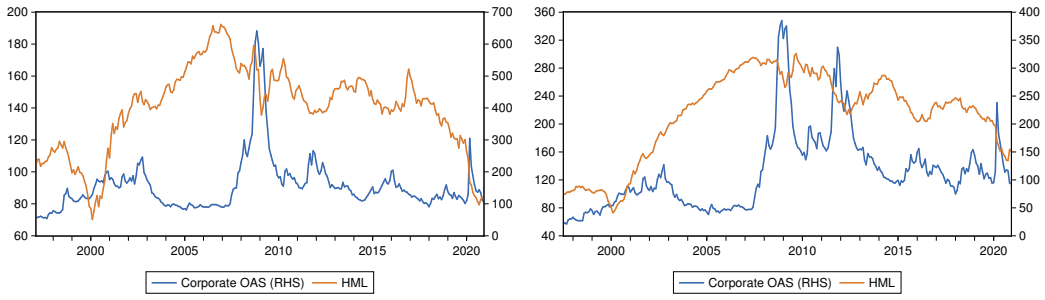
[7]For the U.S., we use the monthly Option Adjusted Spread (OAS) from ICE BofA US Corporate, which is available starting in January 1997. For Europe, we use the monthly Option Adjusted Spread from ICE BOFA Euro Corporate available since December 1996. We split each sample into a high or a low OAS regime based on their respective average over the full sample period.

Figure 6: Average monthly return of the value risk factor (in %) across economic activity



to be the most favorable environment for the value risk factor. However, results are mixed when breaking down high versus low spread regimes as shown in Figure 8. Although value outperforms in a low credit spread regime in Europe, no clear pattern appears in the U.S. From this standpoint, the directionality of the credit spreads appears to be more meaningful that its level when it comes to explaining the performance of the value risk factor.

Figure 7: Historical credit spread in bps



(a) USA

(b) Europe

We saw that the set of macroeconomic factors seems to impact the performance of value in our sample. With the aim of appraising their combined effect and identifying the strongest determinants, we ran least squares regressions on the HML monthly returns in Table 2 for Europe and the U.S. Results generally confirm our previous conclusions. In line with Figures 5 and 6, we find mixed evidence of recession that is mildly significant, and of volatility that is only meaningful in the U.S. Although taken individually, the level of interest rates (and the slope in the U.S.) has a positive significant impact on the value risk factor. When combined with other variables, interest rate dynamics do not come out as compelling as in Figure 3. As a matter of fact, our econometric analysis shows that, when combining the aforementioned different macroeconomic indicators, credit spread tightening and inflationary environment (and to a lesser extent the absence of recession) are the most conducive determinants to the outperformance of the value risk factor.

Figure 8: Average monthly return of the value risk factor (in %) across credit spread regimes

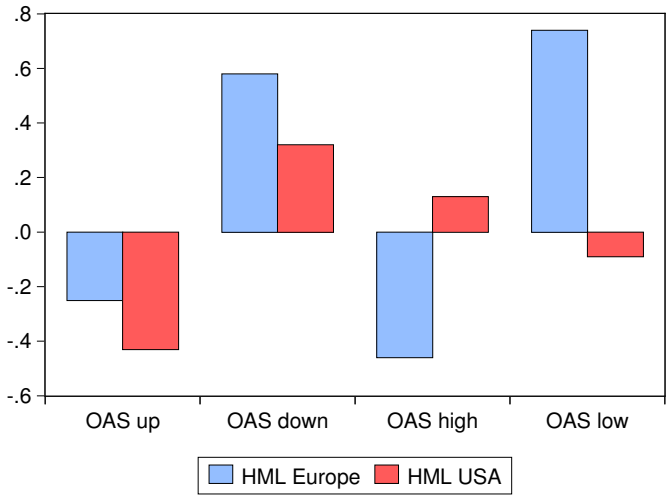


Table 2: Time series regressions

			Europe			
Constant	0.26	−0.32	0.39*	0.29*	0.24	−0.37
10Y level	2.28**					0.63
10Y slope	−0.99					0.91
Inflation		0.33*				0.55***
Recession			−0.41			−0.66*
Credit spread				−5.91***		−7.31***
VSTOXX					−1.43*	0.57
R^2	0.02	0.01	0.01	0.07	0.01	0.12
			USA			
Constant	0.08	−0.68*	0.13	0.03	−0.03	−0.77*
10Y level	0.70*					−0.04
10Y slope	1.41**					1.56
Inflation		0.32*				0.42***
Recession			−1.05*			−0.99*
Credit spread				−4.45***		−7.36***
VIX					0.97	2.58***
R^2	0.02	0.01	0.01	0.03	0.01	0.09

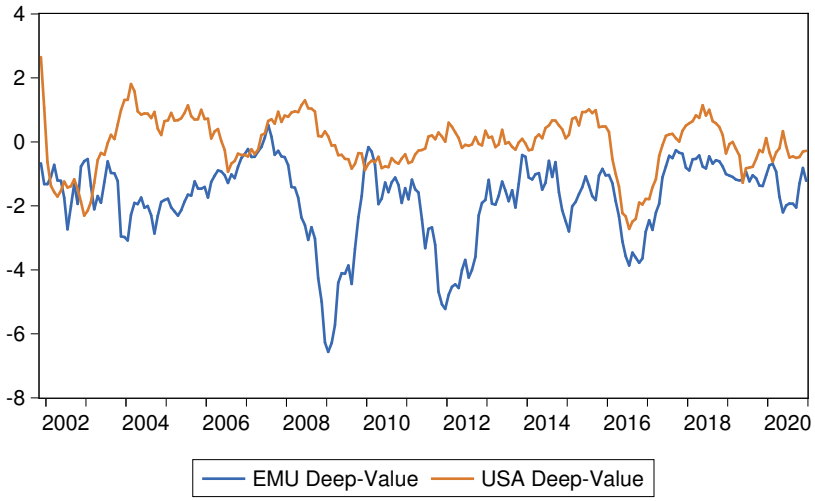
Source: Authors' calculations based on data extracted FRED Database & Factset.

Note: Sample starts from February 1999 to December 2020 for Europe, and February 1997 to December 2020 for the U.S. Interest rate variables are taken in first difference. Inflation is already in difference and recession is a dummy variable. Credit spread, VSTOXX and VIX are percentage change from the previous period.

3.2 Microeconomic factors of the value strategy

We now turn to microeconomic determinants of the value premium and investigate whether recent underperformance can be attributed to the highest book-to-market firms or the so-called "*deep value*" stocks. These companies are distressed for various possible reasons such as having the capacity to repay interest, but not the principal, inadequate income generation to cover debt expenses, etc. For real deep value stocks, such critical situation can turn into a recovery, the company being acquired or going bankrupt. Economic downturn or rising interest rates are often the catalysts for the crash of deep value stocks. Still, such stocks may find buyers. In essence, both deep value investors and more traditional value investors believe in price mean-reversion. However, with a shorter time horizon than for traditional value, investing in this deepest segment is often assimilated to a speculative strategy. Indeed, deep value investors are believers in short-term rotation where sudden price reversion could occur, for instance fueled by supportive flows. Managing to capture the latter is not an easy task, as mean-reversion is generally not as sustained as for generic value stocks. Nonetheless, such contrarian bets can have very positive outcomes, but it is all about stock selection.

Figure 9: 12 months rolling average monthly returns (in %) of deep value (long 95th percentile, short 75th percentile on the book-to-price ratio)



In Figure 9, we plotted the difference between the performance of the 25% highest book-to-market companies versus the highest 5%, the latter being our proxy for deep value. We work on two distinct universes, the MSCI EMU Value and the MSCI USA Value, from December 2000 to December 2020[8]. We note that deep value rotation can occur over a very short period as illustrated during the GFC for the EMU stock universe. On a more general note, deep value performance was inconsistent across the past two decades but was broadly aligned across the two sides of the Atlantic since 2013. The dot-com bubble crash hindered deep value stocks (especially in the U.S.) that recovered up to the GFC, where they dropped sharply in the EMU but resisted fairly well in the U.S. Performance oscillated during the European sovereign debt crisis. The COVID-19 outbreak was also a severe hit (especially in Europe), but a V-shaped recovery has already occurred. Nonetheless, on average over this sample, a deep value investor would have been significantly worse-off in the EMU. It is interesting to note the last two decades were marked by decreasing interest

[8] As far as data cleaning is concerned, negative book-to-market and those over 100 are left out of the analysis for this section.

rates, which usually preserve deep value firms from going bankrupt. We argue that actually, this supportive monetary stance has been responsible for such underperformance. Indeed, it prevented the market from clearing its distressed issuers, which entailed the value premium. Hence, we can argue that these "*zombie stocks*" can be partly held responsible for the value performance drag over the last decade.

As explained above, the sustained low interest rate environment prevented the deep value market from clearing. As a matter of fact, it may also have created distortions in the distribution of metrics for the deep value basket. In Figures 22 and 23 in Appendix A.1, we construct the box-plots of the book-to-price ratio for both the MSCI EMU and MSCI USA universes at the constituent level. We note that the dispersion tended to widen in turbulent markets, for example between 2008 and 2012 or in 2020. Very different trends can be observed, such as a continuous rise in dispersion in the U.S. versus a more varying pattern in EMU. As a matter of fact, dispersion in the U.S. was almost twice the EMU figure in 2020. This rise in dispersion, even only temporarily in the EMU, shed light on an increasing number of firms in a distressed situation, and is likely to imply a performance drag from the deepest value stocks, as already hinted in Figure 9.

In Section Two, we have seen that value is a skewness risk premium, implying potential significant losses in case of a market downturn. Clearly, this effect should be magnified for deep value stocks. This can be verified with its performance distribution plots in Figure 21 in Appendix A.1, and the values of the statistical moments that are reported in Table 3.

Table 3: Empirical moments of the deep value monthly returns (MSCI universe)

EMU	2000-2020	2000-2009	2010-2020	5th
Mean	−1.74%	−1.72%	−1.76%	−5.18%
Median	−1.39%	−1.68%	−1.27%	−4.13%
Variance	16.23%	17.78%	14.95%	19.46%
Skewness	−0.48	0.07	−1.09	−0.31
Kurtosis	3.43	3.37	3.59	−0.81
USA	2000-2020	2000-2009	2010-2020	5th
Mean	0.08%	0.32%	−0.12%	−0.88%
Median	−0.18%	−0.19%	−0.17%	−0.72%
Variance	8.39%	12.68%	4.77%	3.38%
Skewness	2.47	2.89	−0.20	−0.20
Kurtosis	16.00	14.27	1.03	−0.67

Source: Authors' calculations based on based on MSCI data, from 31/12/2000 to 31/12/2020.

Note: Deep value is defined as the difference between the performance of the 5% and 25% highest book-to-price stocks. 5th corresponds to the lowest 5th percentile of the distribution of the respective market factor returns (MSCI EMU or MSCI USA). In EMU, it corresponds to Sep. 2001, Jul. 2002, Sep. 2002, Jan. 2008, Sep. 2008, Oct. 2008, Jan. 2009, May 2010, Aug. 2011, Sep. 2011, May 2012 and Mar. 2020. In the USA, it corresponds to Feb. 2001, Jun. 2002, Sep. 2002, Jun. 2008, Sep. 2008, Oct. 2008, Jan. 2009, Feb. 2009, May 2010, Dec. 2018, Feb. 2020 and Mar. 2020.

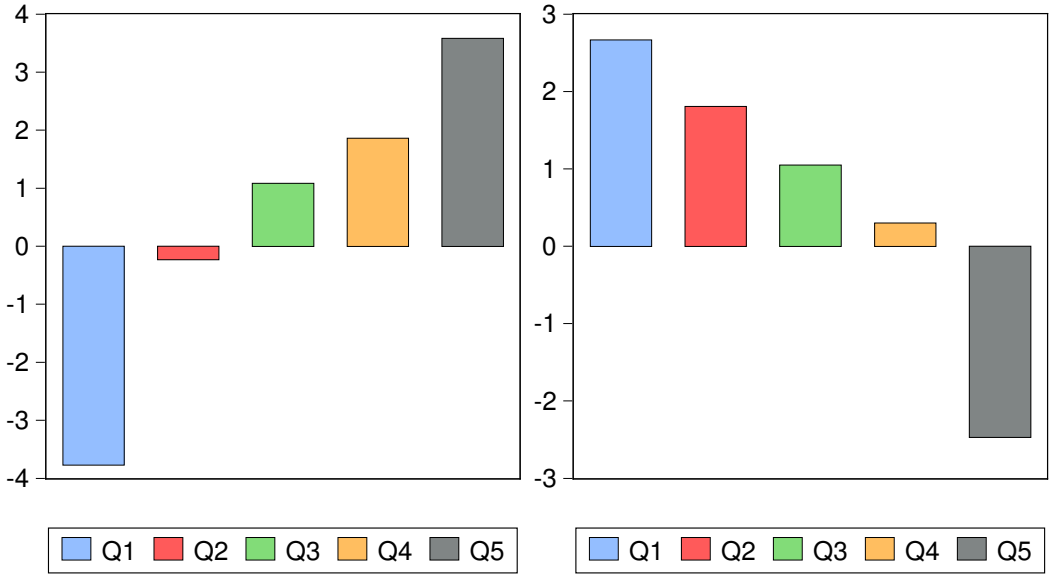
Over the last 10 years, deep value returns have been negative both in the EMU and in the U.S. (as seen in Figure 9). Indeed, recently in the U.S., deep value performance has significantly lagged compared to a flat performance for the previous decade. It is interesting to note that although deep value performance is slightly negatively skewed for Europe, we observe a significant and positive skew in the U.S. during the 2000-2010 period before it

turns slightly negative. As expected, in case of market downturns, deep value took a severe hit, as revealed by the strongly negative skewness, although the U.S. deep value segment seems to hold up better in case of a market downturn. Our analysis shows that deep value stocks have caused a performance drag on value, since 2000 for the EMU and 2010 for the U.S. However, this is not the full story. Value rallied until 2007 in the U.S. and until 2009 for Europe. Surely deep value stocks clearly cannot take all the blame.

3.3 On the interconnectedness between credit and equity value strategies

Aware that value in equity and credit markets convey the same idea, but translate very differently in the metrics employed, we decide to test the robustness of our results. Does changing the value definition yield different performance figures? Thus, we took a credit-like approach to defining value, more specifically using the Expected Default Frequency (EDF) computed by Moody's Analytics CreditEdge^{TM}. Our quarterly dataset starts in March 2006 and ends in June 2020[9]. In Figures 10 and 11, we observe that switching the definition in this way does not alter the recent underperformance of value equity. The stocks with the lowest price-to-book have lagged, so have the companies with the highest EDFs, which is our value proxy for the fixed-income world. In both universes, these metrics are actually very efficient for sorting portfolios. Once again, it points at the recent underperformance of value since the mid 2000s.

Figure 10: MSCI EMU quarterly returns (in %) of sorted portfolios

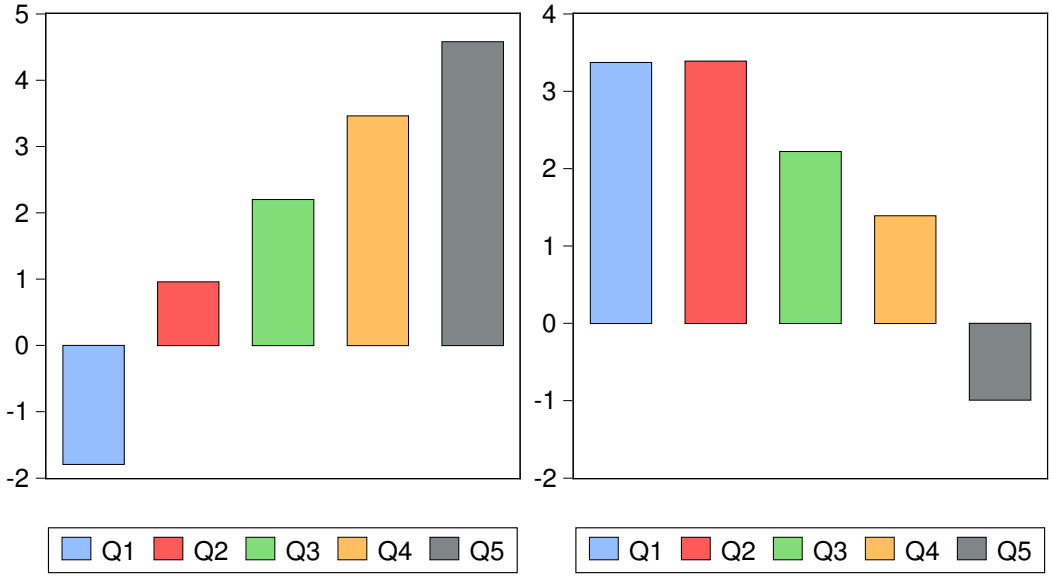


(a) Price-to-book quintiles

(b) Expected default frequency quintiles

[9]For the MSCI EMU universe, EDF data coverage stands at 89% at the end of 2019, and 55% for price-to-book data from Factset (91% and 93% respectively for the North American universe).

Figure 11: MSCI North America quarterly returns (in %) of sorted portfolios



(a) Price-to-book quintiles

(b) Expected default frequency quintiles

Results for sorted portfolio returns are also available at the GICS sector level for the EMU[10] and North American universes in Figure 25 in Appendix A.1. First, the sorting by industry does not give the same smooth sorting as in Figures 10 and 11. In fact, the cleanest ranking similar to the latter is only observed for Materials, Financials, Utilities and IT, although some inconsistencies exist[11]. A peculiar effect comes out. Indeed, for EMU Energy firms, the higher the probability of default, the higher the returns. In fact, sorted equity portfolios based on price-to-book remain more efficient than sorted equity portfolios based on EDF. When defining value stocks as the Q1 sorted portfolio on price-to-book, Industrials and Healthcare stocks held up fairly well over the 2006-2020 period both in North America and the EMU. Similarly, IT value stocks withstood in North America. On the other hand, value stocks of Materials, EMU Utilities and Consumer Discretionary suffered. Hence it reveals that value performance has been uneven across industries.

We now turn to the assessment of the interaction between value credit (EDF) and value equity (price-to-book) metrics and how this relationship has evolved over the recent years. We must recognize that the academic literature remains blurry on that topic. As stated by Fama and French (1992, 1998), if the value premium should reward heightened default risk, then one should find a negative correlation between financial distress and price-to-book (Chen and Zhang, 1998). Nonetheless, it is also argued that bankruptcy risk is not necessarily related to the price-to-book (Dichev, 1998; Griffin and Lemmon, 2002). To test this hypothesis, we plot the rolling one-year correlation between the two metrics[12], and the value quintile percentage overlap[13] in Figure 12.

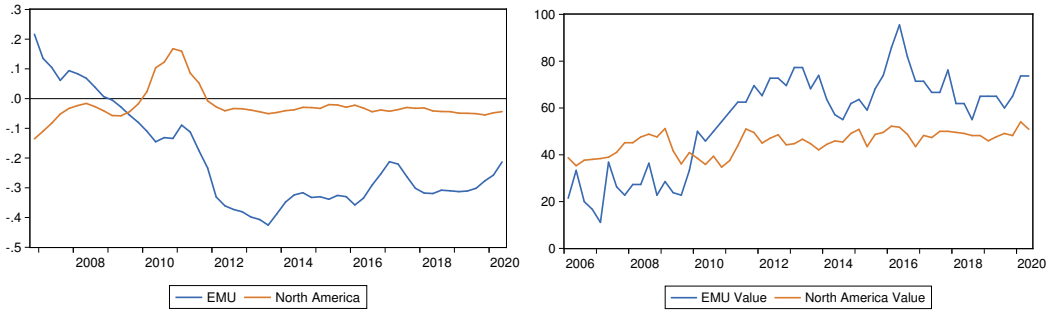
[10]For the EMU universe, the number of real estate issuers in the index at each date is too low to be able to build five quintile portfolios.

[11]Q2 EDF outperforms Q1 EDF sorting in EMU for Utilities, Q4 EDF outperforms Q3 EDF in North American Financials, Q4 EDF outperforms Q3 EDF that also dominates Q2 EDF for EMU Healthcare, etc.

[12]Taken at the issuer level for the whole sample.

[13]The latter is defined as follows. Among the quintile of companies with the lowest book-to-price (the value stocks, it corresponds to the percentage of firms that are also ranked in the highest EDF quintile (i.e. the highest default risk).

Figure 12: Price-to-book and EDF interaction (in %)

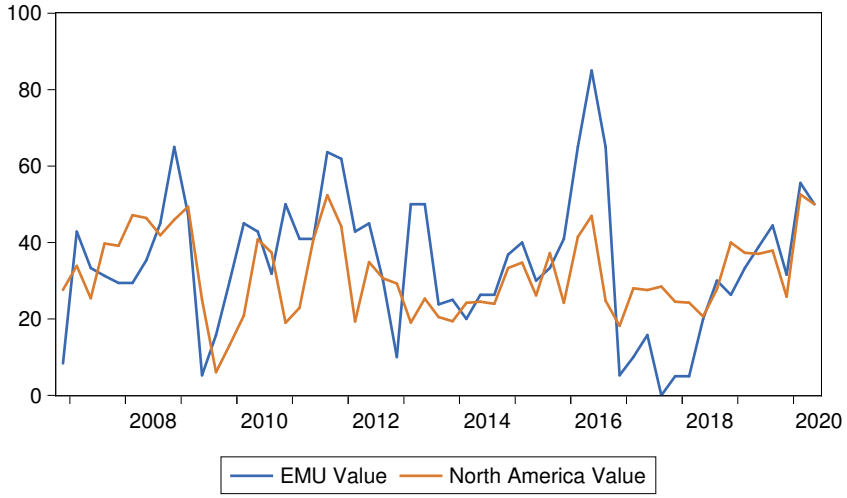


(a) Correlation

(b) Value quintile overlap

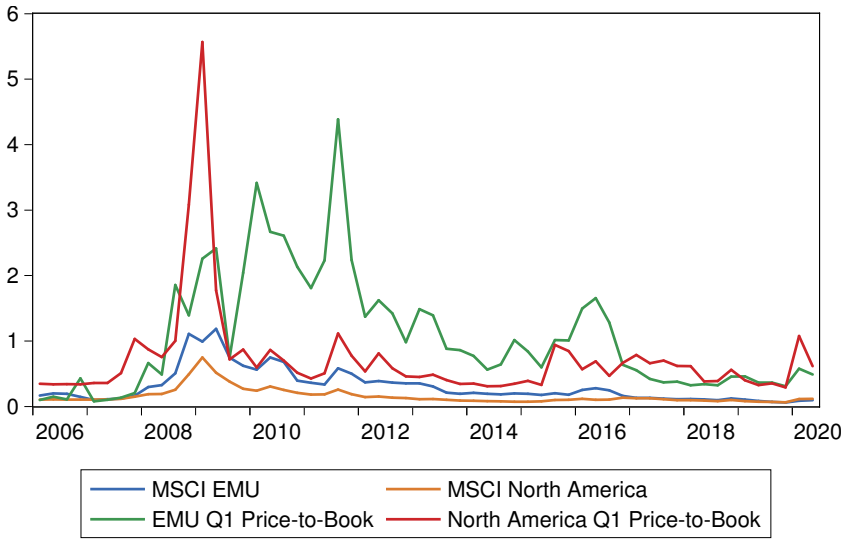
We note that the correlation between the price-to-book and the EDF is not steady and has oscillated between negative and positive territories since 2006. Although the relationship is fairly stable in North America, it does not appear very significant considering the average correlation close to 0%. In Europe, it decreased up to 2013, and has stood in negative territory since 2009. As a matter of fact, the correlation coefficient appears much more meaningful than in North America. Therefore, we argue that the value premium might have rewarded investors for indeed bearing default risk in the EMU since 2009. The results are more nuanced for North America where we may claim that neither growth nor value are *per-se* synonymous with financial distress. It appears that EDF is driven by other determinants, not captured by the price-to-book alone. As far as the overlap is concerned, we note that on average, a value stock is in 74% of the cases also in the highest EDF quintile (the highest default frequency) in Europe in 2020. In North America, this figure drops to 51%. Therefore, between 2006 and 2020, owning a value stock generally meant bearing heightened default risk, but it was not clearly systematic. An investment holding the first quintile value stocks (based on the price-to-book definition) that are not in the highest EDF range may be a true winning bet as it could yield positive performance, as illustrated by the positive returns reached by Q1 to Q4 EDF quintiles in both North America and Europe.

Figure 13: Value quintile overlap (in %) - historical definition



In Figure 13, we test an alternative definition of the overlap. Instead of selecting stocks based on raw price-to-book data, we use a stock's price-to-book divided by its historical average (calculated over the past year). The idea is to cancel out potential sector bias that can translate into polarized price-to-book data, identify issuers on a slippery slope and verify if this translates into an increase in EDF. Changing the overlap definition offers a different picture, where North America and the EMU appear much more alike than in Figure 12. For both universes, market stress was usually accompanied by a rise in the overlap, implying that the issuers with price-to-book significantly lower than their past average were more likely to embody higher default risk. Finally, we also plot the historical average EDF of the MSCI EMU and MSCI North America indexes versus a fictitious index built on the lowest price-to book quintile in Figure 14. For the MSCI indexes, we kept the capitalization weighting scheme (rebased according to our EDF coverage presented before), while for their reduced version we aggregate stocks within the Q1 price-to-book quintile using an equal weighting scheme.

Figure 14: Indexes average EDF (in %)



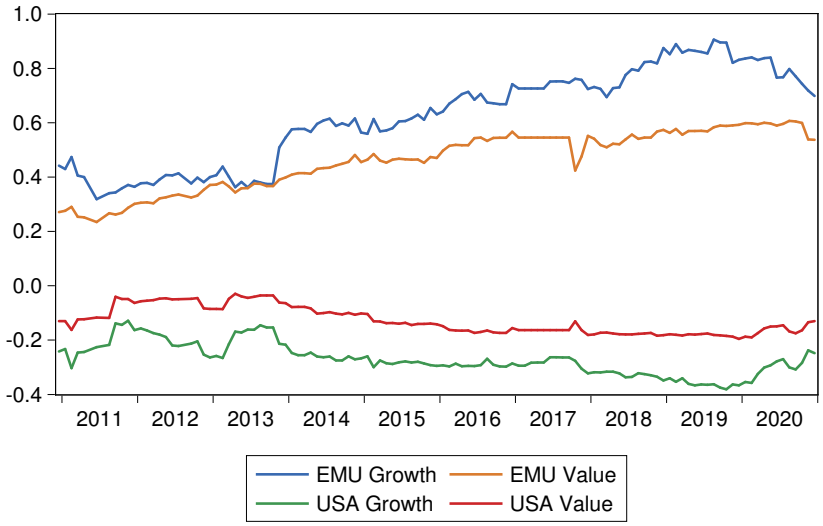
It is interesting to note that the MSCI EMU index has encompassed more default risk than the MSCI North America index on average since the 2008 Global Financial Crisis. However, since 2017, the gap has closed, and they now bear similar levels of financial distress. As far as value indexes are concerned, for most of the time the EMU index has been riskier than its North American counterpart. We witnessed a spike in 2009 in North America and in 2011 in the EMU. In Europe, until 2008, the value index had a similar EDF to its broader index, but since then it has risen. A different story goes on in North America, where the value index has consistently borne more default risk than the MSCI North America index. However, since the GFC in North America, and the sovereign debt crisis in Europe, the gap between the value index and their broader version has closed. To summarize, investing in value stocks does not systematically mean bearing greater default risk and thus, stock selection should be of paramount importance for a value investor.

4 Explaining the recent performance of the value risk factor

4.1 ESG risk analysis

Some investors argue that value is simply too old fashioned. In a context marked by major business model disruptions that were accelerated in 2020 with the COVID-19 crisis, value companies' earnings outlooks may be overtaken by the glamorous growth firms. Indeed, value stocks often belong to sectors such as Energy, Banking, Utilities, Energy, Consumer Staples or Materials, which on top of being considered as less glamorous, are also often pointed at for poor environmental performance. But is value really brown and growth green? We would like to disentangle such common beliefs from an empirical point of view. First, to grasp the broad ESG footprint of the companies, we retrieved the Amundi monthly ESG scores for both the MSCI USA Value and the MSCI EMU Value, and for their growth counterparts since December 2010. Amundi ESG scores stand between -3 and $+3$ with a mean close to 0 at the universe level. We computed the average ESG score at the index level, equally weighting and cap-weighting underlying stocks[14]. Second, we turned towards their exposure to carbon risk following the methodology developed by Roncalli *et al.* (2020).

Figure 15: Amundi ESG score of MSCI equally-weighted indexes



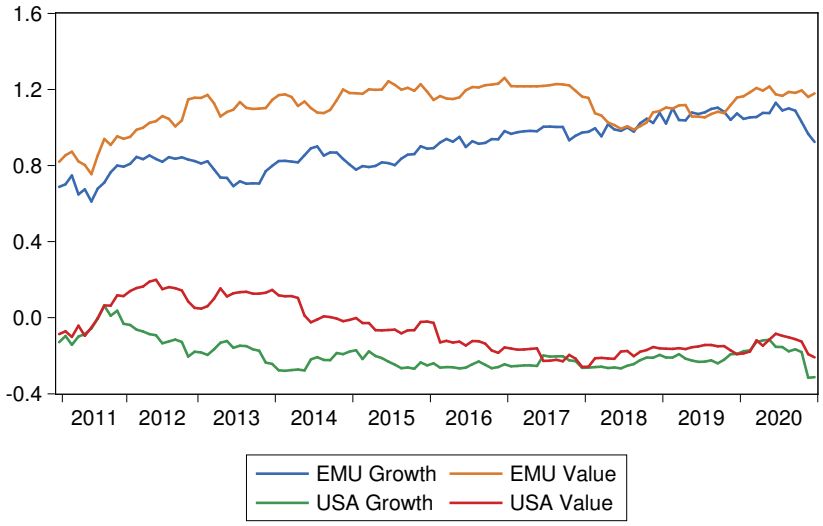
In Figure 15, we observe that the average ESG score of European companies is much higher than in the U.S. We believe this result illustrates the "*transatlantic divide*" (Drei *et al.*, 2019). And it is worth noting how the gap consistently widened over the past decade. In Europe, value stocks are, on average, less well ranked in terms of ESG than growth stocks, while the opposite applies in the U.S. For the sake of completeness, the same analysis is run on the cap-weighted indexes[15] in Figure 16. As a matter of fact, such examination is very informative for an investor that holds either the value or the growth segment of the MSCI indexes. Switching the weighting scheme yields a much different picture, especially in the

[14]The average coverage of ESG data is 98% for EMU value, 97% for USA value, 91% for EMU growth and 97% for USA growth. We ran the same analysis on distinct E, S and G pillars that yielded the same ranking as in Figure 15 for the four strategies

[15]Sector breakdown is available in Figure 24 in Appendix A.1.

EMU. Value is not as brown as some of its detractors claim. Actually, holding the MSCI EMU Value index instead of the MSCI EMU Growth index actually results in a higher ESG score. And the same applies in the U.S. To sum up, the U.S. growth companies may not be as glamorous as many thought on the ESG front. If value stocks have on average a lower ESG score in Europe, the greenness of the value investor's portfolio comes down to its stock picking and portfolio construction, as demonstrated by the MSCI EMU Value index's superior ESG score compared the MSCI EMU Growth index.

Figure 16: Amundi ESG score of MSCI cap-weighted indexes



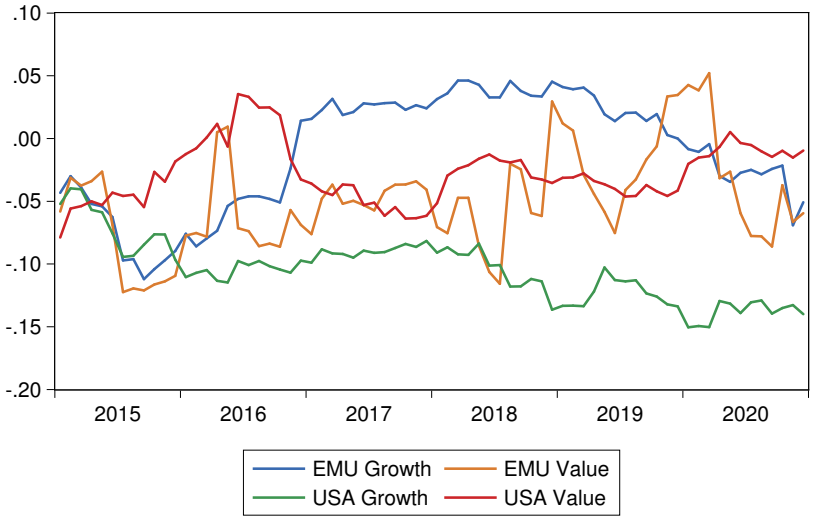
The impact of ESG investing on asset pricing may be significant because of two effects: the valuation of extra-financial risks and the impact of investment flows. For instance, it is obvious that the momentum risk factor may benefit from the behavior of ESG investors. The value risk factor may also be impacted by ESG. Indeed, by construction, the extra-financial risk of best-in-class ESG stocks is lower than the extra-financial risk of worst-in-class ESG stocks. This implies a lower cost-of-capital, implying a higher valuation for stocks with high ESG scores because the discount factor decreases. Moreover, ESG investment flows reinforce the higher valuation of these stocks.

4.2 Carbon risk analysis

We now shift the focus towards the environmental footprint of value investing. More specifically, we analyze its sensitivity to carbon risk. Here we define carbon risk as the exposure to a long-short portfolio of brown minus green companies from the MSCI World, using their carbon intensity for scopes 1, 2 and 3. We are then able to calculate a carbon beta for all stocks (Roncalli *et al.*, 2020). On one hand, a positive carbon beta implies that a company is positively sensitive to carbon risk. This is not necessarily because it has a carbon intensive business model, but rather that the latter is not equipped for a sudden change in the transition toward a green economy and therefore the company would be negatively impacted. On the other hand, a negative beta for a company means that it would benefit from a green transition to a low-carbon economy.

In Figure 17, we plotted the resulting carbon beta of the MSCI Value and Growth indexes covering the same geographical scope. We observe that value has traditionally been

Figure 17: Average carbon beta of MSCI cap-weighted indexes



better equipped for a green transition of the economy in the EMU, with a lower carbon beta than growth. Actually, in this region, average growth betas oscillated around zero, and were particularly steady in the 2016-2019 period. As of the end of 2020, value and growth average carbon betas are very much equal for the EMU. It is a different story on the other side of the Atlantic. On average, carbon betas are higher than in Europe for value, just below zero, highlighting a risk for underlying companies if the green transition were to accelerate. While in the U.S., value carbon beta has tended to worsen since the end of 2017, the growth index has enjoyed constant improvements since 2015. All in all, whereas the gap in carbon sensitivity between growth and value is closing in the EMU, it is actually widening in the U.S.

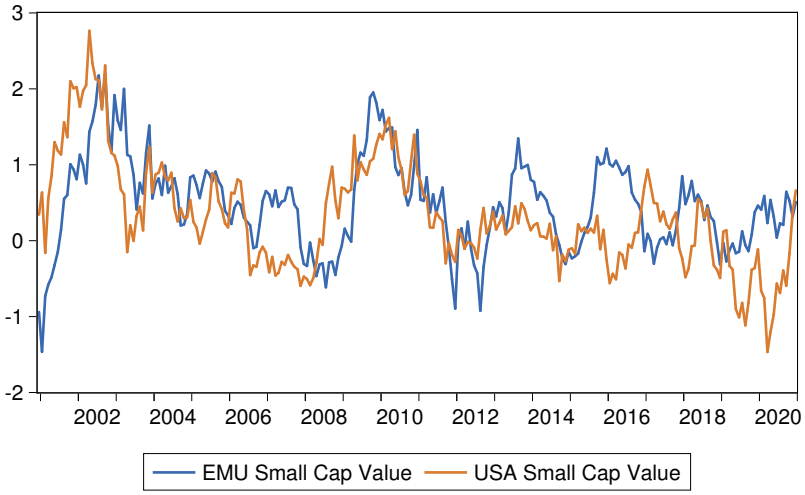
4.3 The small cap effect

We now ask whether recent value underperformance has widespread to its smallest players. Small caps have been broadly praised by investors over the past decades. Indeed, it is a well-documented fact that firms with small market values – that are therefore less liquid – tend to outperform the largest ones (Banz, 1981; Fama and French, 1992). And it is no different within the value world. As Bauman *et al.* (1998) demonstrated, the value premium gets bigger as the market capitalization gets smaller. With the aim of verifying if this still holds between 2000 and 2020, we plot the difference between the performance of the MSCI Small Cap Value index (EMU or USA) versus the respective performance of their generic value index in Figure 18.

Investing in the small cap value segment instead of the broader one between 2000 and 2010 has clearly been a winning bet. After 2010, results are more nuanced, and outperformance is much more volatile. While it still paid off in Europe, performance in the U.S. is more mixed. However, after reaching lows at the beginning of 2020, a turnaround occurred in the U.S. at the end of 2020 with a sharp rise in the performance of small cap value firms.

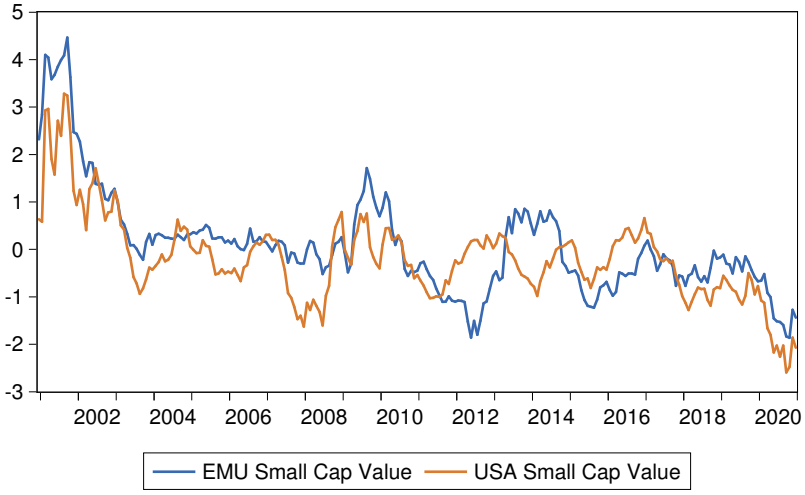
If small cap value stocks can add marginal performance gain compared to an exposure to the broader segment, does it mean that it can also beat the small cap growth universe? To answer this, we plot the difference between the performance of the MSCI Small Cap Value index (EMU and USA) versus their growth counterpart (Small Cap EMU Growth and Small Cap USA Growth) in Figure 19. When comparing the value and growth performance in the

Figure 18: Small cap value performance (in %) with respect to the value index



small cap universe, similar sustained underperformance can be witnessed on both sides of the Atlantic, despite a rebound from lows at the end of 2020. In fact, it appears that small cap value has suffered as much as the broader value index versus growth. Hence, choosing the small cap segment of value can bring benefits to an investor versus the broader index, however it has not been the perfect fix for growth outperformance.

Figure 19: Small cap value performance (in %) with respect to the growth index



4.4 The intangible puzzle

As explained in Section Two, we are keen to approach value performance with an agnostic view, and as such we use baseline book-to-market data as proposed by Fama and French (1992). However, we recognize that it can be enhanced, namely with the inclusion of intangible assets, that have been growing at a solid pace in recent decades. Ocean Tomo[16] estimates that intangible assets accounted for 17% of the S&P 500's assets in 1975. In 2020, this figure stands at 90%. Academic literature pointing at the outdated strict definition of

[16] Ocean Tomo's Intangible Asset Market Value Study 2020, https://www.oceantomo.com.

traditional value has flourished, alongside the transformation of business models, with more and more knowledge intensive industries (Lev and Zarowin, 1999). Such a switch toward an increasingly services-centered economy means that intellectual property (R&D, patents, etc.) but also design, software development and talent recruitment have risen for many firms, however, this does not reflect in traditional accounting metrics such as book value. Brand recognition is also another key aspect of intangible assets. Although intangible assets such as patents, software or franchise agreements are identifiable, and therefore can be priced and capitalized, those generated internally such as customer loyalty, brand recognition or customer lists are trickier to account for. Implications are twofold for an investor. First, omitting the latter might cause her to underestimate the firm's book value, which in turn could distort her view on its *valueness* once compared to stock price. For instance, a company that makes large investments in intangible assets could be seen as cheaper when these expenses are reintegrated into the book value. Second, Chan *et al.* (2001) and Edmans (2011) showed that spending on intangibles (such as R&D or employee satisfaction) may drive stock returns upwards. Amenc *et al.* (2020) propose then to use the intangible-adjusted book-to-price in order to more accurately capture the value premium, a metric that has the advantage of not altering the risk profile of the old value strategy. By adapting the book value with intangibles, they find a stronger value premium, even after controlling for other traditional CAPM factors.

Hence, we believe that accounting for intangibles can provide insightful information for an investor sorting companies on the value/growth spectrum, although it is unlikely to lead to a major reshuffle of the traditional price-to-book ranking. Indeed, our simulations show that the value risk premium increases by about 25 bps per year for both the European and American stock universes. If we compare stock selection with and without intangible assets, we notice some neutral stocks are reintegrated into value stocks, which explains the additional performance. These neutral stocks are those that present a high value of intangible assets. Therefore, we observe a switch in terms of ranking between these neutral stocks with high intangible assets with some value stocks with low intangible assets. Nevertheless, deep value stocks stay in the universe of value stocks, and growth stocks remain growth stocks.

5 Conclusion

Due to its inter-linkages with the economic environment, value clearly has some flaws that can explain its recent performance lag, e.g. its ties to inflation and market uncertainty, the deep segment that has not cleared due to low interest rates, a mixed picture on the ESG front, a faltering business model, etc. Still, even against this backdrop, everything in value should not be thrown away, and it may enhance portfolio returns. First, we saw that a growing body of literature has shed the light on the importance of accounting for intangible assets in book value. Improving how value is defined based on trends in business models, that tend to be less capital intensive, asset-light and more services-centered, may enable better value capture. Second, an investor could depart from the pure essence of value investing and neutralize the inherent sector bias incumbent in value. Finally, value can add substantial diversification within a multi-factor portfolio. For instance, it is generally recognized that it is negatively correlated with other factors such as low-volatility or momentum factors. Additionally, combined with the quality factor, it may act as a strong buffer against default risk and value trap issues.

Despite the ongoing technological and structural changes in the economy (social media dominance, working from home, etc.), we believe that value firms may still have bright days ahead. As we learned when the dot-com bubble burst, the emergence of a new economy

(increasingly widespread internet use at this time) does not mean that companies operating in this trendy sector will enjoy exponential earnings in the long term nor that they will all survive. We also learned that these firms can be genuinely over-valued. Additionally, this shift towards teleworking technologies and increased social media presence has been partially forced by the COVID-19 pandemic and therefore their momentum may fade out once the health crisis is over, and the sector has streamlined. In October 2020, the American Congress raised doubts about the impact of the FAANG monopoly on consumers. It was quickly followed in December by the European Commission, which is keen to prevent anti-competitive practices. Future legislation imposed on tech leaders could be a catalyst for the much-awaited value rally.

We have seen that a brightening of the economic outlook, as illustrated in November 2020 by the hopes placed in the COVID-19 vaccines, can cause strong value rallies. Although an improved economic outlook is usually accompanied by rising interest rates, considering the current monetary stance adopted by the major central banks, we argue that this transition channel may not be as effective as in the past. However, we also think that today is different than yesterday. We have not experienced equivalent low rate levels for such a prolonged period. In addition, the fact that governments are starting a massive fiscal stimulus push may bolster inflation expectations upward, which should benefit value sectors such as Banking, Energy or Industrials. Improvements in consumer and business confidence would also push in that direction. The low-rate environment may have become the new normal, but governments taking over with an unprecedented spending boost, if it materializes by fueling inflation expectations, could be real a game changer for value.

Nevertheless, the negative performance of the value risk factor over the last 10 years should encourage caution about its future performance. From an ex-post point of view, we can always find reasons to explain this underperformance. From an ex-ante point of view, we can also find arguments to support the value risk premium. For some years, many professionals and academics have predicted a new golden age for value investing, but it has been slow to arrive. Moreover, the new value risk factor may be very different from the value risk factor of the 2000s, which was perceived as a long-term reversal bet or a sector long/short strategy. The empirical structural relationships between value investing and economic factors must fit in with the new trends of financial markets because of trading facilities, ESG investing and the digitalization of the economy. Moreover, computing the value of a stock by using fundamental data that are easily accessible to everybody may be a challenge, and perhaps requires more reactive alternative data.

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A Appendix

A.1 Additional results

Figure 20: Distribution of monthly HML returns (in %)

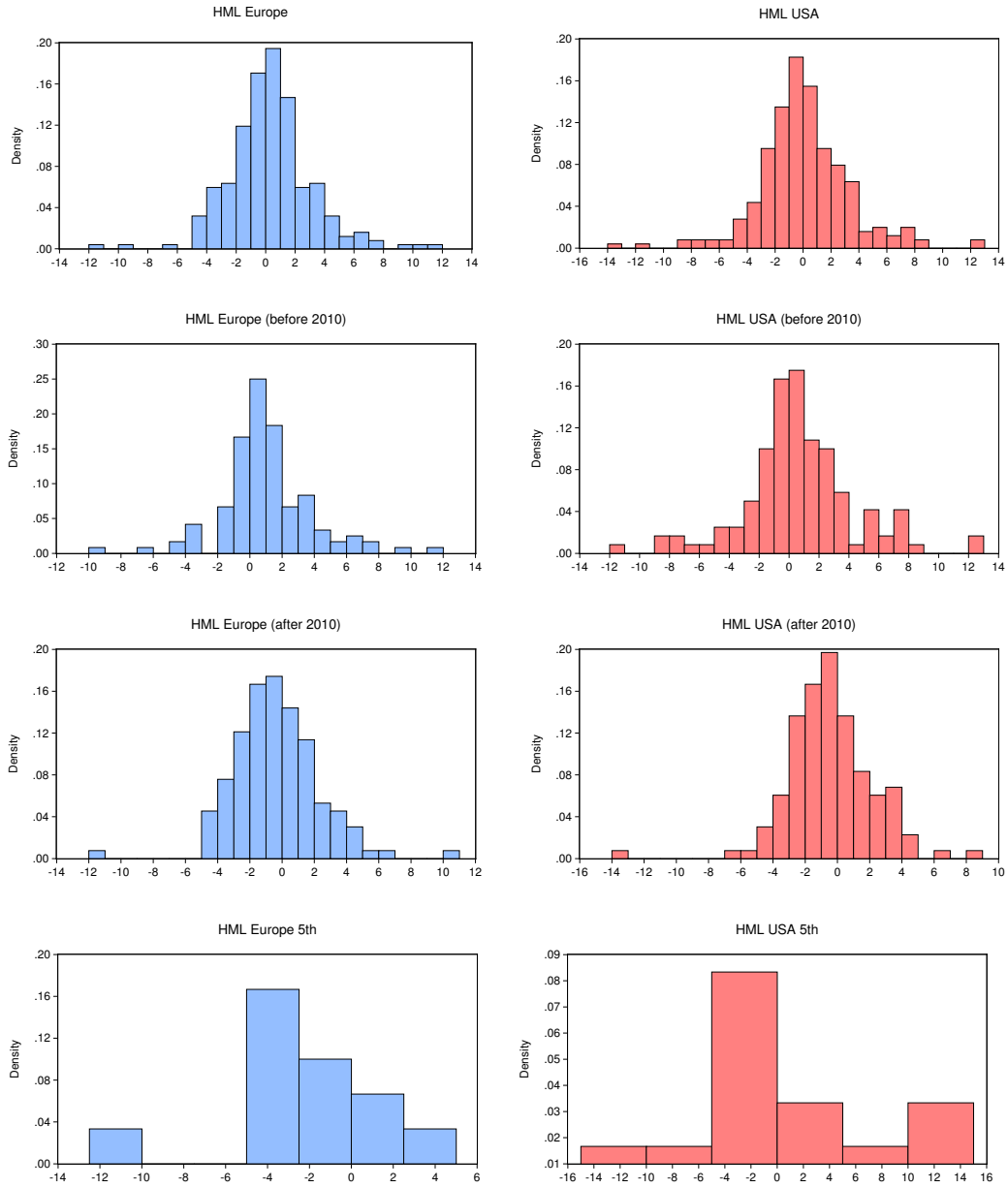


Figure 21: Distribution of deep value monthly returns (in %)

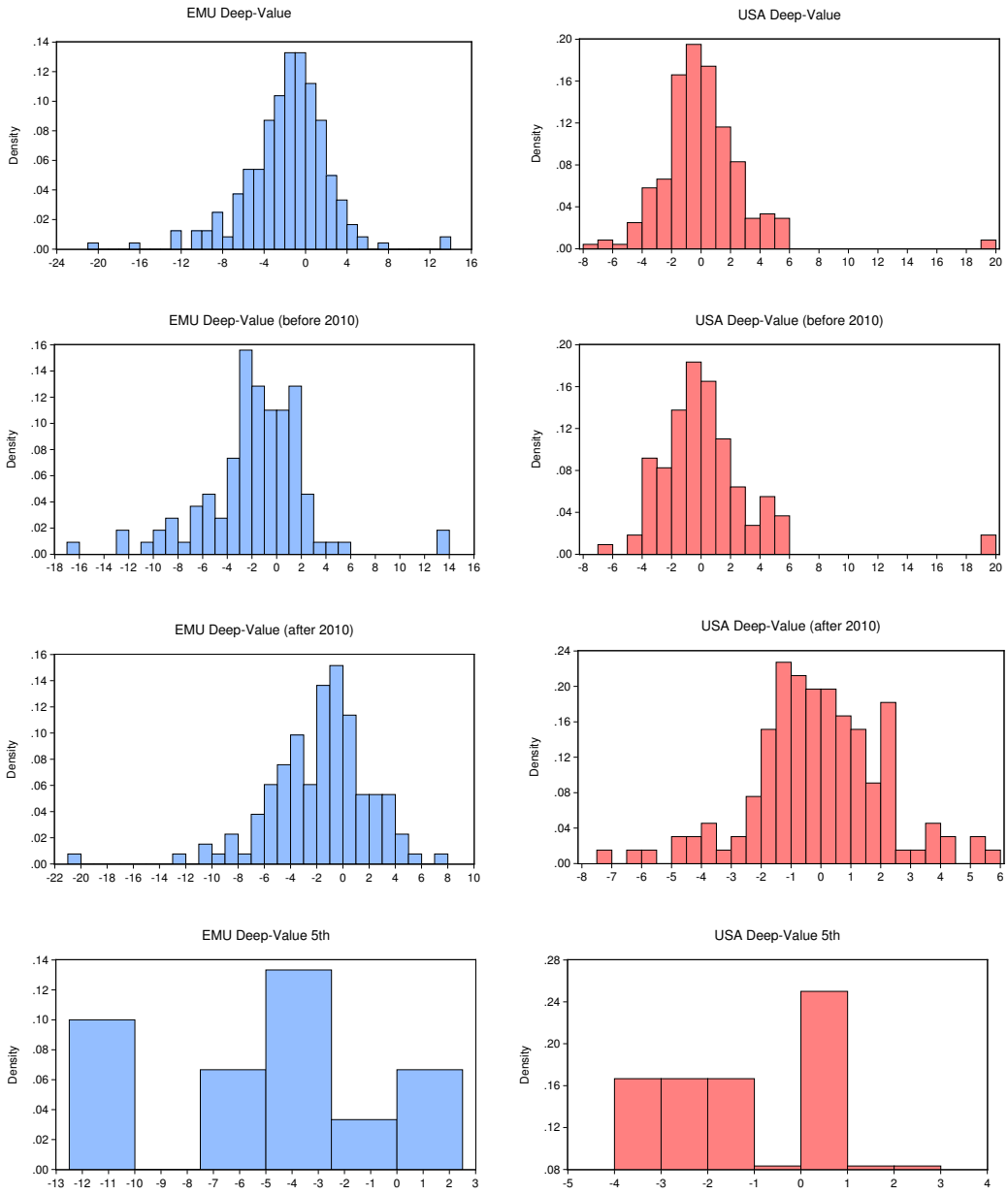


Figure 22: Boxplots of MSCI EMU constituents' book-to-market

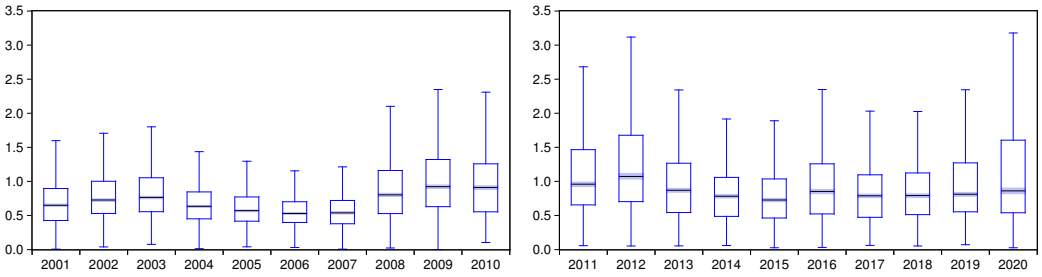


Figure 23: Boxplots of MSCI USA constituents' book-to-market

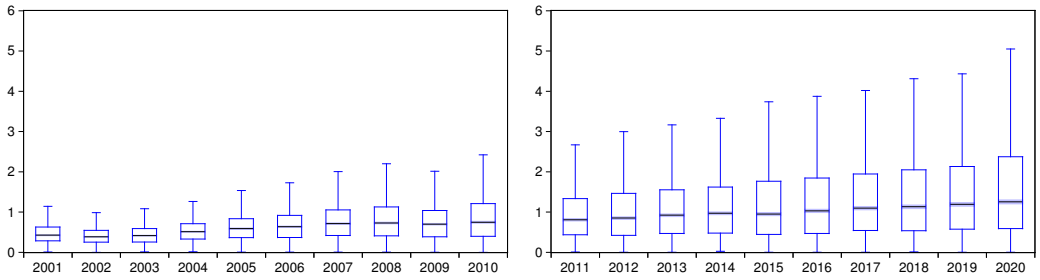
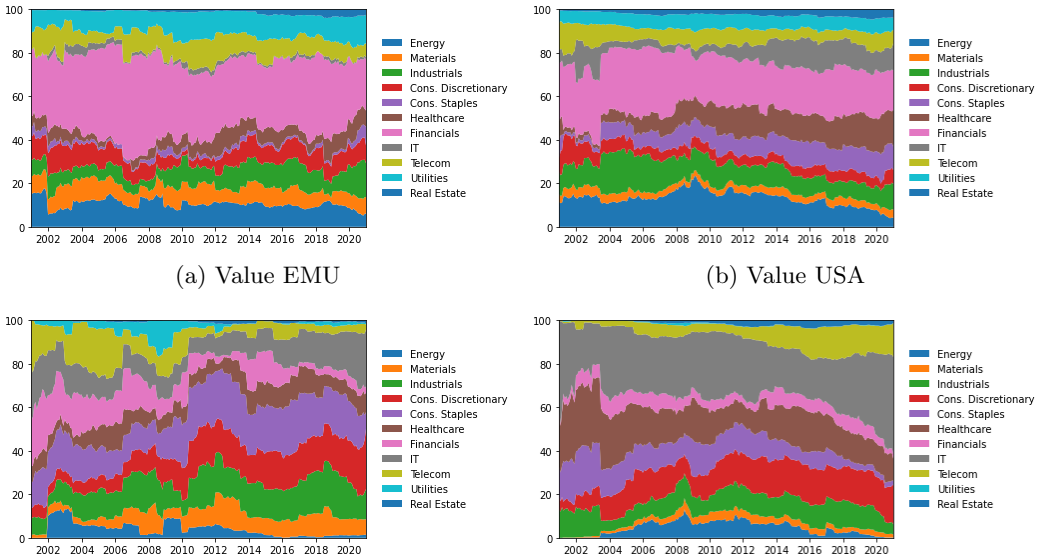


Figure 24: MSCI indexes sectors composition (in %) - Capitalization weighted



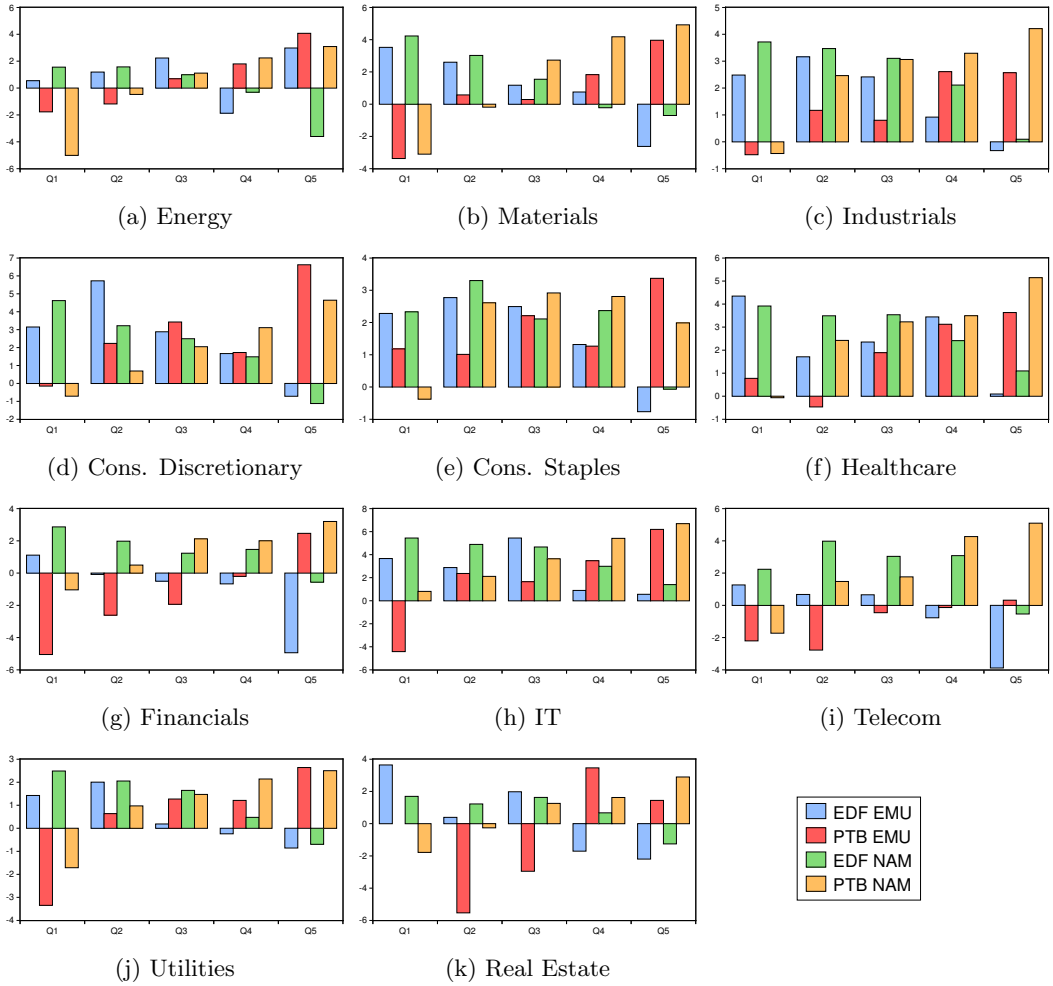
(a) Value EMU

(b) Value USA

(c) Growth EMU

(d) Growth USA

Figure 25: Average quarterly returns (in %) of sorted portfolios by GICS sector



(a) Energy (b) Materials (c) Industrials

(d) Cons. Discretionary (e) Cons. Staples (f) Healthcare

(g) Financials (h) IT (i) Telecom

(j) Utilities (k) Real Estate

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