#16 - 2012

NBIM DISCUSSION NOTE

The Value Effect

In this note, we review the theory and empirical evidence of the value effect. The value effect is the excess return that a portfolio of value stocks (stocks with a low market value relative to fundamentals) has, on average, earned over a portfolio of growth stocks (stocks with a high market value relative to fundamentals). We will focus our attention in this note on the existence of a value effect in equity markets.

Main findings

- The outperformance of value stocks over growth stocks was documented by Graham and Dodd in 1934 and has since received a great deal of attention in financial research. There has been a positive and statistically significant value effect across global equity markets, although the effect has varied significantly over time.

- Fama and French (1992) show that the Capital Asset Pricing Model (CAPM) fails to account for the value effect in historical data. Fama and French (1993) argue that one needs to employ a multifactor model in order to account for the cross-section of equity risk and return. Their multifactor asset-pricing model, which includes two empirically motivated risk factors that capture small-firm and value effects, has been widely adopted by academics and practitioners to better describe equity returns.

- The value effect has since been documented to be robust across different measures of value and portfolio specifications. However, there is some evidence that the value effect has been higher in less liquid segments of the equity market, particularly during the most recent 20-year period.

- A number of rational explanations have been put forward to account for the empirical regularity. These theories attribute the value effect to risk factors such as firm distress, illiquidity or business-cycle sensitivity.

- A number of behavioural finance explanations argue that human cognitive biases may lead to asset mispricing. The most prominent are representativeness, conservatism and overconfidence, which all lead to investor over- and under-reaction and thereby the value effect.

- A recent theoretical framework is where a stock's expected rate of return depends on its sensitivity to cash-flow and discount-rate news. It is argued that a rational investor cares more about falling expectations of future cash flows since this unambiguously reduces investor wealth. An increasing discount rate does the same, but is partly offset by the higher expected return that comes with an increasing discount rate. The outperformance of value stocks is interpreted as compensation for the observation that value stocks are more sensitive to changes in expectations of future cash flows.

Introduction

The introductory textbook view of asset pricing and portfolio theory is straightforward. The Capital Asset Pricing Model (CAPM), put forward by Sharpe (1964), Lintner (1965), Mossin (1966) and Black (1972), states that an asset's expected excess return is a linear function of its sensitivity to the return on the market portfolio, and the only source of systematic risk is the market portfolio. The beta, or the slope coefficient, of the single-factor model measures an asset's sensitivity to the market-portfolio return, and the asset's expected rate of return will be higher the higher the beta.

Empirical support for this simplistic theoretical view of the world is weak. Initial studies found some empirical support (Black, Jensen and Scholes 1972; Fama and MacBeth 1973). Broadly, both of these studies confirm a positive relationship between market beta and average returns, but they find that the CAPM fails to account for *all* of the cross-sectional variation in equity returns. Since then, financial researchers have explored the cross-sectional variation in equity returns and potential links between this variation and other equity characteristics and risk factors. The resulting literature has uncovered several so-called 'anomalies', or deviations from the positive linear risk-return relationship of the CAPM.

Perhaps the most prominent anomaly, the value effect, is the observation that stocks with a high fundamental value relative to their market value (value stocks) have, on average, outperformed stocks with a low fundamental value relative to their market value (loosely defined as growth stocks) (Basu 1975, 1977, 1983; Stattman 1980). The existence of a value effect is a puzzle in financial theory not because value stocks outperform growth stocks, but rather because value stocks in general command no higher market beta than growth stocks, and thus is not justifiable under the CAPM framework. A comprehensive academic literature has tried to explain why the value effect exists, as well as account for both the magnitude and variation of the effect over time. Broadly, the literature trying to account for the value effect can be classified into two categories: rational explanations and behavioural-bias explanations. Advocates of the rational explanations argue that markets are efficient and return comes as compensation for taking on risk. According to their logic, the value effect in isolation is compensation for exposure to some systematic risk beyond that of the non-diversifiable market-risk factor from the CAPM. On the other hand, advocates of the behavioural explanations claim that the excess return of value stocks, rather than being a risk premium, arises as a result of irrational investor behaviour. The behavioural-bias explanations rely on theories of how certain mental mechanisms lead to both underreaction and overreaction among investors. Behavioural explanations argue in general that the outperformance of value stocks is caused by various biases in investor behaviour which lead to asset mispricing.

The note is structured as follows. In Section 2, we document the empirical evidence on the value effect and examine the behaviour of the value effect over time. In addition, we study the robustness of the empirical evidence and, in particular, whether the value effect is dependent on the size of value stocks, the sorting procedure applied when constructing factor portfolios, industry tilts in the factor portfolios, country-specific effects, calendar effects or the sorting variable used. In Section 3, we present an overview of the rational and behavioural explanations for the value effect. Section 4 concludes.

Empirical evidence of the value effect

The value effect has been documented empirically using several different definitions, but most specifications relate the price of a stock to some measure of fundamental company value such as earnings, cash flow, dividends, sales or book value of assets. Some of the first papers documenting the value effect (Basu 1975, 1977, 1983) focused exclusively on the price-to-earnings ratio as the metric for fundamental value. Stattman (1980) employs the book-to-market ratio, which he claims has superior explanatory power over earnings-to-price in the cross-section of average stock returns. Later, Fama and French (1993) and Lakonishok, Shleifer and Vishny (1994) used fairly similar specifications of the value effect, including price-to-book, price-to-cash-flow and price-to-earnings. However, as Fama and French (1992) argue, any such metric of fundamental company value is merely a scaled version of the company's stock price and is usually employed to get some insight into the cross-section of expected returns. For this reason, some of the price-scaled variables could be redundant in that they capture some noise in addition to the underlying factor that can account for the cross-section of average stock returns. Fama and French find that earnings-to-price has some explanatory power, but the ratio becomes statistically insignificant once book-to-market is added to their regression. The authors have since used book-to-market in a number of studies but maintain that, in principle, any price-scaled variable could be used, as the different specifications produce similar results and are, in fact, statistically indistinguishable from one another. Fama and French (1996) show that scaled-price strategies provide results similar to book-to-market, and all of these strategies are successfully priced by their three-factor model. However, the authors argue that it makes sense to stick with book-to-market because of its stability, which will ensure low portfolio turnover.

Fama and French's factor portfolios, as well as the methodology applied when constructing these portfolios, are well documented and available on French's website[1]. Due to the ready availability of the data and methodology, as well as the convincing empirical evidence documented by Fama and French over the years, their approach has become widely accepted among both academics and practitioners as a way to proxy the value effect. After looking at the empirical evidence when using Fama and French's book-to-market specification of the value effect, we will then look at how the results are affected by employing other specifications of the value effect.

How has the value effect behaved over time?

Fama and French (1992) use US data from the Center for Research in Security Prices (CRSP) covering NYSE, AMEX and NASDAQ stocks and document the empirical observation that, on average, stocks with high book-to-market ratios outperformed stocks with low book-to-market ratios during the period 1963-1990. This result was later extended by Davis (1994) and Davis, Fama and French (2000) back to 1926. The factor portfolios constructed by Fama and French are available on French's website and are constructed by employing the following methodology: Each year, the universe of US stocks, with some exceptions, is sorted based on each stock's size and book-to-market ratios. Based on whether the market capitalisation of a company is below or above the median market capitalisation, a small-cap and a large-cap universe are identified[2]. A long-short factor portfolio is constructed by going long the cheapest 30 percent of the stocks (according to book-to-market ratios) in both the small-cap and large-cap universes and short the 30 percent most expensive stocks in the respective universes[3]. Stocks are weighted together using the market capitalisation of the stocks as weights within each of these four portfolios. The long (short) portfolio assigns equal weights to the small-cap and large-cap value (growth) portfolios. The return on this portfolio is then interpreted as the value effect and referred to as High Minus Low (HML). The factor portfolio is rebalanced at the end of each June using the same procedure. Each June in year *t*, the market capitalisation from the end of December in year *t-1* and book value from the end of fiscal year *t-1* are used in order to avoid any forward-looking bias.

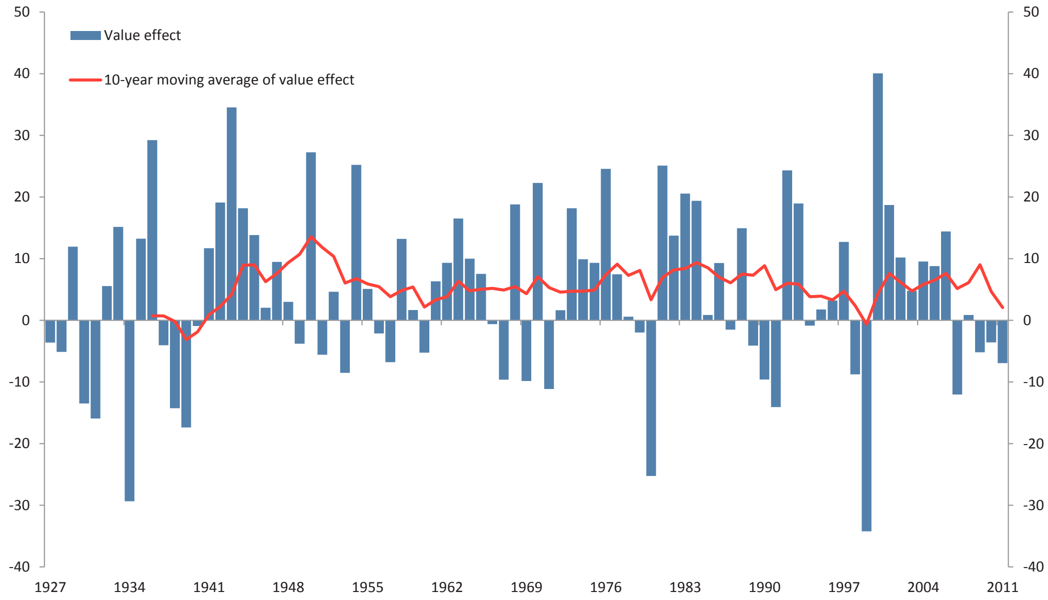
Figure 1 plots the annual returns on Fama and French's HML factor for the 1963-1990 period covered by Fama and French (1992), the extended period back to 1926 covered by Davis, Fama and French (2000) and updated numbers up to and including 2011. Value stocks have, on average, outperformed growth stocks over the full sample period considered (annual mean = 4.7 percent with t-stat=3.1), but the return on the HML factor has varied significantly over time. Out of the 85 years covered, 53 years had a positive value effect and the remaining 32 years experienced a negative value effect, of which 10 saw losses of more than 10 percent.

1 http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/

2 The size breakpoint is based on the NYSE universe.

3 The book-to-market breakpoints are based on the NYSE 30th and 70th percentiles.

Figure 1: Value effect, annual US data 1927-2011.



Source: Kenneth French's data library, NBIM calculations

Table 1 displays return and risk statistics for a monthly time series of the Fama-French HML factor plotted in Figure 1 together with similar statistics for the excess market-portfolio return[4]. Panel A confirms that there has been a value effect of 4.54 percent and a 7.53 percent equity premium over the sample period, which are both statistically significant. The last 3 rows of Panel A show drawdown[5] statistics for both the excess market return and HML. The drawdown of the equity premium has been 84.7 percent, while the drawdown of HML is 46.15 percent. The last two rows show average performance conditional on the monthly performance of the excess market return and HML. The worst 5 percent of HML returns have been -6.82 percent on average, whereas the excess market return has been -2.21 percent in those same months. This shows that, if HML does poorly, the market portfolio performs poorly as well.

The last row shows a similar analysis conditional on the excess market portfolio. The worst 5 percent of observations of the excess market return have been, on average, -12.47 percent. The same months produced, on average, an HML of -1.07 percent. Downside risk in the market and HML are somewhat correlated, but the correlation is not perfect. Panels B and C split the data sample into expansions and recessions using the business-cycle indicator from the National Bureau of Economic Research (NBER). The average value effect has been particularly high during expansions (5.2 percent annualised return on average), but value stocks fare poorly during recessions (1.87 percent annualised return on average). Panel D, which displays the average annualised performance over all decades covered by the full sample, shows that the value effect has varied substantially over time. There are long periods when the value effect has been low and even negative.

4 The market portfolio consists of all stocks in the combined universe of NASDAQ, NYSE and AMEX. The data come from CRSP, and the portfolio is market-capitalisation weighted. Return is excess of 1-month T-bill.

5 Practitioners often measure drawdown as the peak-to-trough percentage loss during a specific record period of an investment.

Table 1: Statistics for HML and market portfolio, monthly US data, July 1926 to March 2012.

	Market (excess over risk free rate)	T-stats	HML	T-stats
		Panel A: Full Sample		
Mean return (annualised)	7,53 %	3,69	4,54 %	3,41
CAPM Alpha (annualised)			3,43 %	2,62
CAPM Beta			0,15	7,44
Standard deviation (annualised)	18,89 %		12,34 %	
Drawdown	-84,70 %		-46,15 %	
Mean return conditional on 5% worst HML returns	-2,21 %		-6,81 %	
Mean return conditional on 5% worst market returns	-12,47 %		-1,07 %	
		Panel B: Recessions		
Mean return (annualised)	-6,84 %	-1,03	1,87 %	0,48
CAPM Alpha (annualised)			3,39 %	0,93
CAPM Beta			0,22	5,91
Standard deviation (annualised)	27,91 %		16,58 %	
		Panel C: Expansions		
Mean return (annualised)	11,3 %	6,00	5,2 %	3,94
CAPM Alpha (annualised)			4,31 %	3,19
CAPM Beta			0,08	3,37
Standard deviation (annualised)	15,5 %		11,0 %	
		Panel D: Average return over decades		
1920's (annualised)	13,9 %		2,8 %	
1930's (annualised)	5,4 %		1,1 %	
1940's (annualised)	10,0 %		9,6 %	
1950's (annualised)	15,6 %		3,5 %	
1960's (annualised)	4,9 %		3,6 %	
1970's (annualised)	1,3 %		8,1 %	
1980's (annualised)	8,1 %		5,9 %	
1990's (annualised)	12,3 %		-1,3 %	
2000's (annualised)	-1,0 %		8,6 %	
2010-2011 (annualised)	9,3 %		-4,5 %	

Source: Kenneth French's data library, NBER, NBIM calculations

The positive value effect found in the historical data would not be a puzzle in theoretical asset pricing had the additional return come as a compensation for taking on additional risk. Fama and French (1993) show that the Capital Asset Pricing Model (CAPM) fails to account for the value effect in the CRSP data, in other words that there is more to the outperformance of value stocks than exposure to the market beta. In fact, the authors find that value stocks have lower market betas than growth stocks, contrary to what the CAPM says about the relationship between risk and return. Fama and French used CRSP and COMPUSTAT data for the period 1963-1991 because, at the time, book equity data was poorly covered by COMPUSTAT. More recently, Davis, Fama and French (2000) improve the data availability and show that there exists a value effect prior to 1963. Table 2 displays the summary statistics for standard CAPM regressions on the CRSP/COMPUSTAT data from French's website. The results in Panel C of Table 2 show the finding of Fama and French, namely that the portfolio of value stocks has a smaller market beta than the portfolio of growth stocks. Moreover, the portfolio that goes long value stocks and short growth stocks has a positive and statistically significant 'alpha'.

Similar results can be found in the more recent part of the data covering the period after the work of Fama and French in 1993 (Panel D, Table 2).

Table 2: CAPM regression statistics, monthly US data, July 1926 to March 2012.

Panel A: 1926 July - 2012 March					
	β: Value	β: Neutral	β: Growth	α: Value minus Growth	t-stat (α)
Small	1,33	1,19	1,27	0,45	3,94
Big	1,20	1,02	0,96	0,12	1,00
Small & Big				0,29	2,62
Panel B: 1926 July - 1963 July					
	β: Value	β: Neutral	β: Growth	α: Value minus Growth	t-stat (α)
Small	1,51	1,26	1,23	0,17	0,97
Big	1,39	1,09	0,94	-0,02	-0,11
Small & Big				0,07	0,43
Panel C: 1963 July - 1991 December					
	β: Value	β: Neutral	β: Growth	α: Value minus Growth	t-stat (α)
Small	1,09	1,12	1,37	0,60	4,42
Big	0,92	0,91	1,04	0,35	2,25
Small & Big				0,47	3,64
Panel D: 1992 January - 2012 March					
	β: Value	β: Neutral	β: Growth	α: Value minus Growth	t-stat (α)
Small	1,01	1,00	1,30	0,78	3,28
Big	0,89	0,89	0,95	0,10	0,45
Small & Big				0,44	2,07

Source: Kenneth French's data library, NBIM calculations

On the other hand, Campbell and Vuolteenaho (2004) find that the CAPM is able to account for the value effect for the earlier part of the data sample, 1926-1963 (Panel B, Table 2), where value stocks have higher market betas than growth stocks.[6] Finally, the CAPM regression for the full period 1926-2012 (Panel A, Table 2) results in a positive and significant alpha, even though the value and growth market betas are in line with what the CAPM says about the relationship between risk and return.

Does the value effect exist in all countries?

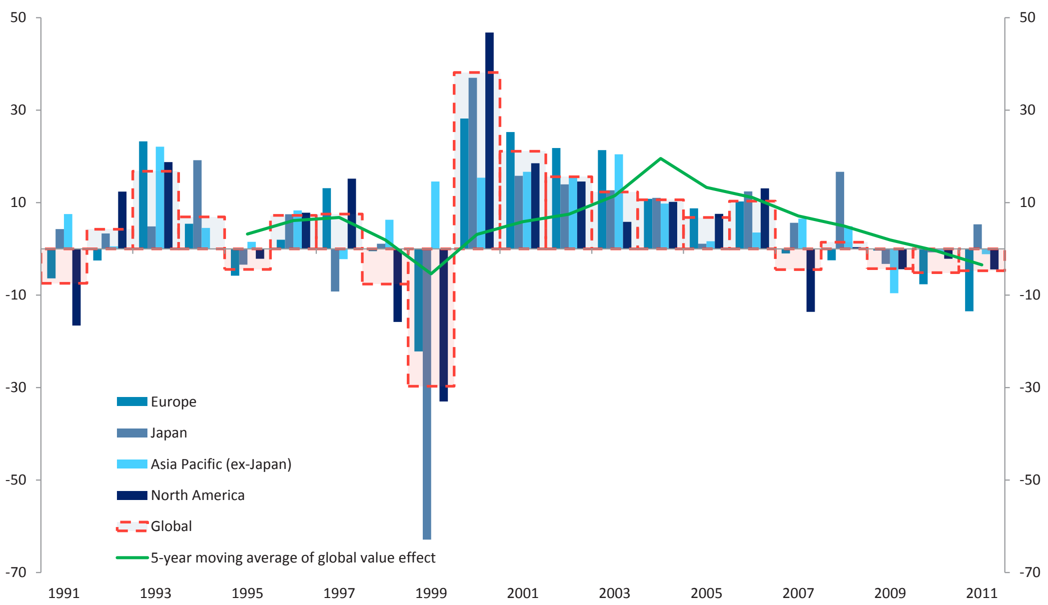
The value effect was first identified in the US stock market and the benchmark value series from Fama-French is calculated based on US companies only. Since then, researchers have found equivalent effects in other countries and in other classes of assets. This research suggests that these effects have been universal in that they have applied globally, at several levels of aggregation and to multiple classes of assets. Fama and French have expanded their value-effect database to include a global set of developed stock markets. Fama and French (1998) employ this dataset, which covers the period 1975-1995, together with a dataset from the International Finance Corporation for 16 emerging markets (1987 – 1995), and confirm their earlier findings globally. The authors find the value effect in twelve

6 The authors also find that there is no evidence against the CAPM in the 1963-1990 data sample when they incorporate time-varying market betas. However, Fama and French (2005) form portfolios by sorting on size, value and market beta and conclude that it is the variation in size and value rather than the variation in market beta that is rewarded with additional return and thus reject the CAPM for the 1928-1963 sample as well as the 1963-2004 sample.

out of thirteen developed countries and twelve out of the sixteen emerging markets investigated. As in their previous studies, the (international) CAPM fails to account for the cross-sectional variation in average stock returns, while a two-factor model incorporating a factor for relative distress risk is able to account for the value effect.

The data set for global value effects is available on a regional level on Kenneth French's website and is calculated using a somewhat different methodology: For each region, stocks are sorted according to size and book-to-market into two size and three value buckets. The stocks covering the top 90 percent of the region's market capitalisation are large-cap, and the remaining 10 percent are small-cap. Value, neutral and growth stocks are classified according to the 30th and 70th percentiles of the book-to-market sort respectively, and are weighted together using the market capitalisation of the stocks as weights. The value effect for each region is then proxied by the High Minus Low (HML) factor, which is found by going long an equally-weighted combination of the two value portfolios and short an equally-weighted combination of the two growth portfolios. Value effects based on this methodology are calculated for Europe, Asia Pacific (ex-Japan), Japan and North America and are shown in Figure 2 and Table 3 below.

Figure 2: Annual value effect for global data using the Fama-French methodology.



Source: Kenneth French's data library, NBIM calculations

Table 3: Annualised risk and return, and correlation for regional value effects, 1991- – 2012.

	Global	North America	Europe	Asia Pac (ex-Japan)	Japan
Mean return (annualised)	4,4 %	3,2 %	4,9 %	6,8 %	5,6 %
Standard deviation (annualised)	8,3 %	11,8 %	8,3 %	11,1 %	10,0 %
T-stat	2,47	1,28	2,76	2,84	2,63
Drawdown	-36,8 %	-45,3 %	-33,1 %	-21,9 %	-43,1 %
Mean return conditional on 5% worst HML returns	-4,8 %	-7,5 %	-4,8 %	-5,6 %	-6,4 %
Mean return conditional on 5% worst market returns	0,3 %	1,9 %	-1,4 %	1,2 %	1,7 %

Correlation Matrix	Global	North America	Europe	Asia Pac (ex-Japan)	Japan
Global	1,00				
North America	0,92	1,00			
Europe	0,82	0,64	1,00		
Asia Pac (ex-Japan)	0,30	0,21	0,22	1,00	
Japan	0,61	0,44	0,41	0,10	1,00

Source: Kenneth French's data library, NBIM calculations

As can be seen in Figure 2 and Table 3, a value effect has existed in countries outside the US and also on a regional level. However, the effect has varied across regions: While the effect has been highest in Asia Pacific (ex-Japan) (7 percent annualised), the value effect in North America has been lowest and most volatile (3.3 percent annualised return and 11.8 percent standard deviation). The value effects in different regions also exhibit very different drawdown statistics, where North America has about twice the maximum drawdown of Asia Pacific (ex-Japan). It is therefore not surprising to see that correlations among regions are generally low, although positive. Figure 3 plots the cross-sectional average of the pairwise 24-month rolling correlations of monthly value effects for all pairs of regions. The chart confirms that correlations have typically been positive and low, although varying over time (min=0, max=0.6). Moreover, the correlations seem to have soared during periods of financial stress.

Figure 3: Average pairwise 24-month correlation of value effects across regions.

Source: Kenneth French's data library, NBIM calculations

The value effect among small and large firms

Research conducted by Fama and French has provided convincing empirical evidence of the value effect, and their empirical methodology has been widely adopted by researchers. Their approach is to double-sort stocks first into size buckets and then into value buckets (within those size buckets), which draws heavily on the research by Banz (1981). This methodology helps to understand the value effect neutral to any size effect, because sorting by size and book-to-market can be correlated from time to time. Doubling-sorting breaks the correlation between value and size portfolios, but it also gives the value portfolio 50 percent exposure to both small- and large-cap stocks. The HML portfolio of Fama and French thus heavily overweights small-value stocks relative to their market capitalisation.

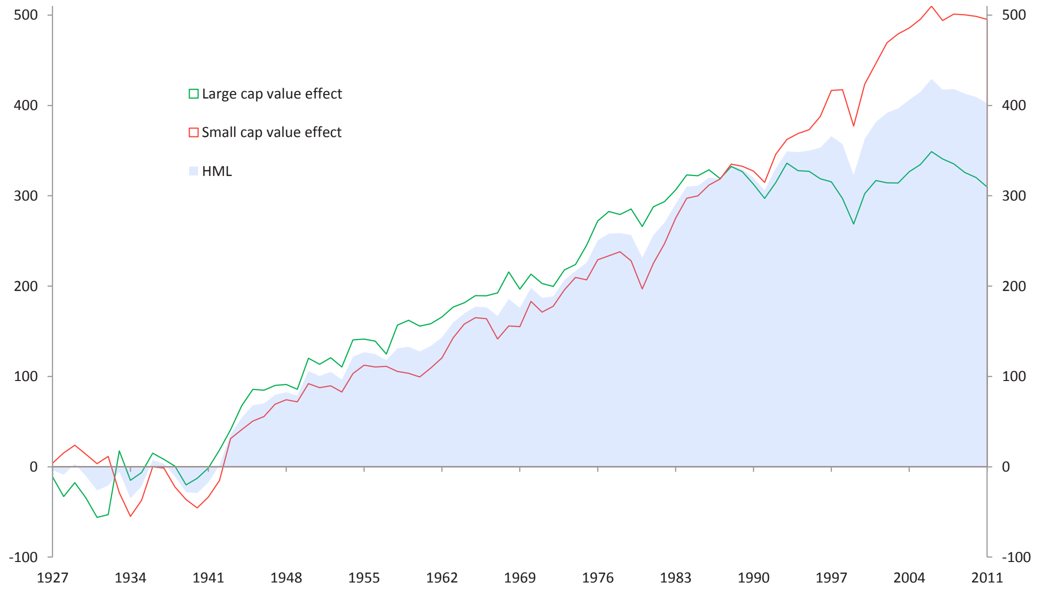
This means that an investor trying to capture the value premium through the Fama-French methodology would have to invest a bigger percentage in the small-cap segment than in the large-cap segment. If a large investor were to use the methodology, special care should be put into consideration of investment capacity and other investability issues, such as transaction costs, market impact and trading restrictions, faced by investment managers (Huij and Verbeek 2009).

Since the investability of the value effect can be very different across small- and large-cap buckets, it is of interest to understand the value effect in those buckets separately. Figure 4 breaks the HML performance down into a value effect among small and large companies. Figure 4 reveals that the value effect was fairly homogenous in small and large stocks until about 1992, when Fama and French published their first article on the cross-section of stock returns. However, as seen in Panel D of Table 2, after 1992 the value effect has been persistent among small firms but non-existent among large firms. During the most recent 25-year period, positive HML performance has been entirely driven by small value stocks. This well-known empirical observation, first made by Griffin and Lemmon (2002), could be due to a variety of factors, such as transaction costs, illiquidity or short-selling constraints. Nagel (2005) finds that the last of these factors, proxied by institutional ownership, has explanatory power in the cross-section of stock returns, – even when holding size fixed.

Since the value effect has been more pronounced among smaller firms, it makes sense to ask whether the value effect in the small-cap segment can be attributed entirely to the small-firm effect of Banz (1981). Figure 5 plots the long-short value portfolios in small and large buckets against the Small Minus Big (SMB) portfolio of Fama and French[7]. One can observe that the outperformance of small value stocks during the most recent period does not coincide with the performance of SMB. The value effect in the small-cap segment cannot be attributed to the small-firm effect, which suggests that there is something about the interaction between size and value measures that generates the outperformance of small value stocks.

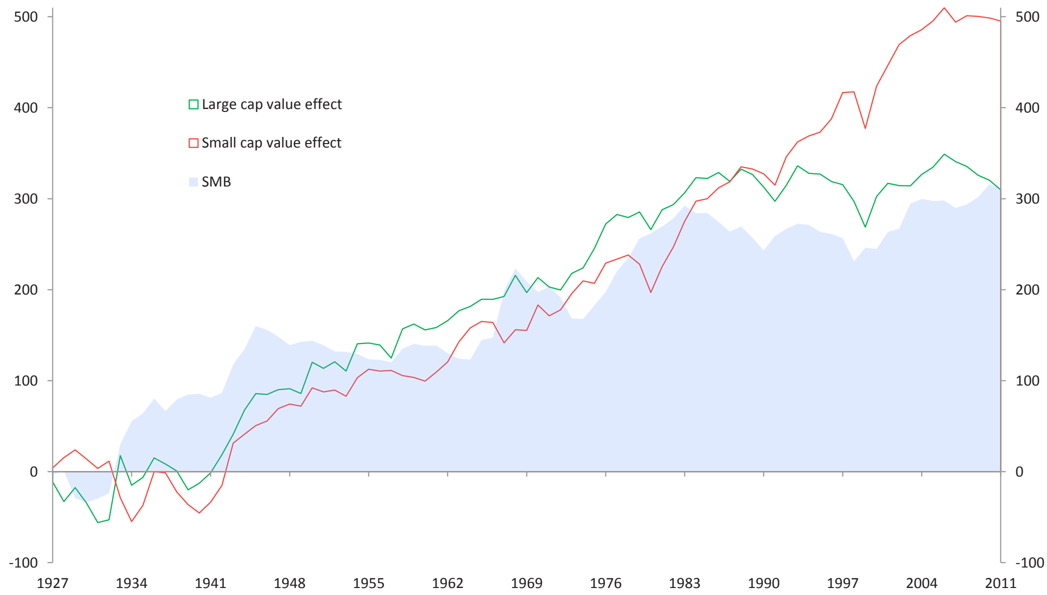
7 The SMB factor is constructed by following the same double-sorting procedure as for the value effect. Thus, the size effect is proxied by going long an equally-weighted combination of the three small-cap portfolios (Small Value, Small Neutral and Small Growth) and by going short a similar portfolio of large-cap stocks.

Figure 4: Breakdown of annual value effect into small- and large-cap segments.



Source: Kenneth French's data library, NBIM calculations

Figure 5: Value effect within the small-cap and large-cap universes vs SMB factor.



Source: Kenneth French's data library, NBIM calculations

Value spread, business cycle and sorting procedure

Cohen, Polk and Vuolteenaho (2003) show that the value effect is predictable by the value spread (the spread between a value measure of value stocks with respect to growth stocks). One of their main conclusions is that the expected value effect is especially high during times when the spread is wide and market prices of value stocks are low relative to fundamentals.

We investigate the effect of value spread on the value effect itself using several different portfolio construction approaches. Table 4 shows the excess market return[8] (first column) in comparison to various HML book-to-market portfolios. The first portfolio is the standard Fama-French HML. The next two columns split the standard Fama-French HML into small and large companies. The last two columns are based on decile sorts using book-to-market ratio only. The portfolio in the second-last column takes a long position in the top three deciles (value) and a short position in the bottom three deciles (growth). The last portfolio uses only the most extreme decile portfolios (i.e. deciles 1 and 10).

Panel A of Table 4 compares these portfolios over the entire sample period 1927-2011. The Fama-French HML has returned an average of 4.7 percent with an average value spread[9] of 2.21. In comparison, the equity premium has been 7.9 percent but the volatility of the equity premium has been 20.8 percent, in contrast to the 13.9 percent volatility of HML. Splitting the Fama-French HML into small and large shows that the value effect has been stronger among small firms, with an average return of 5.8 percent compared to an average return of 3.6 percent for large firms. This may be due to the wider value spread among small firms (2.62, compared to 1.81 for large firms). The extreme-value HML gives a very wide value spread of 4.63 on average. The mean return on this portfolio has been fairly high at 5.8 percent, although the value spread would indicate that the return on this portfolio should perhaps have been higher compared to the HML of small firms, which has a similar average return with a much narrower value spread of 2.62. In general, the more extreme sorting procedures are characterised by wider value spreads together with higher and more volatile returns, as well as worse drawdown statistics.

Panels B and C split the data into recessions and expansions. The value spread has, on average, been wider for all HML portfolios during recessions compared to the full sample. This indicates that value stocks are relatively cheaper than growth stocks during recession periods. Further, the performance of all HML portfolios has been lower during recessions. It appears that the market prices some risk into value stocks during recessions, which then dissipates during expansions. Finally, all HML portfolios have experienced higher average returns and narrower value spreads during expansion periods.

8 The market portfolio consists of all stocks in the combined universe of NASDAQ, NYSE and AMEX. The data come from CRSP, and the portfolio is market-capitalisation weighted. Return is excess of 1-month T-bill.

9 The value spread is calculated by using the annual BE/ME series from Kenneth French's website, where "BE/ME is book equity at the last fiscal year end of the prior calendar year divided by ME as of 6 months before formation". Table 4 uses the annual portfolio returns from the same data set, which are calculated from January to December, but the more prudent approach would be to compare the value spread with returns from July to June. We have compared both approaches and confirm that the results are largely the same.

Table 4: Risk and return characteristics for various value effects, annual US data, 1927- – 2011.

	Market	HML	HML	HML	HML	HML
		Fama-French all	*Fama-French small*	*Fama-French large*	*BM sort*	*BM sort, extreme*
	Excess of 1-month T-bill	*Long-short top-bottom 3 deciles, double-sort on value and size*	*Long-short top-bottom 3 deciles, only with small-cap universe*	*Long-short top-bottom 3 deciles, only with large-cap universe*	*Long-short top-bottom 3 deciles, one-way sort on value*	*Long-short top-bottom 1 decile, one-way sort on value*
Panel A: Full Sample						
Value spread		2,21	2,62	1,81	2,47	4,63
Mean return	7,9 %	4,8 %	6,1 %	3,5 %	4,6 %	5,8 %
Standard deviation	20,8 %	14,0 %	15,5 %	16,5 %	17,1 %	24,4 %
T-stat	3,51	3,16	3,64	1,95	2,49	2,21
Corr w/ the market	1,00	-0,02	-0,08	0,05	0,35	0,30
Drawdown	-72,7 %	-46,5 %	-54,8 %	-52,4 %	-48,9 %	-69,8 %
Mean return conditional on 5% worst portfolio returns		-24,4 %	-32,1 %	-24,9 %	-23,1 %	-30,6 %
Mean return conditional on 5% worst market returns	-37,5 %	-4,5 %	-0,2 %	-8,9 %	-11,0 %	-12,7 %
Panel B: Recessions						
Value spread		2,75	3,34	2,15	3,17	5,95
Mean return	2,8 %	4,2 %	1,1 %	2,8 %	2,8 %	3,2 %
Standard deviation	28,5 %	13,9 %	16,0 %	19,8 %	20,9 %	28,5 %
T-stat	0,55	1,67	0,40	0,78	0,74	0,63
Corr w/ the market	1,00	-0,10	-0,30	0,43	0,50	0,43
Panel C: Expansions						
Value spread		1,91	2,21	1,61	2,07	3,87
Mean return	10,9 %	5,2 %	8,5 %	4,2 %	5,7 %	7,4 %
Standard deviation	14,3 %	14,2 %	16,0 %	14,4 %	14,6 %	21,8 %
T-stat	5,61	2,68	3,91	2,11	2,85	2,48
Corr w/ the market	1,00	0,05	0,04	0,01	0,09	0,09

Source: Kenneth French's data library, NBER, NBIM calculations

Is the value effect driven by industry-specific effects?

An additional concern might be that book-to-market as a measure of value could have a different meaning due to accounting practices and the nature of businesses across industries. Indeed, Cohen and Polk (1998) address this potential issue by breaking book-to-market ratios into within-industry and across-industry components and find that the value effect is primarily a within-industry effect. However, this concern is not addressed in the portfolio-sorting approach of Fama and French, and thus the HML factor may be impacted by industry-specific effects that are unrelated to the pure value effect. It is of interest to understand how this might affect the risk and return characteristics of the value effect. We construct two value factors in order to analyse this potential effect; one factor is constructed using a pure measure of value and the other uses a demeaned version of book-to-market within each industry.

We apply a simple approach where stocks are sorted into ten groups according to their book-to-market ratios. Decile portfolios are formed by equally weighting the stocks within each group. A long and a short portfolio are then constructed based on the ten decile portfolios. We use a symmetrical approach where the long and short portfolios consist of the three decile portfolios with the highest and lowest factor scores respectively. The factor return is then calculated as the return on the long portfolio minus the return on the short portfolio. The stock universe contains all companies in the FTSE World large/mid-cap index, excluding emerging markets. Excluding small-cap stocks and emerging markets will, of course, increase the investment capacity of the calculated factor returns.

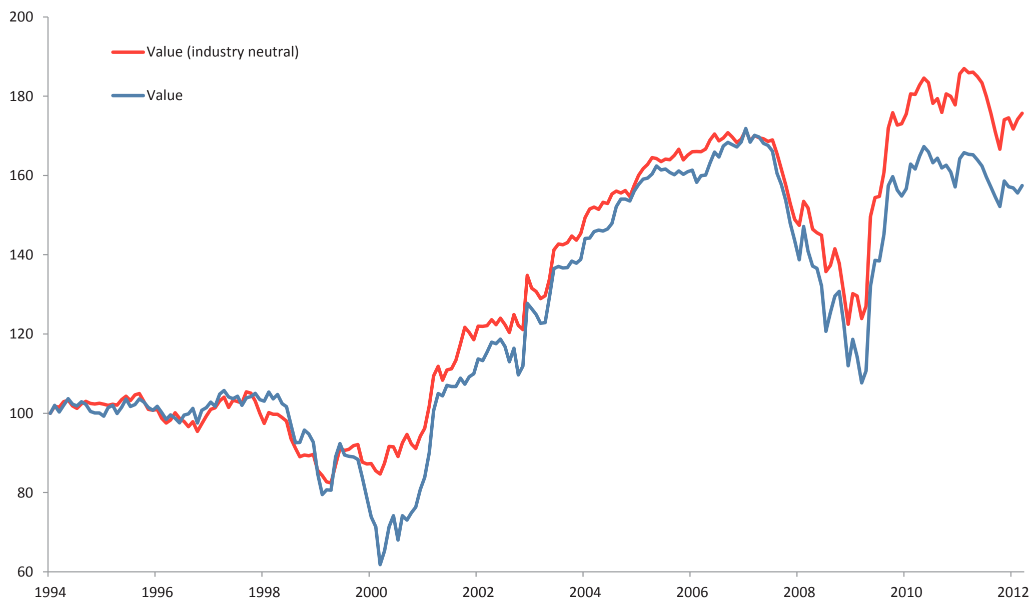
Figure 6 depicts this value effect both in a pure book-to-market sort and on an industry-neutral basis. Industry neutrality, as defined in our approach, is achieved by demeaning the book-to-market ratios across industries every time the stock universe is rebalanced. Both specifications have performed similarly over the period, although the industry-neutral effect has been less volatile and thus performed better on a risk-adjusted basis. Table 5, which displays drawdown statistics for the two factor-mimicking portfolios, illustrates further how industry neutrality improves downside-risk characteristics. However, imposing industry neutrality has not reduced the average value effect over time, so it does not appear that the value effect has existed as a result of industry-specific reasons.

Table 5: Statistics for value effect versus industry-neutral value effect, US data, 1993-2011.

	Value	Value (industry neutral)
Mean return (annualised)	3,2 %	3,4 %
Standard deviation (annualised)	12,2 %	9,0 %
Return/vol	0,26	0,38
Drawdown	-41,5 %	-28,6 %
Mean return conditional on 5% worst portfolio returns	-7,6 %	-4,4 %
Mean return conditional on 5% worst market returns	-1,4 %	-1,0 %

Source: FTSE data, NBIM calculations

Figure 6: Value effect versus industry-neutral value effect, US data, 1993-2011.



Source: FTSE data, NBIM calculations

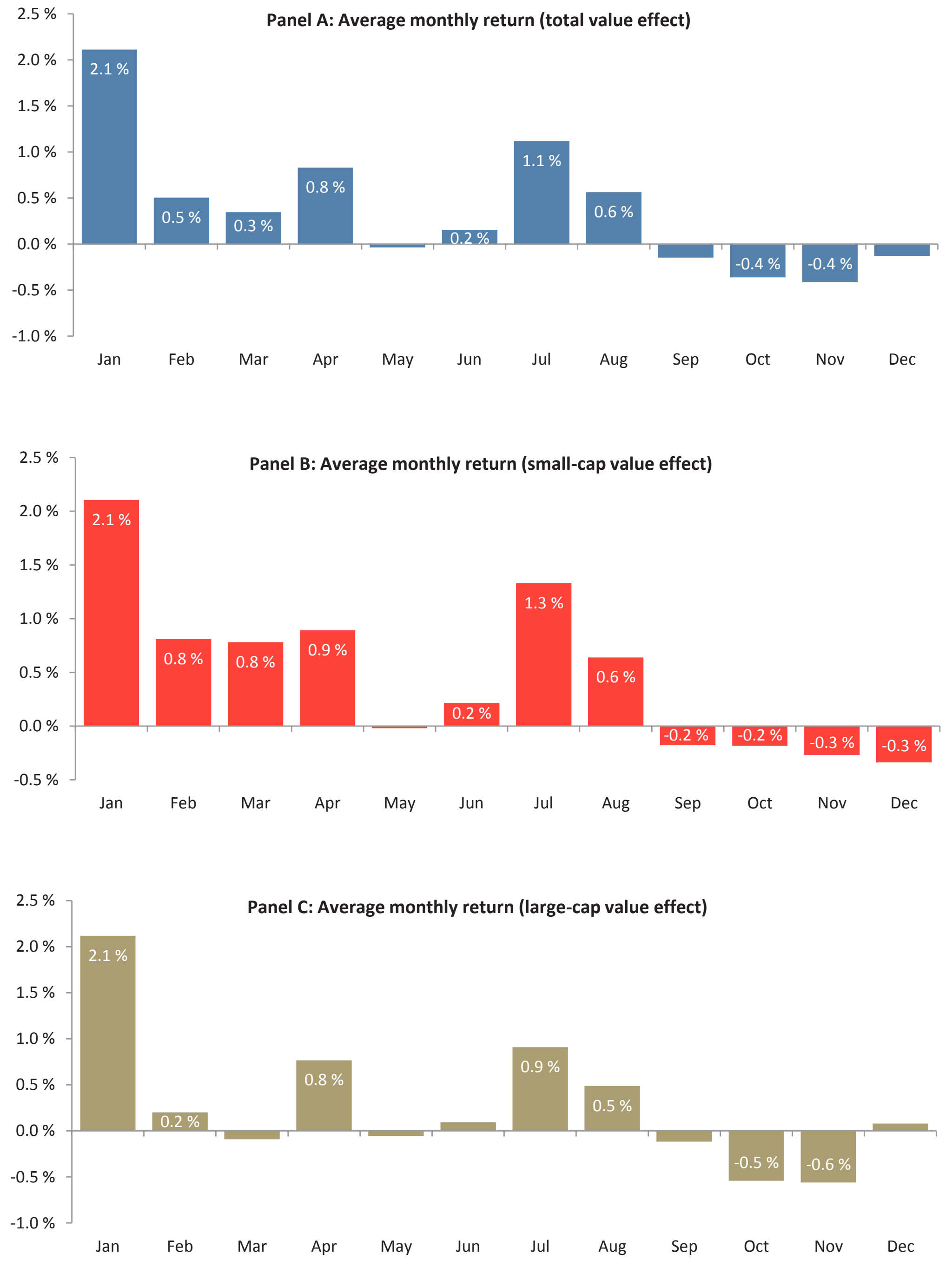
Is the value effect driven by seasonality?

Fama and French (1993) recognise that the value effect could be partly driven by well-documented seasonal effects such as the January effect. The January effect refers to the empirical evidence of persistent superior equity returns in the month of January over time (Roll 1983; Keim 1983). Haugen and Lakonishok (1988) and Lakonishok, Shleifer, Thaler and Vishny (1991) argue that the January effect is caused by so-called window dressing. This hypothesis says that institutional investors tend to sell underperforming stocks before reporting their portfolios to the Securities and Exchange Commission in December. Institutions do this in order to make their portfolios look more attractive to investors, but tend to buy back the underperforming stocks in January, which results in their prices being bid up during the first month of the year.

On the other hand, Roll (1983) claims that the January effect is driven by the tax-selling effect. The tax-selling effect refers to the notion that investors, in order to minimise taxes, will tend to sell stocks that have underperformed during the year in order to offset gains from stocks that have had a good run over the year. This phenomenon will, of course, take place at the end of the year, and when the selling pressure dissipates, the oversold stocks will tend to perform well during the first month of the next year. However, Chan (1986) finds empirical evidence showing that the January effect is just as much related to long-term losses as to the short-term losses at the end of the year. The author argues that any rational tax-seller would realise losses early, and long-term losses should not predict the January return reversal. Fama and French (1993) document that the January seasonal in excess stock returns is related to the book-to-market characteristic. Fama and French further show that their value factor, HML, exhibits a similar January seasonal and that HML absorbs the seasonal variation in stock returns related to the book-to-market characteristic. Kang, Pekkala, Polk and Ribeiro (2011) study how taxable investors price assets at the end of the tax year, and show that capital-gains overhang, tax rate and interest rate drive returns at the beginning of the tax year to a great extent. Within their framework, rational taxable investors can postpone the tax-selling decision, which could cause the January effect to be predictable by long-term losses. The authors construct factor portfolios similar to Fama and French (1993) and find that part of the risk and return characteristics of anomalies such as the value effect can be accounted for by their tax-selling effect

We find some evidence of a January effect in the US value effect, as shown in Figure 7. The figure plots the average monthly US value effect over the entire 1927-2012 data sample from French's website (Panel A, Figure 7). Clearly, January has historically had a higher value effect than the rest of the year. There is also a tendency for a negative value effect towards the end of the year. Panels B and C in Figure 7 show the average monthly effects for the small-cap and large-cap segments respectively, and similar results to Panel A can be found in both segments. However, the relative January effect is particularly strong in the large-cap segment. This is consistent with the findings of Daniel and Titman (1997), Loughran (1997) and Chou, Das and Rao (2011), who all find that most of the value effect in large-cap stocks occurs during the first month of the year. Moreover, Figure 7 shows that the value effect in the small-cap segment has been more persistent throughout the year than the total and large-cap segments. There is also evidence that the value effect spikes at the beginning of Q2 and Q3, while most of the negative effect comes in Q4. This holds true for both small-cap and large-cap stocks.

Figure 7: Average monthly value effect (total, small-cap and large-cap), US data, 1927-2011.



Source: Kenneth French's data library, NBIM calculations

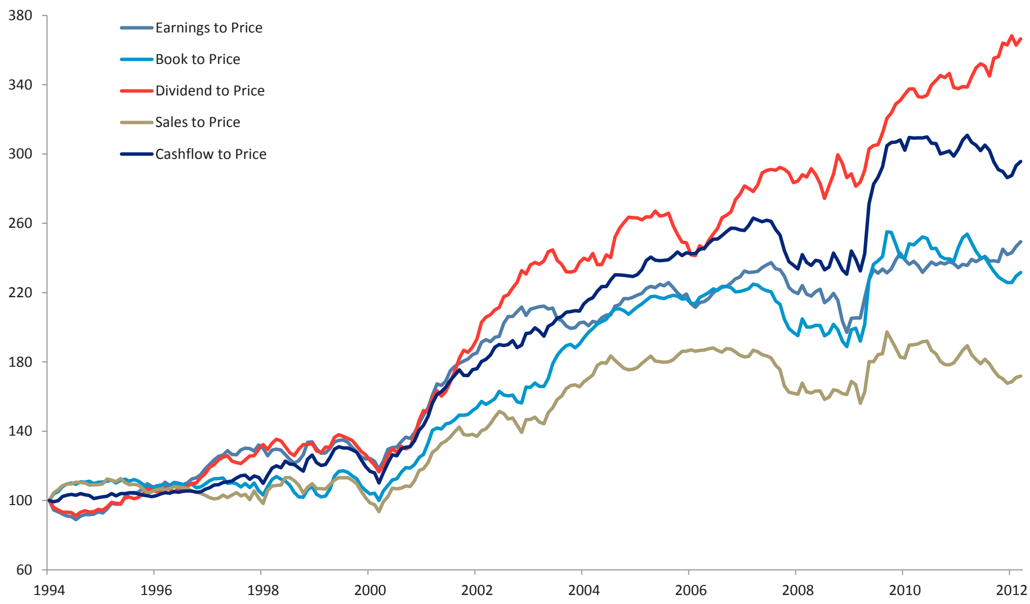
Is the value effect sensitive to the choice of value measure?

As mentioned at the outset of this section, there are different ways to define a value measure and different ways to build a portfolio that tries to capture a potential value effect. The research by Fama and French typically uses book-to-market, as their 1992 paper argues that book-to-market captures the essentials of the value effect. However there are many differing opinions, and other measures may have some merit. Fama and French provide different specifications via French's website. The more recent working paper by Penman, Reggiani, Richardson and Tuna (2012) argues that one should use a combination of earnings-to-price ratio and book-to-market at the same time. Campbell (2008) shows that dividend yield, book-to-market and earnings-to-price can be converted to a comparable ratio using a theoretical framework.

The specifications by Fama and French that we have looked at so far are all based on book-to-market, but different specifications should produce similar results on average. We form long-short value portfolios using five different value measures (book-to-price, earnings-to-price, dividend-to-price, sales-to-price and cash-flow-to-price). Our portfolio construction methodology follows a one-way sorting procedure as above, where value and growth stocks are defined as the top and bottom decile portfolios sorted using any of the five value measures. The universe of stocks covers developed countries in Europe, the Americas and Asia Pacific.

Figure 8 and Table 6 show that all five measures of fundamental value have delivered a positive and statistically significant value effect over the full sample period. However, even though the value effects have broadly behaved similarly, there are significant differences among them. Dividend-to-price has delivered an annualised average return of 7.3 percent, while the annualised average value effect based on sales is 3.3 percent for the full sample period (Panel A, Table 6). The drawdown statistics in Panel A show that the various value measures result in factor-mimicking portfolios with very different characteristics during extreme market conditions: both earnings-to-price and dividend-to-price have positive returns, on average, during the 5 percent worst months of the broad market portfolio. On the other hand, book-to-price, cash-flow-to-price and particularly sales-to-price have negative returns, on average, during the same extreme market downturns. The correlation matrix in Panel A in Table 6 shows that book value, sales and cash flow are highly correlated, while dividend-to-price seems to co-move the least with the other variables.

Figure 8: Cumulative return for various global value effects, 1994-2012.



Source: FTSE data, NBIM calculations

Panels B and C in Table 6 divide the sample into two subsamples consisting of months where the market portfolio has earned positive and negative returns. Panel B shows that the dividend-based effect is robust during negative months, and the effect based on book value fares particularly badly over the same period. Conversely, the effects based on book value and cash flow outperform the other specifications during positive months. However, on average, the various effects tend to co-move more during negative months as indicated by the correlation matrix in Panel B of Table 6.

Table 6: Annualised risk, return and correlation for various global value effects, 1994-2012.

	Market	Earnings to Price	Book to Price	Dividend to Price	Sales to Price	Cashflow to Price
	Panel A: Full Sample (219 observations)					
Mean return (annualised)	8,0 %	5,2 %	4,9 %	7,3 %	3,3 %	6,2 %
Standard deviation (annualised)	16,0 %	6,3 %	7,6 %	6,5 %	7,7 %	6,7 %
T-stat	2,14	3,48	2,74	4,83	1,83	3,96
Drawdown	-54,0 %	-17,0 %	-16,0 %	-15,6 %	-17,3 %	-15,9 %
Mean return conditional on 5% worst HML returns		-3,5 %	-3,6 %	-2,9 %	-4,0 %	-3,1 %
Mean return conditional on 5% worst market returns		0,3 %	-0,9 %	1,3 %	-1,4 %	-0,9 %
	Correlation matrix:					
Market	1,00					
Earnings to Price	0,06	1,00				
Book to Price	0,24	0,38	1,00			
Dividend to Price	-0,14	0,71	0,29	1,00		
Sales to Price	0,17	0,14	0,83	0,10	1,00	
Cashflow to Price	0,23	0,52	0,86	0,36	0,83	1,00
	Panel B: Market Down (86 observations)					
Mean return (annualised)	-44,8 %	5,8 %	1,1 %	11,2 %	2,1 %	4,1 %
Standard deviation (annualised)	12,3 %	6,5 %	6,6 %	7,4 %	7,7 %	6,4 %
T-stat	-9,79	2,41	0,45	4,06	0,72	1,72
	Correlation matrix:					
Market	1,00					
Earnings to Price	0,08	1,00				
Book to Price	0,12	0,49	1,00			
Dividend to Price	-0,11	0,77	0,44	1,00		
Sales to Price	0,16	0,27	0,79	0,25	1,00	
Cashflow to Price	0,18	0,57	0,84	0,47	0,85	1,00
	Panel C: Market Up (133 observations)					
Mean return (annualised)	42,2 %	4,7 %	7,3 %	4,8 %	4,1 %	7,5 %
Standard deviation (annualised)	8,8 %	6,3 %	8,1 %	5,7 %	7,8 %	6,8 %
T-stat	16,03	2,51	3,00	2,79	1,77	3,67
	Correlation matrix:					
Market	1,00					
Earnings to Price	0,18	1,00				
Book to Price	0,33	0,33	1,00			
Dividend to Price	0,02	0,67	0,24	1,00		
Sales to Price	0,27	0,07	0,85	-0,01	1,00	
Cashflow to Price	0,37	0,49	0,87	0,30	0,82	1,00

Source: FTSE data, NBIM calculations

Theoretical explanations of the value effect

The outperformance of value stocks over growth stocks has sparked a plethora of research trying to explain the phenomenon. Broadly, the literature trying to explain the value effect can be classified into two categories: rational explanations and behavioural-bias explanations. Generally, rational explanations argue that the outperformance of value stocks comes as compensation for taking on risk beyond the market beta of the CAPM. Researchers have suggested that value stocks are riskier than growth stocks because they are exposed to risk factors such as distress risk, liquidity risk, macro risks, cash-flow risk or long-run volatility risk. On the other hand, behavioural explanations argue, in general, that the outperformance of value stocks is caused by various biases in investor behaviour which lead to asset mispricing.

Rational explanations for the value effect:

I) Distress risk

Merton (1973) and Ross (1976) laid the theoretical foundations for multifactor asset-pricing models, but none of these models indicate which risk factors should be included. Fama and French (1993) argue that one needs to employ a multifactor model in order to account for the cross-section of equity risk and return. Fama and French (1993, 1995) augment the CAPM with two empirically motivated risk factors which account for the size and value effects.

Fama and French argue that both size and value factors capture risk related to distress. Small and value companies are more exposed to risks related to financial distress, and therefore investors require a higher return for holding those stocks. Fama and French (1993, 1995, 1996) describe a typical value company as a company that has a low market value because the company is performing poorly and is in a difficult financial position. Such companies can be expected to fare poorly during recessions. Investors do not want a portfolio that loses considerable value at the same time as the rest of the economy is entering a crisis, and will therefore demand a risk premium for such exposure. The value factor (HML) is meant to capture this risk premium related to distress.

This explanation does not come without controversy. A number of empirical studies suggest that there is little connection between the outperformance of value stocks and distress risk. Dichev (1998) uses accounting models such as the Altman Z-score to estimate bankruptcy risk based on a set of financial ratios, which should capture risk related to financial distress. The empirical results reveal that there is no relationship between bankruptcy risk and returns during the period 1965-1980. The more recent period, 1980-1995, indicates a negative relationship between bankruptcy risk and equity returns. Dichev therefore argues that distress risk is an implausible explanation for the value effect.

Vassalou and Xing (2004) argue that the accounting models employed by Dichev (1998) are flawed since they are based on backward-looking financial reports, and advocate Merton’s (1974) structural asset-value model as a forward-looking alternative. Structural models such as the Merton model price debt and equity as contingent claims on firm value and use the evolution of these structural variables to determine the point of default. Their results indicate that the value effect is indeed related to distress risk. Campbell, Hilscher and Szilagyi (2008) claim that their reduced-form model measures probability of default more precisely and thus captures a more realistic estimate of the premium investors require for holding stocks in financial distress. The authors find that the stocks with the highest distress risk are, in fact, characterised by lower subsequent returns, and conclude that the value effect cannot be explained by distress.

II) Cash-flow risk

Campbell and Vuolteenaho (2004) argue that a two-beta model with discount rate and cash-flow beta is a better description of the empirical data than a single-factor model.[10] According to their logic, a fall in equity markets can occur for two main reasons: investors require a higher discount rate than

10 This approach is consistent with the model of Campbell (1993), which is a version of the Intertemporal Capital Asset Pricing Model (ICAPM) of Merton (1973). In the ICAPM, investors consider multiple sources of risk, contrary to the CAPM. In the ICAPM, investors price assets not only based on their sensitivity to market movements, but also based on their hedging properties against adverse changes in factors such as future risk-free rates, expected returns and inflation.

previously, or investors receive bad news about cash-flow prospects. In the former case, higher future expected returns compensate for the immediate loss, which makes the discount-rate beta '"good'". However, bad cash-flow news is not compensated by higher future returns, which makes the cash-flow beta '"bad"'. Risk-averse investors will require a higher risk premium on cash-flow betas within this framework.

Consistent with the above logic, Campbell and Vuolteenaho (2004) and Cohen, Polk and Vuolteenaho (2009) find that value stocks have higher cash-flow betas than growth stocks. Campbell and Vuolteenaho (2004) estimate a two-beta model of stock returns, while Cohen, Polk and Vuolteenaho (2009) study whether accounting-based cash-flow betas can explain the cross-sectional variation in returns. Both studies find that value stocks have high cash-flow betas which explain why value stocks have outperformed growth stocks and the CAPM cannot account for this outperformance. Campbell and Vuolteenaho (2004) argue that the observation that value stocks actually have higher market betas than growth stocks over a sample period covering 1926-1963 is still consistent with the risk-based explanation, as this beta largely comes as cash-flow beta.

Campbell, Polk and Vuolteenaho (2010) expand on the findings of Campbell and Vuolteenaho (2004) that value stocks should outperform growth stocks, as the former load heavily on the risk factor that carries the highest risk price – i.e. the risk that investors fear the most (out of the two risk factors included in their model). Campbell, Polk and Vuolteenaho (2010) recognise this result and aim to answer the question of why these groups of stocks move together. Given a standard present-value framework, it could be either common variations in future cash flows or discount rates that drive the co-movement of stocks. The cash-flow channel is a plausible driver, as company fundamentals will surely be affected by the inherent distress risk of value firms and the option-like characteristics of growth firms. On the other hand, the discount-rate channel also seems likely given behavioural theories where the discount rates applied by investors are affected by investor sentiment. The authors decompose market and firm-level returns and find that the main driver behind the cross-sectional variation in exposures to the so-called good and bad betas is company fundamentals.

III) Time-varying risk

Several researchers claim that the value effect is related to the business cycle. Fama and French argue that value stocks tend to perform poorly during bear markets. According to their studies, investors will demand a risk premium for holding value stocks in a situation where investors' marginal utility of wealth is greatest. Jagannathan and Wang (1996) show that the conditional CAPM is able to account for the dynamics around recessions as well as the value effect. Vassalou (2003) shows that that the explanatory power of the Fama and French risk factors mainly come from the fact that they capture news about future GDP growth, linking the explanation to future growth or economic conditions. Goetzmann, Watanabe and Watanabe (2009) study what they refer to as beta-instability risk, i.e. how a stock's sensitivity to the market beta varies across business cycles, and find that value stocks are particularly sensitive to changes in the market beta during bad times. The authors argue that value stocks command a premium because they are more sensitive to market returns during bear markets. Similarly, Ang and Chen (2007) argue that a conditional CAPM can account for the value premium.

Jagannathan and Wang study a conditional CAPM that allows for time-varying market betas and argue that stocks with countercyclical (procyclical) market betas should earn a higher (lower) rate of return than the unconditional CAPM tells us. Zhang (2005) find this to be true in a neoclassical framework with rational expectations where cost reversibility – the idea that it is more costly for a firm to reduce than to expand capital (Ramey and Shapiro 2001) – makes value firms more risky than growth firms during recessions. This happens because value firms, which are less productive than growth firms, find it more difficult to cut back and are thus less flexible and worse off during bad times when firms wish to scale down. On the other hand, growth firms find it more difficult to expand in good times as they tend to be more heavily invested than value firms, which are less in need of expanding as the less productive assets they held on to have become more productive. These dynamics yield value- and growth-stock betas that are countercyclical and procyclical respectively.

Petkova and Zhang (2005) confirm the predictions of the rational model developed by Zhang (2005) and conclude that value stocks are indeed riskier than growth stocks during bad times. This conclusion is based on their finding that the conditional market betas of value (growth) stocks co-move positively (negatively) with expected market-risk premia and will thus be high (low) whenever the expected market-risk premium is at elevated levels. In contrast, Lewellen and Nagel (2006) argue that the conditional CAPM cannot explain the value premium. Their test suggests the need for unrealistically large time-variation in betas for the conditional CAPM to account for the value premium. The authors conclude that the conditional CAPM is (almost) as poor at explaining the value premium as the unconditional CAPM. Franzoni (2002, 2008) and Adrian and Franzoni (2009) observe that the market beta of value stocks has been trending downwards over time compared to the market beta of growth stocks. Franzoni (2002) use CRSP data covering the period 1926-2000 and find that the market beta of value stocks has decreased from above 2 to 0.5 over the sample period. Figure 9, which shows the rolling 5-year beta of the top-decile portfolio of Fama and French, illustrates this result.

Figure 9: 5-year rolling market beta of top-decile portfolio, monthly US data, 1928- – 2011.

Source: Kenneth French's data library, NBIM calculations

Franzoni (2008) expands on this finding and argues that the main driver behind the link between market beta and book-to-market is a firm's growth options, and the changing sign of this relationship over the sample period is due to the growth in the average level of these growth opportunities. Adrian and Franzoni (2009) conclude that investors have failed to recognise this trend, and as a consequence they have continued to overestimate the market beta, or riskiness, of value stocks, and thus demanded a higher expected rate of return than the CAPM would suggest using the realised beta ex-post. An ex-ante CAPM can therefore account for the value premium, according to the authors, who conclude that time-varying market betas need to be taken into account. Since Franzoni (2002, 2008) and Adrian and Franzoni (2009) use data until December 2000, we have extended their analysis to include the most recent data until December 2011. We find that since 2000 the market beta of HML has indeed increased back to almost the same level as it was in the 1930's. This coincides with a period where HML has still provided a strong annual return of 3.6 percent. Since HML has performed so well during a period of increasing beta, the economic explanations of Franzoni (2002, 2008) and Adrian and Franzoni (2009) seem weak.

IV) Long-run (volatility) risk

Bansal, Dittmar and Lundblad (2005) and Hansen, Heaton and Li (2008) build on the framework of Bansal and Yaron (2004) that risk premia largely depend on an asset's cash-flow sensitivity to shocks to long-run economic growth. A crucial feature of their framework is the recursive formulation of utility by Epstein and Zin (1989, 1991) which, loosely speaking, makes it possible to model how impatient investors are to learn what the future will look like. This particular feature implies that an asset's expected return is to a large extent driven by its sensitivity to long-run growth and uncertainty associated with long-run growth, and not just period-by-period growth fluctuations.

Within this so-called long-run risk framework, both Bansal, Dittmar and Lundblad (2005) and Hansen, Heaton and Li (2008) are able to account for the value premium based on their finding that the cash-flow growth of value stocks can be characterised by a higher sensitivity to shocks to, and uncertainty associated with, long-run economic growth, whereas the opposite is found to be true for growth stocks. This may be at odds with the conventional wisdom that value stocks have a short cash-flow duration compared to growth stocks. In fact, Chen (2012) finds that there is no substantial difference between the cash-flow duration of value and growth stocks in either buy-and-hold or annually rebalanced portfolios. Bansal, Kiku and Yaron (2012) support the findings of Bansal, Dittmar and Lundblad (2005) and show that these long-run risk models are able to account for the *level* of observed risk premia when taking an asset's sensitivity to long-run growth risk into account. However, the authors emphasise that the model needs to take into account long-run volatility risk in order to capture the *time-variation* of asset prices. Campbell and Beeler (2012) conduct a critical empirical evaluation of the long-run risk model and document that the model fails to match several stylised facts about macroeconomic dynamics and the cross-section of asset prices.

Campbell, Giglio, Polk and Turley (2012) and Bansal, Kiku, Shaliastovich and Yaron (2011) recognise the importance of including a risk factor capturing the fact that investors are sensitive to variation in volatility over time. While Campbell, Giglio, Polk and Turley acknowledge the importance of the cash-flow and discount-rate betas of Campbell and Vuolteenaho (2004) and Campbell, Polk and Vuolteenaho (2010), they emphasise that a weakness of the two-beta ICAPM is that it ignores the effect of time-varying volatility in equity returns. The authors emphasise that the two-beta ICAPM can be reconciled with the long-run risk framework of Bansal and Yaron (2004) in order to capture both an investor's aversion towards lower expected returns and higher return volatility. Bansal, Kiku, Shaliastovich and Yaron (2011) explore the importance of stochastic volatility in the time-series and cross-section. They assume that the stochastic process driving volatility is homoscedastic, and in their cross-sectional analysis they impose that changes in the equity-risk premium are driven only by the conditional variance of the stock market. In a related approach, Campbell, Giglio, Polk and Turley (2012) advocate the importance of the cash-flow and discount-rate betas of Campbell and Vuolteenaho (2004) and Campbell, Polk and Vuolteenaho (2010). They emphasise that a weakness of the two-beta ICAPM is that it ignores the effect of time-varying volatility in equity returns. The authors emphasise that the two-beta ICAPM can be reconciled with the long-run risk framework of Bansal and Yaron (2004) in order to capture both an investor's aversion towards lower expected returns and higher return volatility. Campbell, Giglio, Polk and Turley (2012) provide direct evidence against the assumptions of Bansal, Kiku, Shaliastovich and Yaron (2011).

An Intertemporal CAPM with stochastic volatility allows adverse changes to the investment opportunity set to arise not only from lower expected returns but also from increasing stock volatility. This framework accounts for investors' desire to hedge against both these two sources of risk to the investment opportunity set. Following their logic, investors require a lower rate of return for holding growth stocks, since they act as a hedge by outperforming value stocks when expected return falls and market volatility increases. The discount-rate beta and cash-flow beta of Campbell and Vuolteenaho (2004), combined with the volatility beta, can account for the value effect, as value stocks are found to load heavily on the volatility beta as well as the cash-flow beta.

V) Liquidity risk

Asness, Moskowitz and Pedersen (2009) document value effects across country equity indices and in the markets for government bonds, currencies and commodities. In addition, they seek to link the effects to underlying risks such as macroeconomic indicators and indicators of liquidity risk. They find a weak relationship between the risk premium and the macroeconomic indicators. To explore the role played by liquidity risk, the authors regress the value premium on a wide range of different funding-liquidity risk indicators, such as the US Treasury-Eurodollar (TED) spread and a global average of TED spreads as well as other funding-liquidity measures used in the literature by Pastor and Stambaugh (2003), Acharya and Pedersen (2005), Sadka (2006) and Adrian and Shin (2010). In addition, the authors compute an illiquidity index that takes a weighted average of all these measures. The use of the TED spread as a measure of funding liquidity is motivated by Brunnermeier and Pedersen (2009), who show that funding liquidity is a natural driver of common market-liquidity risk across asset classes and markets. Also, Moskowitz and Pedersen (2008) show empirically that funding-liquidity measures based on TED spreads are linked to the relative returns of liquid versus illiquid securities globally. For both levels and changes in liquidity indicators, the authors find that value loads consistently on liquidity risk. In other words, value strategies do worse when liquidity is poor and worsening, and one reason for this may be that value companies typically have higher leverage.

Liquidity risk plays a central role in a number of the anomalies identified in financial markets. Evidence suggests that the return on strategies that exploit the size and value effects in the stock market and the credit and term premia in the bond market can in part be attributed to exposure to liquidity risk. In addition to these familiar anomalies, there are many other dynamic trading strategies that also entail indirect exposure to liquidity risk. Khandani and Lo (2007) argue that the return on an investment strategy which exploits reversal effects where an investor underweights stocks that have increased greatly in value during the course of the last week, and overweights stocks that have decreased greatly in value, can to a large extent be interpreted as compensation for taking liquidity risk.

Kang and Li (2010) find that the value premium is correlated to the liquidity premium. In particular, they find that firms with high book-to-market ratios hold less liquid assets than firms with low book-to-market ratios. The authors argue that value firms, in theory, should deliver a premium over growth stocks as investors are exposed to the risk of illiquid assets on the balance sheet that will be relatively harder to convert into cash during recessions. They back up their theory with empirical evidence by employing the Amihud (2002) liquidity measure, which measures illiquidity as the ratio of absolute stock return to dollar trading volume. Kang and Li (2010) find that value stocks are indeed less liquid than growth stocks, and this difference is amplified during market downturns, i.e. when the market is less liquid and more volatile.

Similarly, Akbas, Boehmer, Genc and Petkova (2010) suggest that the so-called flight-to-quality effect, where investors replace risky assets with safer assets during market downturns, will impact value and growth stocks differently. To confirm their theory, the authors estimate liquidity betas for each stock in their data sample, which comes from Kenneth French's website and covers the period 1927-2008. As in Acharya and Pedersen (2005) and Kang and Li (2010), they use Amihud's (2002) liquidity measure to estimate their liquidity factor from daily CRSP data. According to their logic, value stocks will come under selling pressure during bear markets, as they are especially risky when markets turn sour and liquidity dries up, and should thus be particularly sensitive to market liquidity. The authors argue that more or less the opposite is true for growth stocks, and the spread in liquidity betas can potentially help account for the value premium. Their empirical results show that value stocks have higher liquidity betas than growth stocks, and while the liquidity betas of growth stocks go down during bad times, the opposite happens for value stocks. The authors conclude that liquidity betas can account for a third of the value premium in their data sample. In a similar vein, Adrian, Etula and Muir (2012) show empirically that a single-factor model based on the leverage of financial intermediaries can account for several financial-market anomalies, including the value premium. They argue that shocks to the leverage of financial intermediaries coincide with worsening market conditions, where funding constraints are tightening and intermediaries are forced to sell assets at fire-sale prices. According to their logic, investors will require higher compensation for holding assets that correlate positively with shocks to this leverage cycle.

Acharya and Pedersen (2005) develop the so-called liquidity CAPM, which is a gross return version of the CAPM that takes liquidity cost and risks into account. The illiquidity measure is estimated following the price-impact approach of Amihud (2002). Liquidity risk is measured from various covariance estimates between a stock's return and liquidity versus market return and liquidity. The authors employ the CRSP data set over the period 1963-1999 and find that the liquidity CAPM can explain reasonably well cross-sectional returns associated with the small-firm effect, but fails to account for the value premium.

Behavioural-bias explanations:
A number of behavioural research studies confront explanations that the value effect is a rational risk premium. Many theories on the formation of expectations show how different psychological biases in how people think can lead to underreaction and overreaction. These biases include *overconfidence*, *unrealistic optimism*, *representativeness*, *conservatism*, *belief perseverance*, *anchoring* and *availability*.

De Bondt and Thaler (1985, 1987) use CRSP data and construct portfolios by grouping stocks according to past performance (i.e. '"winners'" and "'losers"') and find that past long-term losers (winners) have a tendency to outperform (underperform) the market after portfolio formation. They interpret this long-term reversal as an expression of investors' overreaction. According to De Bondt and Thaler, investors have a tendency to project trends into the future, which may cause equities to fall or rise further in value than implied by fundamentals. The effect of De Bondt and Thaler is closely related to the value effect, because value stocks are typically long-term losers and growth stocks are long-term winners. This long-term reversal coincides with the value effect. In a similar vein, Lakonishok, Shleifer and Vishny (1994) argue that the excess return of value stocks can be attributed to investors' overreaction rather than compensation for risk.

Overconfidence refers to the evidence that people are overly confident when forming beliefs. For example, Alpert and Raiffa (1982) show how people manage to include the true quantity (of some expectation) in their reported 98 percent confidence interval only 60 percent of the time. *Unrealistic optimism* is the bias which makes people too optimistic about their own future prospects relative to the average person. This cognitive bias is related to the so-called *better-than-average effect*, which makes people think that they possess above-average skills within a given domain (Svenson 1981). *Representativeness*, a term coined by Kahneman and Tversky (1974), refers to the observation that people draw conclusions from data too quickly, i.e. if investors see a company reporting surprisingly good numbers several times in a row they expect the company to keep surprising on the upside. *Conservatism*, on the other hand, refers to the observation that people draw conclusions from new data samples too slowly, i.e. people are too slow to change their mind when a new data point contradicts their prior view.

The tendency not to seek out evidence that contradicts our beliefs or theories, together with the tendency to be overly sceptical about any such contradictory evidence, makes people too slow to change their prior views and beliefs, a bias referred to as *belief perseverance* (Lord, Ross and Lepper 1979). Kahneman and Tversky (1974) argue that people often start with some initial value in mind when estimating a number. The final number is reached by (insufficiently) adjusting this initial value, and the estimates will thus tend to be biased towards the initial value or "'anchor'". This bias is referred to as *anchoring*. *Availability* is another cognitive bias described by Kahneman and Tversky (1974) and refers to the observation that people will search their own memory for examples when estimating the probability of some event occurring. The bias comes from the fact that the estimated probabilities will be influenced by how easily examples come to mind, which again will depend on which memories we find most relevant.

A broad literature argues that some investors will suffer from one or more of these psychological biases, which will lead to systematic asset mispricing. Several papers argue that such mechanisms can account for a variety of anomalies in financial markets, and one of the most prominent contributions is the 1998 paper by Barberis, Shleifer and Vishny.

Barberis, Shleifer and Vishny (1998) attempt to account for several financial-market anomalies, including the value effect, within their behavioural model framework. The authors argue that the excess return of value stocks is due to irrational investor behaviour, in particular two of the psychological biases described above: *representativeness* and *conservatism*. *Conservatism* makes investors react too little to new (and surprising) data points, while *representativeness* makes people overreact to trends in the data. These biases may, for example, lead to investors bidding up a company's share price too much relative to its true fundamental value. The company becomes overvalued, investors get disappointed due to their unrealistic expectations, and subsequent returns are low. According to the authors, this dynamic causes growth stocks to underperform and value stocks to outperform – a pattern that generates a value effect over time. A key mechanism within this framework is that investors will base their expectation of future trend reversals on the occurrence of such reversals in the historical data. Bloomfield and Hales (2002) test this theory in an experimental study where a group of MBA students were shown 16 different time-series plots based on a random-walk process. The students were asked to estimate the next step, i.e. the future price, of the process given no other information besides the charts themselves and the fact that the process was the result of a random walk. The results provide strong support for the theory of Barberis, Shleifer and Vishny (1998), as the group of students exhibited statistically significant evidence of both over – and underreaction based on past trends and reversals in the historical data provided.

As with the literature on rational explanations for the value effect, the behavioural literature does not come without controversy. Doukas, Kim and Pantzalis (2002) study whether investors indeed systematically overestimate (underestimate) the future earnings of value (growth) stocks over time. They use analysts' earnings forecasts as a proxy for market expectations and find no evidence that investors turn overly optimistic (pessimistic) about so-called winners (losers). The authors conclude that the value effect cannot arise due to investor overreaction. Doukas, Kim and Pantzalis (2004) expand on these results and suggest that there must be some other phenomenon driving the value effect. They cite the literature on heterogeneous investor beliefs and argue that investor disagreement will have an effect on asset prices. Indeed, Williams (1977) shows that there is a positive relationship between investor disagreement and stock returns. Doukas, Kim and Pantzalis combine the CRSP and COMPUSTAT data previously employed by Fama and French (1993, 1995) with data on earnings forecasts from I/B/E/S and get a complete sample spanning 1983-2001. The authors confirm the existence of a value effect in the data, but argue that, rather than being a compensation for holding stocks that are fundamentally risky or subject to irrational investor behaviour, the value effect should be seen as a compensation for holding stocks with a higher dispersion of earnings forecasts. The authors reason that a stock with a higher dispersion of analyst forecasts, or a higher degree of investor uncertainty, is viewed as being more risky from an investor's point of view because of the disagreement among investors surrounding the future growth path of the company's earnings.

Conclusions

A vast body of research finds a positive and statistically significant value effect across global developed equity markets. The empirical evidence documenting the excess return of value stocks in the historical data is robust to various specifications and definitions as well as time periods. However, the fact that there exists a value effect in the historical data does not necessarily guarantee that such an effect will persist going forward. Thus, the starting point for any portfolio strategy that includes deviations from the market portfolio must be to account for how certain seemingly "puzzling" empirical regularities such as the value effect can be sustained over time. If a sufficiently large mass of investors systematically try to exploit these empirical regularities, the value effect could disappear.

The rationale for a continued value effect therefore hinges on the theory of its existence. If the value effect is caused by behavioural biases, it would be likely that arbitrageurs could trade the effect away. On the other hand, the academic literature based on rational investor behaviour has come a long way in accounting for both the magnitude and variation of the value effect. According to this logic, there will be risk-averse investors who do not seek exposure to value stocks as these are indeed riskier than other stocks. More importantly, these stocks are particularly risky at times when investors tend to be most risk-averse, e.g. during economic recessions. On the other hand, there will be investors with other characteristics, such as a long-term investor with no defined liabilities, who may be particularly suited to exposure to this kind of systematic risk premium.

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