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The Value Premium During Flights

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Abstract

This study examines the profitability on the value-minus-growth strategy in the U.S. stock market, during episodes of market instability. The value premium is very large for small and medium-sized equities during flight-to-safety episodes. There is evidence also of a remarkable value premium for large caps, during flight-from-safety events, where these scenarios are marked by declines in systematic risk and increasing yields. The empirical findings are consistent with a size-dependent explanation of the premium involving both leverage and the value of the growth option.

JEL: G01, G12

Keywords: Value Premium, Flight-to-Safety, Flight-from-Safety, Book-to-market.

Introduction

The profitability of the long-value short-growth trading strategy (e.g., Fama and French (1993)) spiked in November 2016, a month marked by the U.S. presidential election and by a substantial stock market appreciation. Over that month, a robust stock market yielded about 4%, while Treasury prices dropped, with the 10-year benchmark losing 4% of its value. In coincidence with this flight-to-safety in reverse, the value premium reached a monthly return of 8.4%, its fifth most impressive showing since 1963. The large-cap value premium, at 13.3% for the same month, was particularly impressive, especially in view of the familiar notion that value profits mostly stem from small and medium-sized equities (e.g., Loughran (1997), Fama and French (2006)). As the results of this study shall show, such remarkable returns on book-to-market fit a pattern linking the performance of the long-value short-growth portfolio to extreme price dynamics involving *both* stocks and Treasuries.

The role of fluctuations in benchmark borrowing rates in determining the value premium is also highlighted by the strong performance of the value-minus-growth portfolio during market instability episodes characterized by yield increases coupled with *declines* in systematic risk, for large caps. This large-equity value premium during so-called flight-from-safety events, which is impressive *per se*, at about 26.7% in annual terms, is even more notable relatively to the corresponding unconditional mean of the large-cap premium over the 1963-2016 sample, which is a mere 2.5%. Evidence of a substantial value premium in periods marked by declines in systematic risk suggests that systematic risk alone cannot explain the value premium, at least for large equities.

At the other end of the size distribution, there is evidence of an impressive value premium during flight-to-safety events, which are market scenarios marked by systematic risk increases and yields declines. This substantial risk reward on book-to-market during flight-to-safety episodes is consistent with the notion that value equities are especially risky during downturns (e.g., Ortiz-Molina and Phillips (2014)). However, the sheer size of the premium for equities falling in the lowest size quintile in flight-to-safety months, at the annualized rate of 30.5%, suggests that the decline in Treasury yields may be exacerbating the risk gap between high and low book-to-market equities, through a leverage risk channel.

The interaction between the dynamics of borrowing rates and systematic risk in determining the value premium is not only revealed by the levels of the risk reward within the small and large stock categories. Rather, this study documents a clearly decreasing trend in the value premium along with the size dimension during flight-to-safety episodes, as well as an opposite trend during flight-from-safety events. These trends are markedly symmetrical between these two types of market conditions.

Early risk-based explanations of the value premium focused on the high share of assets-in-place characterizing the balance sheet of value firms. In Zhang (2005), and Cooper (2006), costly, or unfeasible, investment irreversibility causes firms with excessive installed capital capacity to experience distress when hit by adverse profitability shocks. From this standpoint, value stocks earn larger returns than growth equities, to compensate investors for asset risk.

From another perspective, however, the tangibility of assets-in-place make these investments a safe haven during troubled times. Indeed, both Novy-Marx (2011) and Ozdagli (2012) stress that leverage is crucial to models generating a positive value premium. In particular, they argue that, absent the effect of leverage, firms that are rich in investment opportunities (growth firms) are riskier than value firms, which would originate a growth premium, contrary to the empirical evidence.[1]

[1] The role of investing potential in determining asset risk is based on the identification of the firm growth option with a call option on capital. As we know from the financial options literature, the value of a call

In an earlier contribution, Gomes and Schmid (2010) bridged the roles played by asset risk and leverage by arguing that leverage and systematic risk are linked dynamically through the value of the growth options that populate the investment set. Their key insight is that firms can reduce their asset beta, i.e., their exposure to systematic risk by diminishing the share of intangibles in their balance sheet, i.e., by exercising a growth option and acquiring assets-in-place. That this hedging activity is financed by debt creates a trade-off between systematic and leverage risk, at the firm-level.[2] In this context, the value premium originates from the comparative advantage of growth firms, over value firms, in reducing their exposure to systematic risk by investing in tangible assets, i.e., in advantageously exploiting the trade-off between leverage and systematic risk.

An alternative explanation to the value premium is proposed by Ozdagli (2012) who, while modeling investment options as well as firm optimal capital structure, instead concludes that the value premium is essentially ascribable to the direct effect of financial leverage, with high book-to-market firms being more leveraged, and therefore more risky, than growth equities.[3] This direct leverage effect is thus reduced to the classical framework of Modigliani and Miller (1958), in which firm debt directly increases equity risk.[4]

Flights are characterized by trends in leverage costs and market risk of opposite nature.

option amplifies the effects of shocks to the value of the underlying asset. See Ozdagli (2012) for a discussion on investing options.

[2]The empirical results in Choi (2013) provide solid support to the hypothesis that reductions in asset risk are matched by increasing firm leverage, as he documents a negative relationship between leverage and estimated asset betas.

[3]The conclusion that value firms are highly leveraged is also confirmed by models that take into considerations other sources of risk. For instance, Gomes and Schmid (2010) also obtain that firms that are richer in unexercised growth options (i.e., growth firms) have less debt than firms which have exercised more of their expansion opportunities (i.e., value firms).

[4]The direct effect of leverage states that, if book leverage is constant, equity risk is positively correlated with the market value of firm debt. Empirically, Ozdagli (2012) documents that book leverage (market leverage) is about constant (increasing) across book-to-market deciles.

Examining the profitability of the value-minus-growth strategy during market flights allows the to evaluate the relative strength of the leverage and systematic risk channels, in originating the value premium. To illustrate, during flight-to-safety episodes borrowing rates decline and systematic risk increases. The decline in yields weakens the cost barriers to the reduction of systematic risk through leverage, the very activity that originates the comparative advantage of growth over value equities in Gomes and Schmid (2010). In contrast, falling borrowing rates should weaken the value premium, especially for firms with high levels of corporate borrowing, as argued in Ozdagli (2012).

These insights from the literature yield a set of testable hypotheses for the risk reward associated with book-to-market. Evidence of a significant value premium in months marked by flight-to-safety episodes are consistent with a predominance of the growth option channel in determining firm total equity risk, as argued in Gomes and Schmid (2010). In contrast, a growth premium would indicate that high book-to-market stocks tend to be riskier than low book-to-market equities, because of leverage risk. The opposite predictions can be tested for flight-from-safety events. During this latter type of market instability, the profitability shock is benign, whereas it is leverage conditions that deteriorate. Should systematic risk be the ultimate source of the value premium, then there should be no reward on book-to-market during flight-from-safety events.

The performance of the aggregate value-minus-growth strategy (i.e., the HML premium) during flights appear to be consistent with the theoretical framework proposed in Gomes and Schmid (2010). The return on the value-minus-growth portfolio is significant during flight-to-safety events, that is when an increase in market risk is coupled with falling yields. In contrast, the aggregate value premium is insignificant during flight-from-safety events.

The intuition that size may interact with both leverage and the growth option in generating the value premium can be traced back to Berk et al. (1999a). According to their model, the expected returns on small firms are determined mostly by their exposure to systematic risk whereas large companies, for which the impact of new projects is minimal, yield expected returns that mostly depend on borrowing rates. This study exploits the differences in the dynamics of borrowing rates and systematic risk characterizing flights episodes to formulate a series of hypotheses that can be tested using the returns on the value-minus-growth strategy for firms of different size.

Other early and influential contributions concluded that firm size determines the relative weight of the risks stemming from the growth option versus asset risk, in determining firm total risk. In particular, Carlson et al. (2006) show that the relevance of firm's expansion potential is declining over equity market value. This trend yields a size effect that overlaps with the premium associated with book-to-market. From this perspective, the relevance of the growth option channel in determining the value premium should weaken along with market capitalization. The implication is that in determining firm total risk, more weight is placed for small caps than for large equities on the ability of growth firms to reduce systematic risk through investment. Further, the predictions of models stipulating that the value premium stems from the growth option channel (e.g., **Gomes and Schmid (2010), Choi (2013))** should be more compelling for small firms than for larger sized entities.

While the growth option channel appears to dominate the leverage in originating the HML premium, the analysis of the value premium within size quintiles paints a more nuanced picture of the role of leverage risk channel in originating the risk reward on book-to-market. The returns of size-sorted high-minus-low book-to-market strategies strongly suggest that the effectiveness of the risk offsetting mechanism between leverage and systematic risk may be waning along with the size dimension, leaving leverage as the main driver of the value premium for firms with large market capitalization.

The empirical results not only reveal a large value premium for small (large) firms during flight-to-safety (flight-from-safety) events, but it also uncovers a monotonic relationship between size and the premium during flights. The gap between the returns on high and low book-to-market equities appears to be declining along with the size dimension during flight-to-safety events, but increasing during flight-from-safety events. Hence, the evidence suggests that the importance of the growth option risk mechanism in originating the premium wanes as market capitalization increases, whereas the relevance of the leverage risk channel increases with size. Put differently, changes in borrowing rates appear to be more (less) compelling than shocks to systematic risk as firm market capitalization increases (declines).

An analysis of the dynamics of the value premium during flights that are marked by severe versus mild price fluctuations in stocks and yields confirm that systematic risk appears to dominate leverage risk in originating the value premium, with the reverse relationship being observed for large caps. However, the results also indicate that neither risk channels are completely inactive, at either end of the size distribution.

This study analyzes the risk reward on book-to-market during events (e.g., flights) the incidence of which is elicited from the data. Previous scholarly research has illustrated how employing different empirical methodologies to identify extreme market conditions may yield remarkably different results (e.g., Baele et al. (2014) and Hartmann et al. (2004)). In this study I use the term flights to mark periods in which borrowing yields and stock returns signal a reallocation of resources reflecting agents changing attitude towards risky investments and safety, certainty, and liquidity. From this standpoint, these events are associated with significant deviations from the status quo of the relationship between the returns on the aggregate stock portfolio and benchmark Treasuries, with flight-to-safety showing an appreciation (depreciation) of Treasuries (stocks) and flight-from-safety being characterized by the opposite trends in aggregate returns. The identification strategy deployed in this study relies on significant changes in the correlation between the returns on stocks and Treasuries, and it builds on a series of previous contributions (e.g., Forbes and Rigobon (2002) and Baur and Lucey (2009)). This approach has been chosen among the many proposed in the literature as it enhances the correspondence of the empirical analysis with the theoretical frameworks informing the interpretation of the results.

The literature on the correlation of bonds and equities is rather large, with contributions in this area of research often relying on models of the cross-asset volatility and correlations (e.g., Engle (2002a), Cappiello et al. (2006), Perego and Vermeulen (2016)). Motivated by these studies, in this article I also consider a broader definition of flights that is based on the sign of the Dynamic Conditional Correlation (DCC) between the daily returns on stocks and Treasuries. The conclusions of this study hold independently from the empirical strategy employed to identify flights.

The analysis of the risk-adjusted returns on the value strategy reveals that the exposure to systematic risk appears to explain the value premium for small and medium-sized equities, during flight-to-safety events. These results further support the conjecture that systematic risk originates the risk reward on book-to-market, at the lower side of the market value distribution. However, the analysis also indicates that leverage and systematic risk interact, possibly non-linearly, in determining the value premium, during flight-to-safety episodes.

Fight-from-safety episodes are marked by systematic risk declines and leverage risk increases. During this type of flights, the CAPM appears to fail to explain the large value premium observed at the high end of the size distribution. Hence, decreases in systematic risk appear not be significantly associated with the value premium on large caps. In fact, the leverage risk factor (e.g., TERM) suffices to erase the abnormal returns on the value-minus-growth strategy across all size categories, during flight-from-safety events. Overall, the analysis of the adjusted returns on the long-value short-growth strategy indicates that leverage risk plays an important role in originating the risk reward on book-to-market.

The 1963-2016 sample covered in this study includes periods market by high inflation rates. From this perspective, one could object to the use of nominal returns in defining flight episodes. To verify that the conclusions of the empirical analysis hold when inflation expectations are accounted for, flights are alternatively identified using real returns. All the conclusions yielded by the analysis relying on nominal returns, including the monotonic relationships between the growth option and leverage risk channel with firm size, remain unaltered when using real returns to identify flights.

Myers (1977) argued that firms with more investment options should issue mostly short-term debt, to minimize agency costs, all the rest equal. This theoretical prediction bears out to the empirical analysis (e.g., Barclay et al. (2003) and Billett et al. (2007)). From this perspective, at the firm level, the value of the growth option and the maturity of corporate debt may interact, thus making endogenous the maturity of corporate borrowing costs. To investigate whether these considerations affect its conclusions, this study also includes the analysis of the value premium during flight events identified using short-maturity Treasuries as the safe asset. This exercise confirms that relying on long or short-term Treasuries yields strongly consistent results.

Further evidence supporting the hypothesis that leverage plays a more important role in determining the value premium for large caps is offered by the analysis of contagion episodes. Contagion episodes are marked by shocks to systematic and leverage risk of the same nature. From this perspective, these events do not directly lend themselves to an analysis aiming to disentangle the effects of the trade-off between leverage and systematic risk, on the value premium. However, the dynamics of the value premium during contagion episodes shed some further light on the mechanisms originating the premium. Of particular interest is the comparison of the value premium during flight-to-safety and negative contagion episodes. These events are market conditions that are both characterized by increasing systematic risk, but feature opposite trends in borrowing rates, with yields being declining during flight-to-safety episodes. When yields increase during a stock market downturn, as it is the case during negative contagion events, large firms yield a significant book-to-market premium. In contrast, when yields decline during a downturn, as it is the case during flight-to-safety episodes, the value premium is insignificant for large equities. In contrast, small and medium-sized firms yield a significant value premium during both negative contagion and flight-to-safety events. These results are consistent with the hypothesis that the role of leverage risk in determining the value premium increases with firm size.

The remainder of the article is laid out as follows. The next section begins the empirical analysis by illustrating the methodology employed to identify flight and contagion episodes. The analysis proceeds in Section 3 with a conditional evaluation of the profitability of the value-minus-growth strategy during flights. Next, we find the analysis of the dynamics of the value premium for flights defined in real terms, using short-term Treasuries, identified using the DCC methodology, and for flights marked by severe and mild price shocks. The analysis of contagion episodes precedes a concise statement of this study's conclusions. Further details on the identification of flight and contagion episodes, as well as the presentation of additional robustness checks, are relegated to a series of dedicated appendices.

1 Motivation and Hypotheses

In the early stage of the literature on the value premium asset risk was identified as the channel through which market risk is linked to book-to-market ratios. High book-to-market firms are particularly exposed to asset risk in Zhang (2005), as they own a relatively large share of assets-in-place. Investors wish to be compensated for the inflexibility of a value firm asset structure, especially when downturns make fire sales more likely.[5]

While market risk has been positively linked to the profitability of the value-minus-growth strategy, the effect of borrowing rates on the premium is less actively discussed, at least in the empirical literature. Yet, theoretical contributions have identified in both leverage and systematic risk two fundamental drivers of the value premium. In their influential study Berk et al. (1999b) modeled interest rates separately from systematic risk and showed that the relationship between expected equity returns and the value of the growth option depends on the level of interest rate. Carlson et al. (2006) argue that book-to-market ratio relates to operating leverage, where this is akin to financial leverage, but for being associated with the financial payoffs and obligations entailed by the assets-in-place owned by the firm.

While operating leverage is largely unobservable, as it depends on the capitalized value of all future costs and revenues (e.g., Novy-Marx (2011)), the total effects of future obligations on firm risk, be these due to financial or operating leverage, largely depend on the prevailing borrowing rates (e.g., Berk et al. (1999b)).[6] Hence, the value premium is bound to depend

[5] The empirical analysis of Ortiz-Molina and Phillips (2014) appears to bear out this interpretation of the relationship between asset risk and the value premium. Their study concludes that the inability to cheaply reverse certain types of investments, like real assets, is more damaging for equities with high book-to-market values, than for those showing low book-to-market ratios. The effect appears to be amplified during periods characterized by market risk increases.

[6] In Carlson et al. (2006), for example, the present value of the cash flows stemming from assets-in-place, which determines the operating leverage, directly depends on the risk-free leverage rate. Ozdagli (2012) notes that when investment is financed with leverage, the shareholders care about financing costs.

on interest rates in models that use book-to-market to proxy expenditure commitments.

Gomes and Schmid (2010) argue that leverage and systematic risk are linked dynamically via the value of the growth options that populate the investment set of the firm. Their key insight is that firms can reduce their exposure to systematic risk by diminishing the share of intangible assets in their balance sheet, i.e., by exercising the growth option and acquiring tangible assets. The assumption that this hedging activity is financed by debt creates a trade-off between systematic and leverage risk, at the firm-level, which henceforth is called the growth (risk) channel. In this context, value equities are those issued by firms that are both highly leveraged and asset-rich, but that show little expansion potential. In contrast, growth equities feature low exposure to debt, but are very sensitive to systematic risk, because of the large share of intangible assets on their balance sheet.[7] In this context, the value premium stems from the comparative advantage of growth firms in exploiting the trade-off between asset and leverage risk. Naturally, changes in borrowing costs may hinder or facilitate the risk hedging activities of low book-to-market firms. Hence borrowing rates directly affect the terms of the trade-off between leverage and systematic risk originating the value premium.

Another perspective on the role of leverage in determining the value premium is discussed in Ozdagli (2012) who proposes a model in which corporate borrowing alone suffices to generates the value premium. In this setting, financial leverage affects equity risk through two channels. Debt increases equity risk directly, as proposed in Modigliani and Miller (1958). According to this leverage channel, there should be a positive value premium, with

[7] That firms with strong expansion opportunities show low levels of corporate borrowing is consistent with the empirical evidence presented in studies on optimal capital structure (e.g., Barclay et al. (2003), Billett et al. (2007)) which have highlighted that leverage is negatively related to growth opportunities, as predicted in Myers (1977).

high book-to-market being more leveraged and therefore more risky than growth firms.[8] In contrast, if we identify firm's expansion opportunities with call options on capital, then asset-light growth firms are riskier than more asset-rich value firms. In this context, it is the growth risk channel that should originate a negative value premium.[9] Ozdagli argues that empirical evidence of a positive value premium provides evidence that the direct effect of market leverage dominates the growth option channel.[10]

Elaborating on the results of the literature, I pose that decreasing yields affect the valuation of high book-to-market equities in two ways. The direct effect (through the leverage channel) is that lower rates reduce leverage risk, which benefits highly leveraged value equities. The indirect effect (through the growth channel) of a decline in yields is to strengthen the risk advantage of growth firms. Lower rates reduce cost barriers for firm expansion, where the exercise of the growth option to hedge systematic risk is the activity that originates the comparative risk advantage of low over high book-to-market equities.

Flight-to-safety episodes feature falling yields coupled with declining stock returns. If the leverage channel dominates, then the value premium should be low or zero under flight-to-safety scenarios. In contrast, if the growth option mechanism originates the value premium, then the return on the value-minus-growth strategy should be large. The opposite predictions

[8] The direct effect of leverage states that, if book leverage is constant, equity risk is positively correlated with the market value of firm debt. Empirically, Ozdagli documents that book leverage (market leverage) is about constant (increasing) across book-to-market deciles.

[9] In Ozdagli (2012), the premium is exacerbated by tax advantages on debt, as the tax shield makes disinvestment more costly.

[10] An additional reason to analyze the role played by benchmark borrowing rates in determining the value premium stems from a facet of firm risk that is associated with rigidity in wages (e.g., Carlson et al. (2006), Favilukis and Lin (2015)). Value firms are less able to adapt to aggregate shocks because their investment capacity is restrained by wage commitments. Empirically, it is known that wage growth tends to cluster around the long-run inflation rate (e.g., in Abbritti and Fahr (2013)). Consistently, changes in benchmark long-run rates may affect the valuation of high and low book-to-market equities by affecting investors' expectations of future labor costs. From this standpoint, rising yields signal higher expected long-run inflation and thus expectations of heavier wage commitments, which increase asset risk more for firms with strong wage commitments, i.e., more for value than growth equities.

Table 1: Predictions for the Value Premium During Flights

	Alternative Explanations	
	Growth Channel	Leverage Channel
Flight to Safety	+	0 or -
Flight from Safety	0 or -	+

are associated with flight-from-safety episodes, as these market scenarios feature the opposite trends in systematic and leverage risk. Table 1 summarizes these testable predictions.

The intuition that size may interact with both leverage and the growth option in generating the value premium can be traced back to Berk et al. (1999a), where they concluded that the expected returns on small firms are determined mostly by their exposure to systematic risk whereas large companies, for which the impact of new projects is minimal, yield expected returns that mostly depend on borrowing rates. This study exploits the differences in the dynamics of borrowing rates and systematic risk characterizing flight and contagion episodes to formulate a series of hypotheses that can be tested using the returns on the value-minus-growth strategy for firms of different size.

Aside for Berk et al. (1999a), also other early and influential contributions concluded that firm size determines the relative weight of the risks stemming from the growth option versus asset risk, in determining firm total risk. In particular, Carlson et al. (2006) show that the relevance of firm's expansion potential is declining over equity market value. This trend yields a size effect that overlaps with the premium associated with book-to-market. From this perspective, the relevance of the growth option channel in determining the value premium should weaken along with market capitalization. The implication is that in determining firm total risk, more weight is placed for small caps than for large equities on the ability of growth firms to reduce systematic risk through investment. Further, the predictions of models stipulating that the value premium stems from the growth option channel (e.g.,

Gomes and Schmid (2010), Choi (2013)) should be more compelling for small firms than for larger sized entities.

Flights display trends in borrowing rates and systematic risk of opposite nature. Flight-to-safety periods feature falling yields coupled with declining stock returns. On one hand, the decline in yields reduces cost barriers to the reduction of systematic risk through leverage, the very activity that originates the comparative advantage of growth versus value equities, according to the growth option channel. On the other hand, the increase in systematic risk makes the comparative advantage of low book-to-market firms all the more compelling in determining firm risk. Thus, flight-to-safety episodes should be associated with a large value premium for firms for which total risk is driven by the growth option channel. Under the hypothesis that the relevance of the growth option in determining firm-level risk declines along the size dimension, the prediction is then for a large value premium for equities with low market capitalization, during flight-to-safety episodes.

The literature offers some solid empirical evidence showing that leverage ratios and firm's market value are positively related (e.g., Rajan and Zingales (1995), Beck et al. (2005), Sufi (2009)). These results are consistent with a strengthening, along with the size dimension, of the leverage channel in determining the value premium. Building on this insight, leverage should play a preponderant role in originating the value premium more at the high-end of the market value range, than for small firms. Put differently, the predictions of models stipulating that the value premium stems from differences in leverage risk for high and low book-to-market equities (e.g., Ozdagli (2012)) should be more compelling for large caps than for small-sized equities.

Flight-from-safety episodes are marked by systematic risk declines and yield increases. Rates' increases detrimentally affects the total risk of firms, with the effect being particularly felt for firms with high leverage ratios. Further, the decline in systematic risk marking these market scenarios weakens considerations on the ability of systematic risk hedging in evaluating firm total risk. The implication is that the leverage channel should dominate the growth channel in determining the value premium for large caps. Hence, flight-from-safety episodes should be associated with a significant value premium for categories of firms in which leverage risk is large. As the empirical evidence indicates that size and leverage ratios are positively related, the leverage risk channel should play a preponderant role in originating the value premium at the high-end of the market value range. Hence, for large caps, flight-from-safety should be associated with a significant value premium.

Flight-to-safety episodes activate the growth option risk channel, through the increase in systematic risk, whereas flight-from-safety events are linked to surges in leverage risk. Notably, however, there are also secondary effects of contrasting nature. Flight-to-safety are associated with a decline of leverage risk, whereas flight-from-safety are marked by a decline in systematic risk. Lowering yields weakens the effectiveness of the leverage risk channel, in originating the value premium. If the leverage channel is the predominant cause of the risk differential between high and low book-to-market large caps, then flight-to-safety episodes should be linked to a very small, or even negative, value premium at the high end of the size distribution. Similarly, flight-from-safety episodes should be associated with a low or even negative value premium for small-sized equities, as the decline in systematic risk weakens the effectiveness of the growth option channel, in calculating firm total risk.

To summarize this section's discussion on the role of firm size in originating the value premium, the argument is that the investment (leverage) risk is more compelling in originating the value premium for small (large) firms. These hypotheses yield a complete set of testable predictions for the risk premium on book-to-market during flight to and from safety

Table 2: Prediction for the Value Premium Within Size Quintiles

	Small Caps	Large Caps
Flight to Safety	+	0 or -
Flight from Safety	0 or -	+

episodes. For ease of exposition, these predictions are summarized in Table 2.

While the predictions are stated for large and small caps in Table 2, it is presumable that the role of size in determining the predominance of either the investment option or leverage risk channel, during flights, is continuously distributed across the range of market capitalization. From this perspective, these predictions bear a stronger formulation in terms of the relationship between the value premium and size, during flights. More precisely, the value premium should be declining over the size dimension during flight-to-safety events, and increasing with market capitalization during flight-from-safety events.

This study evaluates the value premium from the perspective of the growth option and leverage risk channels. However, alternative views are suggested by other streams of the asset pricing literature. For instance, Cremers et al. (2008) propose risk factor based on firms likelihood to be acquired to explain the cross-section of equity returns. According to their results, the takeover factor is highly correlated with the standard High-Minus-Low (HML) premium, while not being subsumed by it. The factor is motivated by a model in which agency or synergy acquisition motives cause abnormal returns for firms which are potential targets of a takeover. The agency channel would explain a positive premium on potential targets. The added values stemming from potential synergies between the target and acquiring firms defines the synergy motive. This latter may explain both positive and negative expected returns on the target firms. In particular, when the valuation of risk is high, the synergy channel may entail a negative return premium on targets. However, when the price of risk declines, the expected synergies may cause a positive target premium. The agency motive yields an unambiguous positive premium, and its effect exacerbates during periods marked by positive cash-flow shocks.

Cremers et al., note that high book-to-market and large firms appear to be particularly exposed to the takeover channel. During flight-from-safety episodes, the price of risk declines whereas yields increase. Increasing interest rates tend to be detrimental to cash flows, as well as they make takeover options more expensive, all the rest equal. These features would weaken the agency motive to the acquisition. The synergy channel, instead, would be linked to a positive takeover premium, as market risk declines. In view of these findings, a large value premium for large caps during flight-from-safety events is consistent with the strong effect of the takeover factors for high book-to-market and strong market capitalization. Conversely, a weak return premium on book-to-market during flight-to-safety for large caps would be consistent with a negative takeover premium, due to the synergy motive, and weak agency motives (due to high market risk).

2 Identification of Flights

Following the approach proposed in Baur and Lucey (2009), flight to and from safety events are identified by significant changes, in the negative range, of the correlation between stocks and Treasuries. The correlation shocks for a potential crisis period are estimated with respect to the recent *status quo* of the relationship between the returns on the risky and safe indexes. Because the methodology employed to identify flights is not novel to this study, bar some important variations (e.g., the rolling sample framework), and since the focus of this paper is the value premium, rather than the identification of market instability events, a thorough discussion of the methodology, estimation details, as well as the evaluation of alternative methodologies, are relegated to Appendix A and its subsections. The following paragraphs provide a brief overview of the flight identification methodology, for the sake of clarity.

Let τ_0 be the first available trading day of a given calendar month. The (potential) crisis period consists of the daily observations falling into the calendar month initiating in τ_0, whereas the benchmark period coincides with the two calendar months preceding τ_0.[11] Denoting by $r_{s,t}$ the daily returns on the aggregate stock portfolio and by $r_{b,t}$ the daily returns on the Treasury benchmark portfolio, the linear model employed to detect flights over the month starting in τ_0 is:

$$r_{b,t} = \alpha_b + \beta_b r_{s,t} + \gamma_b r_{s,t} D_{\tau_0} + \gamma_b^* r_{s,t} D_{\tau_0}^* + e_t \tag{1}$$

where the binary variable D_{τ_0} equals 1 for all the observations falling in the calendar month starting in τ_0 (i.e., during the crisis period), and is zero otherwise. The dichotomous variable $D_{\tau_0}^*$ is always 0 except for the observations falling in the crisis and benchmark windows. Thus, $D_{\tau_0}^*$ equals one for all the observations falling in the two calendar months preceding date τ_0, as well as for the observations of the crisis month.[12] The coefficient on the crisis indicator D_{τ_0} in equation (1), denoted by γ_b, measures the change in the correlation between the stock and Treasury returns when moving from the benchmark to the crisis period. Flights are identified by significant changes, in the negative range, of the correlation between stocks and Treasuries. Further filters on the coefficients of equation (1) are devised to guarantee that flight-to-

[11] Baur and Lucey (2009) rely on benchmark and crisis windows of 50 and 20 trading day, respectively. The use the 50/20 windows yields results that are virtually indistinguishable from those obtained using calendar months. See the appendix for further discussion.

[12] Equation (1) allows for three separate levels of correlation between stocks and Treasuries: one for the period preceding the benchmark period, and two for the benchmark and crisis windows, respectively. This approach, proposed in Baur and Lucey (2009), generalizes Forbes and Rigobon (2002) by including the benchmark-crisis indicator variable.

safety (flight-from-safety) episodes are marked by falling (increasing) yields and depreciating (appreciating) stock values, as suggested in Baur and Lucey (2009). For any given month flights to and from safety are mutually exclusive market scenarios. Empirically, $r_{s,t}$ is the series of daily returns on the US value-weighted market portfolio from the Centre for Research in Security Prices, CRSP, whereas $r_{b,t}$ is the CRSP daily return on the 10-year Treasury.[13] Relying on Treasuries to model the dynamics of firms' borrowing conditions is convenient to foster consistency with the literature on market instability (e.g., Baur and Lucey (2009), Baele et al. (2013)), as well as to abstract from firm-specific credit risk considerations (e.g., Yang et al. (2009)).[14]

Equation (1) is evaluated for a sequence of rolling samples. The use of rolling benchmark periods captures the evolution of the information set of market participants, so that flights are defined with respect to recent market activities, rather than with respect to some ideal period of "normal" markets. In fact, the benchmark period itself may include episodes of market instability.

The estimation of equation (1) yields two dichotomous indicators, one for flight-to-safety and one for flight-from-safety events. These variables cover the calendar months ranging from June 1963 to December 2016. The first column in Table 3 reports the frequency of flight episodes over the entire sample. Given the severity of the financial crisis initiated in the summer of 2007, a plausible conjecture is that the frequency of flights may have been affected by the turmoil. To evaluate this possibility, Table 3 also reports the frequency of

[13] Variable 2000007 from the CRSP KYTREASNOX series. The series starts on June 14, 1961. The KYTREASNOX returns are from a monthly rebalanced portfolio of Treasuries with homogeneous maturities.

[14] The use of returns on Treasuries to capture the dynamics of aggregate leverage risk is also consistent with the theoretical framework underlying this study's analysis of the value premium. For example, in Gomes and Schmid (2010), firm debt is modeled as a consol bond paying an instantaneous coupon. This coupon is declining in the return of the risk-free rate, i.e., it is increasing in the yield on the risk-free bond. See also the discussion in Ozdagli (2012) for use of risk-free debt to explain the role of leverage in determining the value premium.

Table 3: Frequencies of Flights

Sample Period	1963–2016	1963–2007	2007-2009	2009-2016
	$n = 642$	$n = 528$	$n = 24$	$n = 90$
Flight to Safety	54 (8.40)	39 (7.39)	7 (29.17)	8 (8.89)
Flight from Safety	46 (7.15)	26 (4.92)	2 (8.33)	18 (20.00)

Note: The table reports the number of flight episodes detected in the calendar months falling between June 1963 and December 2016, as well as in a few of relevant sub-samples. Frequencies, in brackets, are calculated over the number (n) of calendar months in each subsample. Flight episodes are identified using the daily returns of the CRSP value-weighted stock market portfolio and the returns on the CRSP monthly rebalanced Treasury portfolio with 10-year maturity. The 2007-2009 crisis is enclosed between July 2007 and June 2009. The benchmark and crisis periods are of two and one calendar months, respectively.

Table 4: Summary Statisitcs of Returns During Flight Episodes

	Average		Median		Cut-off Top 10%		Cut-off Bottom 10%	
	Equity	Treas	Equity	Treas	Equity	Treas	Equity	Treas
Flight to Safety	-3.79	2.02	-2.68	1.91	-0.92	4.33	-8.47	0.14
Flight from Safety	3.71	-1.45	3.02	-1.19	7.21	-0.16	1.04	-3.70
All Sample	0.89	0.57	1.17	0.38	5.85	3.24	-4.41	-2.10

Note: The table list summary statistics of the price fluctuations observed during flight episodes. The percentiles are with respect to the distributions of the returns observed during flight-to-safety and flight-from-safety, considered separately. The monthly returns (not annualized) are from June 1963 to December 2016.

flights over three sub-periods: June 1963-June 2007, July 2007-June 2009, and July 2009-December 2016. The cut-off months are chosen to mark the beginning and the end of the most destructive phase of the 2007-2009 financial crisis.[15]

Figures 1 and 2 graphically illustrate the incidence of flights through time. Table 4 offers some basic statistics on the returns observed during these extreme market scenarios.

[Figures at the end].

Within each asset class, the fluctuations associated with flights appear to be rather symmetrical, in terms of the magnitude of price changes. The median of the price increases for equities appear to be larger than the magnitude of the price drops, with the median

[15] Bear Stearns liquidated two hedge funds exposed to the subprime mortgage sector in July 2007. The NBER recession indicator identifies the end of the downturn in June 2009.

stock appreciation during flight-from-safety topping 3%. In general, price fluctuations in the return on the long-term Treasury portfolio appear to be more subdued, with the average and median returns hovering around 2% both for price drops and increases.

The difference between the average and the median of the return distribution appears to be more marked for equities than for Treasuries. This result is explained by the presence of large price drops for equities (at about 20%), which are however absent for Treasuries. The top and bottom 10 percentiles of the return distributions emphasize that even extreme price changes tend to be smaller for Treasuries than for stocks, in absolute magnitude. A comparison of the effect of mild versus severe price drops on the value premium is postponed to Appendix B.

A qualitative validation of this study's empirical approach to the detection of market instability episodes is yielded by the ability of the flight estimators to match major market events. Such validation strategy yields comforting results. To begin with, evidence of flight obtained in this study match those reported for crisis events analyzed in Baur and Lucey (2009).[16] With regard to most recent events, which are necessarily not examined in Baur and Lucey (2009), Bear Stearns' liquidation of two hedge funds that were exposed to the subprime mortgage sector, occurred in July 2007, the demise of Bear Stearns, in March 2008, and Lehman Brothers' collapse, in September of 2008, were all marked by flight-to-safety episodes. The strong market reaction to the comments by the Federal Reserve Chairman on the reduction of quantitative easing policies in May 2013 (i.e., the so-called taper tantrum), is marked by a flight-from-safety episode. Similarly, there is evidence of a flight-from-safety episode in November 2016, as already mentioned.

[16] While this consistency is expected, as this study builds on the methodological insights of Baur and Lucey (2009), the approach adopted in this study considers rolling sample which are truncated at the end of the crisis period, as well as different types of standard errors. Hence this study's econometric approach is sufficiently different to make the consistency with previous literature worth mentioning.

3 The Value Premium During Flights

As outlined in Section 1, elaborating on recent theoretical contributions on the value premium yields quite precise predictions on the performance of the value-minus-growth strategy during flight episodes. This section summarizes the empirical evaluation of the hypotheses listed in Tables 1 and 2. The analysis considers the series of the monthly returns on the aggregate value-minus-growth portfolio (i.e., the HML premium), from Ken French's database, as well as on five size-sorted high-minus-low book-to-market portfolios. The returns on these size-sorted value-minus-growth strategies are calculated aggregating over the 25 size and book-to-market sorted portfolios (Fama and French (1993)), also available in Ken French's database.[17] Within each size quintile, and in each month, the value-minus-growth return is the spread between the return on the top (high) and bottom (low) book-to-market portfolios. Focusing on size quintiles, rather than relying on broader portfolios of large and small equities (e.g., Fama and French (2006)) allows investigating the existence of trends in the relationship between the premium and market capitalization, during episodes of market instability.

The first two rows of results in Table 5 report the stratified averages, over the flight indicators, of the returns on the six value-minus-growth portfolios, in annualized terms. Standard errors are obtained from a regression of the returns on the book-to-market portfolios on the indicators of flight to and from safety, which have been introduced in Section 6.[18] The regression approach preserves the full time-series structure of returns, and thus it allows

[17] At the end of the June of each year in the sample, the 25 size and book-to-market portfolios are formed at the intersections of two independent sorts of NYSE, AMEX, and (after 1972) Nasdaq stocks into five size and book-to-market groups. The groups are identified on the basis of the quintiles of the end-of-June market capitalization for NYSE stocks, and of the quintiles, again for NYSE stocks, on book-to-market ratios. Book equity is for the fiscal year ending in the preceding calendar year, and market equity is market capitalization at the end of December of the same calendar year. Firms with negative book equity are excluded.

[18] Note that in each given month flight-to-safety and flight-from-safety events are mutually exclusive.

to obtain autocorrelation-corrected standard errors (e.g., Cooper et al. (2004)).

I note that asymptotic inference is less than optimal in the present case, as the flight indicators are estimated variables with an unknown distribution. A valid alternative is offered by the use of bootstrap techniques (e.g., Horowitz (2001)). A further advantage of relying on bootstrap inference is driven by its resampling nature. Flights tend to be low-frequency events, as shown in Table 3. Therefore testing techniques that maximize the impact of the available observations tend to improve the quality of inference. All this said, In the following I opt for reporting the familiar autocorrelation-corrected asymptotic standard errors, whenever the asymptotic estimators of standard errors and those yielded by bootstrapping techniques yield virtually identical results.[19] Appendix B includes the analysis of the robustness of the key findings of this study to the use of asymptotic inference.

To test whether the average returns on the individual value-minus-growth strategies are significantly different from the sample average when one type of market instability occurs, I also regress the value-minus-growth monthly returns on each market instability indicator, taken individually, plus a constant.[20] Table 6 reports the coefficients of these regressions.

The stratified averages reported in the first column of Table 5 for the aggregate value-minus-growth portfolio indicates that the value premium is large and significant during flight-to-safety months. The first column of results in Table 6 also shows that the value premium is significantly larger during months for which there is evidence of flight-to-safety episodes than during months for which this type of market instability is not observed. The value premium

[19]The equivalence between the boostrap and asymptitic inference holds throughout the results presented in this study, with the exception of some of the results obtained for the CAPM-adjusted returns (see table (9). In that case, the bootstrap results are preferred.

[20]For example, the return on the aggregate value-minus-growth portfolio (VMG in the tables) is regressed on a constant and the indicator of flight-to-safety episodes. If the coefficient of the flight indicator is significantly different from zero, then the value premium is significantly different depending on whether a flight-to-safety episode occurs.

appears to be insignificant during flight-from-safety events. Further, the return gap between high and low book-to-market equities appears to be insignificantly different for periods with and without flight-from-safety events. In view of the hypotheses listed in Table 1, these pieces of empirical evidence suggest that the growth option channel dominates leverage risk, in determining the value premium.

Of course, an alternative explanation is that the preeminence of the growth risk channel is caused by shocks to systematic risk that are stronger than those affecting borrowing rates in the sample under examination. This latter explanation finds weak support in the comparison of price fluctuations associated with flight episodes reported in Table 4. Stock prices oscillations during market instability episodes tend to be more severe than those ascribable to Treasuries. This difference suggests that there have been stronger fluctuations in systematic risk than in expectations for long-term borrowing rates, which then would bring about the investment option channel in originating the premium. From this perspective, the analysis of the aggregate value premium across flight to and from safety events yields limited insights on the risk channels originating the return reward on book-to-market risk. Therefore, we turn out attention to the study of the value premium within each flight category.

As argued in Section 1, the relevance of the leverage and investment risk channels in determining the value premium may vary along with the size dimension. The predictions summarized in Table 2 are that the value premium of small firms is driven by the systematic risk hedging abilities of low book-to-market firms, whereas the value premium of large caps is driven by leverage risk. As argued, more stringent predictions can be formulated in terms of the relationship between size and the value premium during flights. In particular, the hypotheses are for a negative (positive) relationship between the value premium and market capitalization during flight-to-safety (flight-from-safety) events.

The stratified averages reported in Table 5 show indeed that the value premium decreases along with firm market value, during flight-to-safety months. A sizeable value premium associated with flight-to-safety months is found for firms up to the fourth size quintile, and the annual premium rate ranges from 30.5% to an economically significant 6.10%, for the fourth size quintile.[21] Noticeably, the value premium is economically and statistically insignificant for equities falling in the top size quintile.

The decreasing trend in the value premium along with the size dimension during flight-to-safety episodes is consistent with the hypothesis that the relevance of systematic risk versus leverage, in determining the value premium, may be monotonically size dependent. From this perspective, it is suggestive that an exception to the monotonic trend is concentrated on the third quintile of the size distribution. This size group is typically characterized by a market beta that is larger than that of the immediately preceding size category (e.g., Fama and French (1993)). Further, this beta is comparable in magnitude to that of the lowest size quintile. Hence, that the value premium observed during flight-to-safety episodes for the first and third size quintiles, at about 30% and 27%, are very close is consistent with the intuition that the ability to reduce systematic risk weights similarly, and heavily, on firm valuation in both size groups.

A flight-from-safety is a flight-to-safety in reverse. As such the expectation on the profitability of the premium during flight-from-safety is that it should increase along with the size dimension, because of the same effect causing the declining trend during flight-to-safety events. During flight-from-safety, the risk advantage of large (small) growth firms should be exacerbated (weakened) by the increase (decline) in borrowing rates (systematic risk). Symmetrically, value firms total risk should increase for large (small) equities due to the

[21] All monthly returns are annualized and are expressed in percentage terms.

increase (decline) in yields (systematic risk).

The stratified average reported in Table 5 bear out to the prediction of an increasing trend in the value premium along with the size dimension, during flight-from-safety months. There is a remarkable value premium for large firms, at about 26.7%, during flight-from-safety months. For equities falling in the fourth largest size quintile, the value-minus-growth strategy yields an economically significant 7.32% annualized return. A substantial value premium during periods of declining systematic risk and increasing rates is consistent with leverage being a dominant driver of the risk reward. Table 5 also documents that for the two lowest size quintiles, there is a statistically insignificant, but economically sizeable, growth premium, of about 4-5% during flight-from-safety episodes. This result is consistent with the leverage risk channel being outweighed in firm categories for which total risk is associated with the value of the growth option.

The analysis of the coefficients of the individual regressions reported in Table 6 indicate that the value premium of small (large) firms is lower (larger) than its sample average, during flight-from-safety months. The opposite effect is observable for flight-to-safety episodes, if in a weaker form. That the coefficients in Table 6 show an opposite sign at the two extremes of the size range, during both types of flights, is another piece of evidence supporting the hypothesis that the prominence of leverage or systematic risk in driving the risk advantage of low book-to-market equities may be size dependent.

Overall, the results discussed in this section are consistent with the hypotheses listed in Table 2. Shocks to borrowing rates are more (less) compelling than shocks to systematic risk for large (small) firms, in originating the value premium. From this standpoint, leverage-based models, like that proposed in Ozdagli (2012), can be fruitfully integrated with models capturing the effect of the growth option when explaining the value premium for equities.

Table 5: Stratified averages of the Value Premium

	VMG	ME1	ME2	ME3	ME4	ME5
Flight to Safety	13.24** (2.40)	27.43** (3.39)	18.92** (2.35)	26.40** (2.89)	5.17 (0.63)	−0.95 (−0.13)
Flight from Safety	6.86 (1.17)	−2.66 (−0.40)	−4.92 (−0.77)	5.70 (0.76)	4.57 (0.55)	25.50** (2.42)
Sample Average	4.48** (3.11)	10.35** (4.97)	6.46** (3.11)	6.71** (3.14)	2.96 (1.42)	2.60 (1.29)

Note: The table summarizes, by column, the stratified averages of the annualized monthly returns on the aggregate value-minus-growth portfolio, and on the five size-based value-minus-growth portfolios. The last row report the all-sample average. The column M1 refers to the value premium for stocks falling in the size quintile with lowest market capitalization. Stratification is according to the indicators of flight-to-safety and flight-from-safety episodes. Monthly returns are from June, 1963 to December, 2016. The t-statistic values, which are reported in brackets, are corrected for autocorrelation.

Table 6: Regressions of the Value Premium on Individual FC indicators

	VMG	ME1	ME2	ME3	ME4	ME5
Flight to Safety	9.5* (1.69)	18.52** (2.26)	13.50* (1.65)	21.36** (2.30)	2.4 (0.29)	−3.85 (−0.53)
Flight from Safety	2.53 (0.42)	−13.85** (−2.02)	−12.12 (−1.85)	−1.07 (−0.14)	1.71 (0.20)	24.37** (2.27)

Note: The table reports the coefficients α_2 of the regression $VMG_t = \alpha_1 + \alpha_2 F_t + \varepsilon_t$ where VMG_t is the series of monthly returns on either the aggregate value-minus-growth portfolio or one of the five size-based value-minus-growth strategies. The variable F_t represents one of the binary indicators of flight-to-safety and flight-from-safety episodes. Each choice of VMG_t and F_t yields a unique coefficient α_2, which is reported at the intersection of the row corresponding to the F_t variable selected and the column associated to the VMG_t series employed in the regression. Monthly returns are from June 1963 to December 2016. The t-statistic values, which are reported in brackets, are corrected for autocorrelation. The size group with lowest market capitalization is identified by M1.

The frequencies reported in Table 3 indicate that the stratified return averages reported in Table 5 are evaluated for about fifty flight to and from safety episodes. As a robustness check, in Section 4.5 I rely on DCC-based flight indicators, which identify a large number of flight episodes, and find results that are consistent with those obtained using regression-based flight indicators. A robustness check using rolling samples and daily flight indicators, reported upon in Appendix A, also yields consistent results for the performance of the value-minus-growth strategy during flights.

4 Robustness

This section examines the robustness of the conclusions drawn up to this point to key changes in the methodology employed to evaluated flight episodes, and to the use of the CAPM-adjusted returns. It also reports on the performance of the value-minus-growth strategy during flights where these are identified using real returns. The analysis is further expanded to consider the effect of relying on short-term Treasury rates, rather than on the benchmark 10-year Treasury, in identifying the safe-haven investment option. Further robustness checks, of more technical nature, are presented in Appendix A.

4.1 Real Returns

Most of the theoretical literature on the value premium abstracts from considering inflation and thus discusses real returns (e.g., Gomes and Schmid (2010)). Hence, to foster consistency between the theoretical and empirical frameworks, flights episodes should be identified using real returns rather than nominal ones. The conclusions of this study hold when real returns rather than nominal returns are employed to identify flights.

Table 7: Stratified Averages with Real Returns

	$n = 642$	VMG	ME1	ME2	ME3	ME4	ME5
Flight to Safety	48 (7.47)	16.48** (2.80)	31.17** (3.47)	23.28** (2.67)	30.21** (5.77)	7.27 (0.85)	1.98 (0.26)
Flight from Safety	53 (8.25)	3.91 (0.76)	−5.44 (−0.85)	−8.94 (−1.39)	1.21 (0.11)	5.13 (0.77)	22.04** (2.54)

Note: The first column reports the incidence of flight indicators, where these are calculated using the excess returns, over the one-month risk-free return, of the CRSP 10-year Treasury monthly portfolio and the CRSP value-weighted stock market portfolio. Frequencies, in brackets, are with respect to the number n of calendar months in the sample. The remaining columns summarize the stratified averages of the monthly returns on the aggregate value-minus-growth portfolio, and on the five size-based value-minus-growth portfolios. M1 denotes the size group with lowest market capitalization. Monthly average returns are from June 1963, to December 2016. Returns are in annualized percentage terms. The values of the t-statistic are in brackets, and are corrected for autocorrelation.

Real returns as calculated as the spread between monthly nominal returns and the monthly risk-free rate, which is extracted from Ken French's database. These real returns are substituted to the nominal returns r_s and r_b in equation 1 to estimate real-terms flight indicators, following the methodology described in Section 6.

The comparison of the stratified averages of the value premium reported in Tables 5 and 7 indicates that using real returns does not affect any of this study's conclusions. In particular, the empirical evidence continues to support the hypotheses highlighted in Table 2 and 12. This consistency is expected given the high correlation between the flights obtained from real and nominal returns.[22]

4.2 Shorter Maturity as Safe Haven

Studies exploring the optimal capital structure of the firm argues that the choice of debt maturity is influenced by a variety of market forces, among which information asymmetries, agency costs, tax incentives and, crucially, by the value of the growth options available to

[22] The tetrachoric correlation between the nominal and real flight-to-safety indicators is 0.94, whereas the corresponding correlation for the flight-from-safety variables is 0.95.

the firm. As the growth option appears to be one of the drivers of the value premium, the choice of gauging corporate borrowing rates using a long-term benchmark may raise some concerns. The possibility is that this approach results in placing more weight on the dynamics of leverage for firms with poor growth opportunities.[23] As a result, the choice of gauging benchmark corporate rates by long-term yields, as done in section 6, may not be as neutral as hoped. To assuage these concerns, the analysis of the value premium during flight and contagion episodes is replicated hereafter for market instability events identified using the return on the 1-year Treasury. The choice of the one-year maturity is dictated by data availability and economics concerns. This maturity is also the shortest for which CRSP calculates Treasury daily returns that are comparable to those employed in Section 6. Further, the short maturity is also considered to model safe haven assets that allow investors to "park" their wealth in liquid and short-term risk-free investments while waiting for market uncertainty to resolve. Table 8 reports the stratified averages of the value premium for flight and contagion indicators that are identified using equation 1 after substituting the returns of the 10-year Treasury with that of the 1-year Treasury.

After substituting the 1-year maturity to the 10-year benchmark, the number of flight-from-safety months drops precipitously, by more than 50%. The resulting extreme paucity of observations is likely to affect the statistical significance of the value premium for these market conditions. For example, while the stratified averages of the value premium during flight-from-safety events are economically significant, they are not statistically so. This lack of significance is not surprising, given that there are only 17 incidences of flight-from-safety episodes in the sample, when relying on the one-year borrowing rate benchmark. Despite

[23] As argued in Myers (1977), firms with more growth options in their investment opportunity sets should issue mostly short-term debt, to minimize agency costs. See also Barclay et al. (2003) and Billett et al. (2007).

Table 8: Stratified averages with Short-term Treasuries

	$n = 643$	HML	ME1	ME2	ME3	ME4	ME5
Flight to Safety	67 (10.43)	20.22** (5.24)	41.51** (7.27)	27.51** (4.87)	30.21** (5.77)	11.98** (2.18)	6.06 (0.97)
Flight from Safety	17 (2.65)	8.07 (1.05)	13.15 (1.46)	−10.88 (−1.26)	1.21 (0.11)	15.38 (1.46)	31.22** (2.71)

Note: The first column reports the incidence of flight and contagion indicators, where these are calculated using the daily returns of the 1-year Treasury and of the value-weighted stock market portfolio, both from CRSP. Frequencies, in brackets, are with respect to the number n of calendar months in the sample. The remaining six columns summarize the stratified averages of the annualized monthly return of the aggregate value-minus-growth portfolio, and of five value-minus-growth portfolios of stocks falling into size-based quintiles, with M1 being the size group with lowest market capitalization. Monthly average returns are from June 1963 to December 2016. Returns are listed in annualized percentage terms. The t-statistic values are in brackets and are corrected for autocorrelation.

these differences, the comparison of the stratified average over flights identified using the long and short-term maturities, presented in Table 5 and Table 8, outlines a substantial robustness of the conclusions obtained in this study. In particular, the performance of the value strategy during market instability episodes is strongly consistent with that documented in Section 3, especially for the types of episodes in which a sufficiently large of observations allows a more robust evaluation of statistically significance (e.g., positive contagion and flight-to-safety episodes).

4.3 Adjusted Returns

Previous research has shown that the premium on book-to-market yield significant adjusted returns, once adjusted for market risk (e.g., Fama and French (2006)). The CAPM monthly adjusted returns (annualized) for the value-minus-growth strategy are reported in Panel A of Table 9, for the whole sample and for the subsamples identified by evidence of flight to and from safety.[24]

[24] I employ bootstrap with replacement to obtain the p-values reported in Table 9. The use of standard errors obtained from asymptotic variance estimators entails mostly insignificant adjusted returns, in both

As expected, the risk-adjusted returns of the value-minus-growth strategy appear to be significant across size categories, in the full sample.[25] However, over months marked by flight-to-safety episodes, the CAPM appears to account satisfactorily for the value premium across all size categories. The first row of results in Panel A of Table 9 shows that, at the 5% significance level, there are no significant abnormal return for the value-minus-growth strategy, across the size quintiles. The finding of only weakly (i.e., at the 10% significance level) positive abnormal CAPM returns during flight-to-safety episodes is consistent with systematic risk being the driving source of the risk reward on book-to-market, for these market scenarios. Put differently, market risk exposure appears to suffice to capture differences in the risk profile of growth and value firms, during flight-to-safety events.

The first row of results in Panel B of Table 9 reports the TERM-adjusted returns of the value-minus-growth strategies, for flight-to-safety events, where TERM (e.g., Fama and French (1993)) gauges leverage risk.[26] These risk-adjusted rates are positive and highly significant, for all value-minus-growth portfolios, but the one of the top size quintile. The implication is that during flight-to-safety episodes leverage risk alone fails to explain the value premium.

Including the TERM risk factor in the CAPM regression, for the subsample identified by flight-to-safety events, brings about significant adjusted abnormal returns on value-minus-growth portfolios for small and medium-sized equities. In particular, the abnormal returns reported in Panel C of Table 9 for flight-to-safety episodes appear to support the hypotheses

the subsamples identified by the flight to and from safety indicators. Since the flight indicators are estimated variables with unknown distribution, the p-values obtained through bootstrap techniques are preferable over those yielded by asymptotic statistical inference in the subsamples defined by the incidence of flights.

[25] Using standard errors yielded by asymptotic variance estimators, the CAPM adjusted risk premium on book-to-market is insignificant in the last two size quintiles, when analyzing the full sample. This result is consistent with the conclusions reported in Fama and French (2006) for the 1963-2004 sample.

[26] Employing the excess return on the 10-year homogeneous maturity Treasury used to identify flights instead of TERM yields indistinguishable results.

tabulated in Table 2 more strongly than the CAPM-adjusted returns reported in Panel A. This finding is consistent with an interaction effect of leverage and systematic risk in determining the value premium, during flight-to-safety events. The effects of leverage and market risk may interact non linearly, however. In an unreported result I find that a regression including the interaction of TERM and the market excess return yields insignificant adjusted returns, for all firm size categories, during flight-to-safety events.

The adjusted returns reported in the second row of results in Panel A of Table 9, indicate that the CAPM fails to capture the value premium during flight-from-safety events, across all size categories. Put differently, shocks to borrowing rates generate a large adjusted value premium, for large caps, that does not appear to be captured by the exposure to market risk. However, the results reported in Panel B of the same table indicate that adjusting for leverage risk (through the TERM factor) fully erase these abnormal returns during flight-from-safety events. The lack of significance of the risk reward on book-to-market during flight-from-safety episodes holds regardless of whether the market excess return is included with the TERM factor, as shown in Panel C. From this perspective, the of Table 9 indicate that the leverage risk channel does not significantly interact with the risk stemming from the investment option in determining the value premium, during flight-from-safety events.

To summarize, the results yielded by the analysis of risk-adjusted returns indicate that during flight-to-safety events, systematic risk explains the bulk of the large value premium observed for small and medium-sized equities. However, there appears to be a degree of interaction between leverage and systematic risk, which may be non-linear in nature. In contrast, the value premium observed during flight-from-safety events appears to be solely due to leverage.

Table 9: Stratified Averages Adjusted Returns

Panel A	VMG	ME1	ME2	ME3	ME4	ME5
Flight to Safety	4.86 (0.12)	11.13* (0.07)	7.25 (0.12)	11.50* (0.08)	1.97 (0.21)	−3.54 (0.17)
Flight from Safety	15.33** (0.02)	15.13** (0.03)	10.17* (0.07)	16.81** (0.04)	14.17* (0.07)	18.20* (0.07)
All Sample	5.48** (0.00)	12.51** (0.00)	8.13** (0.00)	8.31** (0.00)	3.80** (0.01)	2.70** (0.04)
Panel B						
Flight to Safety	22.35** (0.00)	36.32** (0.00)	35.11** (0.00)	40.23** (0.00)	20.09** (0.01)	6.01 (0.13)
Flight from Safety	−1.75 (0.26)	−4.78 (0.15)	−10.19* (0.07)	−8.14* (0.10)	−3.64 (0.18)	7.85 (0.54)
All Sample	4.96** (0.00)	7.44** (0.00)	6.62** (0.00)	7.37** (0.00)	3.44** (0.04)	2.80* (0.07)
Panel C						
Flight to Safety	14.17** (0.03)	19.33** (0.03)	24.16** (0.01)	25.39** (0.01)	18.37** (0.04)	3.39 (0.18)
Flight from Safety	7.77 (0.10)	10.52 (0.10)	3.78 (0.17)	5.10 (0.16)	6.70 (0.16)	7.01 (0.16)
All Sample	5.06** (0.00)	7.68** (0.00)	6.80** (0.00)	7.54** (0.00)	3.53** (0.04)	2.08* (0.07)

Note: Panel A reports the coefficients α of the regression $VMG_t = \alpha + \beta_2 Mrkt_t + \varepsilon_t$ where VMG_t is the aggregate monthly return on the value-minus-growth portfolio, and on the five size-based value-minus-growth portfolios. The last row reports the all-sample adjusted returns. The variable $Mrkt_t$ is the excess stock market return. The adjusted returns in the first and second rows are evaluated for the subsamples identified by months for which the flight-to-safety and flight-from-safety indicators are equal to 1, respectively. In Panel B the market excess return is substituted by the risk factor TERM. In Panel C the CAPM equation is augmented with the TERM factor. The column M1 refers to the value premium for stocks falling in the size quintile with lowest market capitalization. Monthly returns are from June, 1963 to December, 2016. The bootstrap p-values are obtained from bootstrap with replacement, under the null $\alpha = 0$ in each sample. The adjusted returns are in annualized percentage terms.

4.4 Severe and Mild Shocks

This section refines the analysis of the value premium by focusing on flights that are characterized by shocks of different degrees of severity. Presently, months characterized by flights are sorted into four groups, depending on whether the observed price fluctuations are mild or severe. Stock price drops are classified as severe (mild) when larger (smaller), in magnitude, than the median of the stock returns observed during months showing the market condition under consideration. To illustrate, the drop in stock prices featured by a given flight-to-safety month is classified as severe if during the same month the return on stocks is below the median of the monthly stock returns recorded over the 54 months showing evidence of flight-to-safety dynamics. Treasury return fluctuations are categorized as mild versus severe in an analogous fashion. Table 4 reports the thresholds employed to separate mild and severe events for each asset class. For each type of market instability, I construct four indicators on the basis of the severity of fluctuations in returns.[27]

Building on the framework outlined in Section 1, we should expect that the effects of the growth option risk channel, in originating the risk premium, are emphasized by severe increases in systematic risk. In contrast, the role of leverage risk should be highlighted by scenarios showing strong fluctuations in yields. In particular, strong shocks to systematic risk should drive the value premium for small firms, whereas severe fluctuations in yields should determine the risk rewards on book-to-market for large caps.

The analysis of the returns on the value-minus-growth strategy during market instability episodes that are characterized by severe and mild declines of systematic risk and leverage are consistent with these predictions. However, the results add some nuances to the conclu-

[27] For example, there are four dichotomous variables for flight-to-safety episodes. These are Severe-Mild, Mild-Mild, Severe-Severe, and Mild-Severe flight-to-safety indicators. Each of these variables is nonzero only for the events for which stock and Treasury returns fall in the appropriate categories of return fluctuations.

sions of Section 3, as neither the growth option risk channel nor leverage risk appear to be completely inactive at either end of the size distribution.

The results reported in Panel A of Table 10 show that in the lowest three size quintiles the premium is significant in any flight-to-safety scenario for which the increase in systematic risk is severe.[28] For large caps, however, the results indicate that a positive value premium is only present when the increase in systematic risk is large and the yield decline is mild. In contrast, there is evidence of a growth premium when leverage risk declines markedly, due to severe drops in rates. These results are consistent with the predictions outlined in Table 2: the value premium of small and medium-sized is mostly driven by the investment risk channel, whereas the risk reward on book-to-market responds to yield shocks, for large-sized equities.

The stratified averages reported in Panel A of Table 10 show that the value premium appears to be at its strongest when the increase of systematic risk is severe, and at the low end of the distribution. Moreover, when market risk experiences a severe increase, and yields fall also severely, we observe a strongly declining trend in the premium, over the size categories. In these scenarios, there is a positive value premium for small firms, but a growth premium for large caps. To interpret these results, we recall the discourse yielding the predictions listed in Table 1, for flight-to-safety events: the growth option risk channel links increases in systematic risk with a positive value premium, whereas declines in rates reduce the risk of high-debt value firms, through the leverage risk channel, and thus yielding a growth premium.

The finding of strong growth premium for large caps during severe-severe flight-to-safety episodes is consistent with the leverage channel being the dominant source of the risk spread

[28] Due to the low number of observations, in this section I rely on bootstrap to obtain the standard errors of the stratified averages. Asymptotic inference yields qualitatively equivalent results.

between value and growth firms, at the high end of the size distribution. The strong value premium observed for small caps for these same scenarios is consistent with the growth option channel dominating leverage risk in determining the risk reward on book-to-market, at the low end of the size distribution.

However, the results also indicate that neither the leverage or investment option channels are inactive at either side of the distribution of market capitalization. The comparison of the flight-to-safety episode characterized by the severe-severe and severe-mild shocks, for systematic and leverage risk respectively, is consistent with severe declines in yields having the effect of weakening the risk advantage of low-debt growth firms, across all firm size categories, including for small caps. Similarly, severe increases in systematic risk coupled with mild shocks to borrowing rates are associated with a significant value premium for large caps. Indeed, the presence of a significant value premium for large caps for severe-mild flight-to-safety episodes, as shown in the first row of Panel A in Table 10, is consistent with the growth option risk channel being active also at the high end of the size distribution, when the increase in systematic risk is severe.

If systematic risk is associated with higher risk levels for high book-to-market equities than for growth firms, then market expansions should yield the opposite effect: all the rest equal, the spread between value and growth options should be negative when systematic risk declines. Analogously, increases in yields should activate the leverage channel risk, thus yielding a risk advantage to low-debt growth firms, and generating a positive value premium.

The stratified averages of the value premium during flight-from-safety episodes documented in Panel B of Table 10 are consistent with these conclusions. In particular, the growth premium found for small and medium-sized firms for scenarios in which systematic risk declines severely indicates that the investment option risk dominates leverage risk in determining the firm risk, at the low end of the market capitalization distribution. Put differently, in buoyant markets investors regard growth firms as riskier, thus originating a growth premium when stock market returns are large. Evidence of a positive value premium for large caps when yields increase is instead consistent with the leverage channel being the driving risk channel in originating the value premium, for firms with high levels of market capitalization.

Comparing the top quintile value premium averages across all the scenarios listed in Panel B, indicates that the large-cap value premium is at its minimum when the decline in systematic risk is severe. This result suggests that systematic risk still plays a role in determining the risk-reward on book-to-market for large firms, albeit a marginal one. Similarly, small-caps yield the smallest growth premium when yield increases are strong, which suggests that the leverage risk affects the risk reward on book-to-market also at the low end of the size distribution.

4.5 DCC-based Flights

There is a wide literature aiming to assess the international correlation of bonds and equities. Studies in this area often rely on models of the cross-asset volatility and correlations (e.g., Engle (2002b), Cappiello et al. (2006), Perego and Vermeulen (2016)). Motivated by these studies, I consider a broader definition of flights based on the daily value of the Dynamic Conditional Correlation (DCC) between the returns on the stock index and the benchmark 10-year Treasury. Consistently with previous literature, this section focuses on daily returns and obtain a time series of DCC daily correlations. In this context, a DCC-flight-to-safety occurs during a given trading day when the DCC is negative and the return on the stock index is negative whereas the return on the 10-year Treasury portfolio is positive. Switching the

Table 10: Flights with Severe and Mild Shocks

Panel A			Flight to Safety					
Market (↓)	Yields (↓)	n	VMG	ME1	ME2	ME3	ME4	ME5
Severe (↓)	Mild (↓)	8	38.50** (0.00)	70.62** (0.00)	57.10** (0.00)	54.60** (0.00)	24.01** (0.02)	0.01** (0.01)
Mild (↓)	Mild (↓)	19	13.32** (0.01)	17.40** (0.03)	20.28** (0.00)	18.94** (0.02)	4.98 (0.13)	6.41 (0.13)
Severe (↓)	Severe (↓)	19	9.19* (0.09)	32.12** (0.01)	9.17 (0.13)	26.87** (0.03)	−1.20 (0.23)	−15.06* (0.06)
Mild (↓)	Severe (↓)	8	7.11 (0.14)	10.72 (0.14)	13.12 (0.12)	15.40 (0.11)	6.07 (0.15)	−0.61 (0.24)
Panel B			**Flight from Safety**					
Market (↑)	Yields (↑)	n	VMG	ME1	ME2	ME3	ME4	ME5
Severe (↑)	Mild (↑)	9	−5.78 (0.11)	−13.78** (0.01)	−13.46* (0.05)	−16.48** (0.02)	−16.94** (0.03)	10.15* (0.10)
Mild (↑)	Mild (↑)	14	12.94** (0.04)	7.16 (0.11)	1.63 (0.21)	7.87 (0.14)	8.17 (0.13)	34.85** (0.01)
Severe (↑)	Severe (↑)	14	−0.45 (0.23)	−15.42* (0.05)	−22.57** (0.04)	4.18 (0.19)	11.17 (0.13)	33.29** (0.04)
Mild (↑)	Severe (↑)	9	15.59** (0.01)	−3.79 (0.19)	13.11* (0.04)	20.14** (0.02)	17.38** (0.03)	24.94** (0.04)

Note: This table summarizes, by column, the stratified averages of the annualized monthly returns on the aggregate value-minus-growth portfolio, and on the equivalent five size-sorted long-value short-growth strategies. The stratification is on flight-to-safety and flight-from-safety episodes that are characterized by different combinations of severe and mild fluctuations of the monthly returns on the aggregate stock portfolio and on the benchmark 10-year Treasury. A severe drop in stock prices during a flight-to-safety occurs when, during the flight, the stock market aggregate monthly return is below the median of the corresponding returns recorded for the months in which flight-to-safety episodes are observed. An analogous definition applies to the returns on the 10-year Treasury. Note that a positive Treasury return indicates declining yield rates. The opposite set of conditions identifies severe and mild fluctuations during flight-from-safety episodes. Monthly returns are from June 1963 to December 2016. The bootstrapped p-values are reported in brackets.

sign of the daily returns on the asset class representatives defines a DCC-flight-from-safety.

The disadvantage of relying on the sign of the DCC to define flight episodes, rather than on significant changes in inter-asset correlations, is that we lose any reference to deviations from an existing status quo. Thus, the resulting indicators of flight to and from safety have little to do with market instability. The advantage of this approach is that it yields plenty of observations for which DCC-based flights are detected, as the methodology relies on returns sampled at a daily frequency and applies a broader definition of flights. A large number of flight events is beneficial to the quality of the inference on the stratified average of the value-minus-growth strategy.[29]

There are 13,341 trading days for which the DCC can be calculated over the 1963-2016 sample, and, as shown in the first column in Table 11, of these about 10% are marked by DCC-flights.[30] A comparison with the frequencies reported in Table 3 shows that the use of the DCC yields generous estimates of the incidence of flights, as expected.[31] The stratified averages of the daily returns on the value-minus-growth strategy during DCC-based flights are reported in Table 11.[32]

The analysis of the performance of the value-minus-growth strategy reveals that the premium is broadly characterized by trends during flights episodes. The risk premium is broadly declining (increasing) along the size dimension during flight-to-safety (flight-from-

[29] I rely on a DCC with one symmetric innovation and one conditional covariance lag in the univariate volatility model. Introducing asymmetric innovations like in Cappiello et al. (2006) does not alter the conclusions.

[30] Also in this case, inference based on bootstrap or asymptotic variance estimators yield identical results. I therefore refer the familiar asymptotic t-statistic values.

[31] In an unreported analysis I find that DCC-based flight-to-safety episodes appear to dominate, in terms of frequency of incidence, during and after the 2007-2009 crisis. This finding is consistent with the conclusion obtained for the regression approach to identify flights.

[32] The reported standard errors are autocorrelation adjusted. Also in this case, the use of bootstrapped standard errors fails to modify the results obtained from asymptotic inference.

Table 11: Regressions of the Value Premium on Individual FC indicators

	$n = 13,341$	VMG	ME1	ME2	ME3	ME4	ME5
Flight to Safety	1,381 (10.35)	-1.06 (-0.54)	25.24** (11.52)	2.59 (1.00)	8.79** (3.24)	2.57 (0.79)	-29.93** (-9.07)
Flight from Safety	1,401 (10.50)	3.34* (1.74)	-13.78** (-7.50)	1.10 (0.46)	-1.02 (-0.40)	1.69 (0.58)	25.70** (7.56)
Sample Average		1.93** (4.18)	4.41** (7.77)	2.88** (4.42)	2.95** (4.30)	1.33* (1.85)	1.14 (1.44)

Note: The first two rows of results report the stratified averages of the value premium over the DCC-based indicators for flight-to-safety and flight-from-safety episodes. The table summarizes, by column, the stratified averages of the daily returns on the aggregate value-minus-growth portfolio, and on the five size-based value-minus-growth portfolios. The average daily returns are in basis points. The sample period is from June 1963 to December 2016. The t-statistic values, which are reported in brackets, are corrected for autocorrelation. The size group with lowest market capitalization is identified by M1.

safety) episodes. The results also reveal, however, that the sign of the DCC captures market conditions that exacerbate the return spread between high and low book to market firms almost exclusively a the extremes of the size range, that is for firms with a market capitalization falling in the first and fifth quintiles. This finding is consistent with the DCC method identifying not only events that strongly affect the balance of leverage and systematic risk in firm total risk assessment, but also periods for which the changes in the relative profitability of stocks and bonds are moderate. From this perspective, the use of the daily estimates of the stock-bond correlation hinders the disentangling of the effects of the leverage and systematic risk channels, on the value premium.

5 Contagion Episodes

Most recent studies debating the origin of the value premium (e.g., Gomes et al. (2003), Carlson et al. (2006), Choi (2013), Favilukis and Lin (2015), among others) assume that aggregate shocks are determined by a unique state variable. This approach is consistent with the classical asset pricing paradigm (e.g., Campbell and Cochrane (1999)) in which aggregate stock returns are countercyclical, whereas borrowing rates are procyclical.[33]

Flight episodes fit neatly in the mold of these cyclical patterns. In contrast, it is harder to grasp the mechanisms underlying market conditions in which stocks appreciate and borrowing rates decline, as it is the case, for example, during positive contagion episodes. Yet this declination of aggregate market instability accounts for about half of the instances in which instability is detected in our sample.

Brandt and Wang (2003) propose that the risk aversion of the representative agent is a function of the realization of relative consumption growth (as in Campbell and Cochrane (1999)) as well as on inflation shocks. Through simulations, the authors document that Treasuries respond more precisely and strongly than equities to unexpected innovations in inflation, but that stocks respond more promptly to shocks to (relative) consumption growth. Elaborating on these conclusions, flights and contagion episodes between stocks and Treasuries can be thought as originating from shocks to consumption growth (or output) and leverage costs that are of similar (for flights) or opposite (for contagion) nature. This two-state-variables approach is consistent with earlier explanations of the value premium, such as in Berk et al. (1999b) where firm risk fluctuations are generated by two sources of aggregate risk, one of which drives borrowing rates.

Table 13 summarizes the incidence of contagion episodes. In the 1963-2016 sample negative contagion episodes have occurred in about 6% of the months. Positive contagion months, in which both stocks and Treasuries appreciate, account for a relatively large percentage of events, as they are detected in about 13% of the instances. Both positive and negative contagion episodes virtually disappeared since 2007, which suggests that the 2007-2009 crisis

[33]One of the exceptions is Verdelhan (2010) according to whom the risk-free return is low during bad times because a negative shock to the domestic economy depreciates the domestic currency against those of trading partners.

had caused a structural change in the relationship between long-run inflation expectations and stock returns. The exploration of this possibility is beyond the scope of this study.

Episodes of negative contagion are characterized by increases in systematic risk coupled with increasing yields. As during both flight-to-safety and negative contagion systemic risk raises, the effects of the growth option channel should be similar under both scenarios. Consistently with the hypothesis that the relationship between the relevance of the growth option in determining firm risk is declining in firm size, the risk advantage of low book-to-market firms should be similar during negative contagion and flight-to-safety episodes for small caps. In terms of leverage, flight-to-safety and negative contagion are marked by different trends in the benchmark yields. If the dominance of the leverage channel in originating the value premium is increasing over size, then the value premium of large caps should be lower during flight-to-safety than during negative contagion episodes.

The predictions for the differences in the value premium during flight-from-safety and negative contagion episodes for small and large caps are reversed, with respect to those outlined for the comparison of negative contagion with flight-to-safety. During both flight-from-safety and negative contagion episodes, yields increases activate the leverage risk channel. Consistently with the hypothesis that the effect of leverage risk on the value premium is increasing over size, the value premium during flight-from-safety should be close to that observed during negative contagion, for large caps. In terms of systematic risk, flight-from-safety and negative contagion episodes are marked by opposite trends. According to the hypothesis that the effect of systematic risk are declining in firm size, the prediction is for a weaker return on the value-minus-growth strategy during flight-from-safety than during negative contagion episodes, for small equities. The first two rows of Table 12 summarize the predictions on the performance of the value premium during negative contagion episodes.

Positive contagion episodes feature price moments that are the opposite of those marking negative contagion events, with the returns on bonds and stocks being positive and more tightly correlated, as stocks appreciate and yields fall. The predictions for the difference between the value premium during positive contagion and flights should then be the opposite of those formulated for negative contagion episodes, at each end of the size distribution. Thus we should observe a similar value premium during positive contagion and flight-from-safety, for large caps. There should also be a comparable value premium during positive contagion and flight-to-safety, this time for small caps. Differences in the value premium during positive contagion should be concentrated in small firms, for flight-to-safety episodes, and in large equities, during flight-from-safety scenarios. In particular, the increase in systematic risk marking flight-to-safety (flight-from-safety) episodes should be associated with a stronger value premium than the one observed for the small (large) firm size category, during positive contagion.

The symmetry in the predictions for negative and positive contagion relies on investors weighting symmetrically aggregate shocks of opposite nature. However, there is a large literature arguing that markets respond asymmetrically to bad and good news. For instance, Cappiello et al. (2006) noted that the correlation of stock and bonds returns across international markets responds more markedly to bad news, and note a significant difference between the response of bond and equity correlation. Further, Engle and Ng (1993) argued that the second moments of asset returns respond markedly differently to positive and negative aggregate shocks.[34] In particular, news regarding unfavorable events appear to affect cross-asset correlations more markedly than favorable ones. From this perspective, during positive contagion episodes the combined declines in systematic risk and yields could also

[34] Even at the equity level, Bollerslev et al. (2016) the information conveyed by the volatility of stock price decreases and increases appears to have differential predictive power equity returns Bollerslev et al. (2016).

Table 12: Predictions for Contagion Episodes

	Small Caps	Large Caps
Negative Contagion v.s. FTS	NC=FTS	NC>FTS
Negative Contagion v.s. FFS	NC>FFS	NC=FFS
Positive Contagion v.s. FTS	PC<FTS	PC=FTS
Positive Contagion v.s. FTS	PC=FFS	PC<FFS

Note: FTS stands for flight-to-Safety episodes, FFS stands for flight-from-safety episodes.

Table 13: Incidence of Contagion Episodes

Sample Period	1963–2016	1963–2007	2007-2009	2009-2016
	$n = 643$	$n = 516$	$n = 24$	$n = 90$
Negative Contagion	36 (5.60)	34 (6.59)	0 (0)	2 (2.22)
Positive Contagion	83 (12.91)	81 (15.70)	0 (0)	2 (2.22)

Note: The table reports the number of contagion episodes detected in the calendar months falling between June 1963 and December 2016, as well as in a few of relevant sub-samples. Frequencies, in brackets, are calculated over the number (n) of calendar months in each subsample. Contagion episodes are identified using the daily returns of the CRSP value-weighted stock market portfolio and the returns on the CRSP monthly rebalanced Treasury portfolio with 10-year maturity. The 2007-2009 crisis is enclosed between July 2007 and June 2009. The benchmark and crisis periods are of two and one calendar months, respectively.

generate an insignificant value premium across firm size. The two bottom rows of Table 12 summarize the predictions for the value premium during positive contagion, with respect to flights.

The stratified averages reported in Table 5 indicate that the value premium with no size-sorting is large and significant for negative contagion months, reaching a annualized return that is slightly lower than that observed during the flight-to-safety months. Moving along with the size dimension, the premium is shown to be statistically and economically significant for all size categories, ranging from 22.43% to 12.63%. There appear to be no value premium during positive contagion episodes, across all firm size categories.

The stratified averages reported in Table 5 appear to broadly support the predictions reported in Table 12. The large-cap (small equity) value premium is larger during negative

Table 14: Stratified Averages on Contagion Episodes

	VMG	ME1	ME2	ME3	ME4	ME5
Negative Contagion	13.59** (3.12)	22.43** (3.70)	18.99** (2.90)	19.74** (3.44)	14.80** (2.51)	12.63** (1.80)
Positive Contagion	−0.89 (−0.24)	−0.88 (−0.16)	1.32 (0.27)	−2.63 (−0.55)	−2.80 (−0.57)	−1.16 (−0.22)
Sample Average	4.48** (3.11)	10.35** (4.97)	6.46** (3.11)	6.71** (3.14)	2.96 (1.42)	2.60 (1.29)

Note: This table summarizes, by column, the stratified averages of the annualized monthly returns on the aggregate value-minus-growth portfolio, and on five size sorted value-minus-growth strategies. Stratification is according to the indicators of negative and positive contagion episodes. The column M1 refers to the value premium for stocks falling in the size quintile with lowest market capitalization. Monthly returns are from June, 1963 to December, 2016. The t-statistic values, which are reported in brackets, are corrected for autocorrelation.

contagion than during flight-to-safety (flight-from-safety) episodes. This result provides another piece of evidence to the hypothesis that the effect of increases in either leverage or growth risk has a different effect along the size dimension.

Form Table 5, we can note that the strong value premium for large caps during negative contagion is about half than the one observed for the same size category during flight-from-safety episodes, while the prediction is for similar premia. Analogously, the value premium of small equities during negative contagion is smaller than that observed during flight-to-safety scenarios. A potential explanation for these weaker returns resides in the simultaneous activation of the growth option and leverage channels during negative contagion. For instance, the increase in yields marking negative contagion (but not flight-to-safety episodes) may hamper the ability to hedge systematic risk through leverage, thus weakening the risk advantage of growth firms that is associated with the investment option channel. The weakening of the growth option channel would decrease the value premium for equities that are particularly sensitive to expansion risk, i.e., for small caps. A similar reasoning applies to large firms during negative contagion and flight-from-safety episodes, with the increase in systematic risk lowering the risk stemming from the growth options for large equities.

In principle, any difference in the performance of the value strategy during contagion and

Table 15: Summary Statistics of Returns During Contagion Episodes

	Average		Median		Top 10%		Bottom 10%	
	Equity	Treas	Equity	Treas	Equity	Treas	Equity	Treas
Negative Contagion	-3.48	-2.28	-2.60	-2.11	-1.08	-0.36	-7.25	-4.86
Positive Contagion	4.18	2.10	3.93	1.75	8.62	4.54	1.08	0.29
All Sample	0.89	0.57	1.17	0.38	5.85	3.24	-4.41	-2.10

Note: The table list basic summary statistics of the returns observed during contagion episodes. The percentiles are with respect to the distributions of the returns observed during positive and negative contagion episodes, considered separately. The monthly returns (not annualized) are from June 1963 to December 2016.

flights may be driven by the magnitude of the respective economic shocks. This possibility is however ruled out by a direct evaluation of the return fluctuations marking the four market scenarios. The comparison of Tables 4 and 15 reveals that the average returns on the stock index and the benchmark Treasury during flights and contagion episodes are comparable within each asset class, taken in absolute value. Therefore the expectation is that the predictions outlined in Table 12 should not be driven by marked differences in price fluctuations during flights and contagion periods.

To summarize the results of this section, the performance of the value-minus-growth strategy during contagion episodes appear to be consistent with the growth option (leverage) rick channels being dominant for small (large) equities in determining the value premium. However, the results also indicate that the effects of neither the growth and leverage risk channels are entirely absent at either ends of the size distribution.

6 Conclusions

Equities issued by firms characterized by significant expansion potential tend to be strongly exposed to systematic risk, as the value of the growth option is highly sensitive to aggregate demand (or productivity) shocks Berk et al. (1999b). As argued by, among others, Gomes and Schmid (2010) and Choi (2013), firms can reduce their exposure to systematic risk by reducing their ownership of intangible assets, i.e., by exercising the growth option. This hedging activity is financed through leverage, which then originates a trade-off between asset and leverage risk. In this context, the value premium stems from the comparative advantage of growth versus value firms to exploit this risk trade-off.

Shocks to leverage rates and systematic risk lie at the core of the types of market instability analyzed in this study, these being episodes of flight-to-safety, flight-from-safety, as well as negative and positive contagion. The analysis of the return spread between high and low book-to-market stocks during flights and contagion months yields an opportunity to study the mechanisms generating the value premium for scenarios that are diametrically different in terms of the dynamics of leverage rates and market risk. A key result stemming from this analysis is that the offsetting mechanism between leverage and systematic risk can be differently nuanced for equities of different market sizes. Put differently, the terms of the trade-off between leverage and beta risk, while being similar in nature, appear to vary along with the market value dimension, with the relevance of systematic risk waning as market capitalization increases. Leverage-based models of the value premium, as that proposed in Ozdagli (2012), appear therefore to be particularly suitable to explain the value premium in large equities.

This study documents a remarkably large value premium in months showing evidence of flight-to-safety and negative contagion episodes between stocks and Treasuries. These value gains appear to be concentrated in small and medium-sized equities. The empirical results also provide strong evidence of a large value premium for large caps, which is associated with the incidence of flight-from-safety episodes.

Previous research has shown that the returns on the value-minus-growth strategy for large firms have been disappointing in the post-1963 period (e.g., Fama and French (2006)). Evidence of a strong value premium during flight-from-safety events suggests a novel line of inquiry to find an explanation of the unimpressive performance of the large-cap value premium in the post-1963 period. The conjecture is that shocks causing yield increases may have been generated too sparsely to entail a substantial value premium, for large equities. Put differently, a decline in the incidence of the shocks affecting yields may have weakened the mechanism driving the value premium for large-sized stocks, which, according to this study's conclusions, mostly originates from leverage cost increases. Smoother yield dynamics may have been the consequence of monetary policy activities aiming to actively manage inflation expectations (e.g., Sargent et al. (2006)).

The theoretical framework driving the interpretation of the results of this empirical study assumes that the value premium is risk-based: value gains stem from the risk differential between high and low book-to-market equities. However, patterns in investors' behavior have also been invoked to explain the profitability of the value strategy. For example, the profitability of the value-minus-growth portfolio may stem from overreaction-driven pricing errors, as investors overprice growth stocks, and underprice value stocks (e.g., Lakonishok et al. (1994)). As value stocks tend to have a history of poor performance (e.g., Fama and French (1995)), then investors may project the negative return trend into the future, which then creates unfavorable expectations for high book-to-market equities. The reverse effect would apply to stocks with low book-to-market ratios, as these tend to be characterized by favorable past performances. The behavioral model in Daniel et al. (1998), also yields similar explanations of the premium, while being based on a return reversal for undervalued (overvalued) value (growth) firms.

To the extent to which investors operating in the Treasury and stock markets share similar biases, the extreme market conditions associated with flight and contagion episodes could be, in principle, linked to the profitability of the value strategy, via behavioral biases. However, the conundrum in determining this link lies in how to associate flights or contagion episodes to large the realizations of the behavioral biases. While a potential empirical framework for an inquiry along these lines can be drawn from the extant literature (e.g., Cooper et al. (2004)), it remains hard to motivate why market overreaction or underreaction, if any, during periods of market instability would affect differently equities of different size. However, it is interesting to note that the results presented in this study indicate that the value premium tends to be large when stocks are strongly depreciating, that is when overreaction (to good news) and underreaction (to unfavorable news) are, presumably, at their lowest level.

Asness et al. (2013) argue that firm-based explanations may be hard to reconcile with evidence of a significant value premium in a wide range of asset classes the performance of which is not naturally associated with firm's profits (e.g., currencies, government bonds, and commodities). In this study, I propose that evidence of a significant value premium in interest-rate sensitive assets does not need to be perceived as disqualifying firm-level explanations of the value premium in stock returns. Rather, the value premium in equities may be the result of investors' integrated assessment of value and growth equities in terms of balance sheet characteristics and leverage cost expectations. These same expectations may lie at the root of the value premium documented for fixed income securities.

Appendix A: Identification of Flight and Contagion Episodes

The literature has produced many metrics of market instability alternative to the bond-stock return correlation (e.g., Longstaff (2004), Gatev and Strahan (2006), Baele et al. (2013), Mueller et al. (2012)). Most of the contributions falling in this line of research aim to highlight the role of illiquidity in determining market instability, in the spirit of the analysis of illiquidity spirals modeled in Brunnermeier and Pedersen (2009). In contrast, this study builds on the methodology proposed in Forbes and Rigobon (2002) and Baur and Lucey (2009) and characterizes flights and contagion episodes as events marked by significant changes in the relative profitability of the equity market index and the benchmark 10-year Treasury. This choice allows to abstract, to the extent possible, from market structure considerations in gauging the force shaping the interaction of systematic risk and leverage to originate the value premium. Further, this approach has the advantage of not being limited to measures of market instability that are specific to an individual market or to a dramatic event (e.g., Money Market Funds withdrawals in 2008). Relying on the broad stock market portfolio and Treasuries gives this study a perspective that is sufficiently general to examine shocks that affect the fundamental rates of the economy.

Previous research (e.g., Schaefer and Strebulaev (2008)) has shown that measures of the cost of corporate borrowing are strongly correlated to benchmark Treasury rates. However, gauges of aggregate leverage rates for firms that are alternative to Treasuries have been considered for this study's analysis (e.g., yields on commercial paper or high-grade corporate bonds). While these rates may be better suited to describe the dynamics of firm-specific leverage risk, they have been rejected on two grounds. First, aggregate corporate borrowing rates are not necessarily appropriate to capture aggregate leverage shocks, as credit risk considerations may muddle the empirical analysis. Second, market instability episodes like flights are not necessarily well-described by aggregate movements in corporate borrowing rates (e.g., Baele et al. (2013)). Indeed, the events of the 2007-2008 crisis have shown that the status of haven of many of corporate "safe" securities may be called into question, precisely when market instability occurs (e.g., Dwyer and Tkac (2009), Bartram and Bodnar (2009)).

Previous literature on market instability has focused on episodes of market turmoil that were linked to specific events or dates (e.g., September 11, 2001). The challenge posed by the financial crisis initiated in 2007 is that this period is characterized by a sequence of diverse market shocks which are spread over about two years. The results of any empirical analysis aiming to identify flight and contagion episodes by examining only a selection of sub-samples of this eventful period is bound to be liable of sample selection bias. To obviate these concerns, in this study the timing of the crisis is determined by evaluating a static identification methodology within a rolling-sample framework.

Another study that allows for an endogenous timing of market instability episodes and that also relies on the benchmark sovereign bond rate and the return on the aggregate stock index is Baele et al. (2014). The authors focus on flight-to-safety (which they term flight-to-safety) episodes which are calculated on a daily basis.[35] They employ four empirical techniques to evaluate the incidence of flights. Each empirical approach yields a separate dichotomous flight indicator. The frequency of the four flight indicators varies dramatically, depending on the method selected, ranging from 23% to 0.7% over the examined January

[35] Also this study provides a daily-based assessment of the frequency of flights. The results are relegated to the appendix.

1980-January 2012 period.[36] Baele et al. combine these four variables and obtain a unique flight to safety indicator which appears to capture the major financial crises in the US. The authors do not explore flight–from-safety and contagion episodes. Reassuringly, the indicators in Baele et al. that are most closely defined on the basis of volatility and correlations yield frequency of flight incidences that are very close to those discussed in this study.[37]

Flights feature a negative correlation between the returns of the aggregate stock market index and the benchmark Treasury. Hence, to the extent to which aggregate output is a broad measure of systematic risk, and recalling the interest rates move in the opposite direction of return on the risk-free asset, the conclusions of Brault and Khan (2018) are consistent with flights being more prevalent during the post-1985 sample.

6.1 Estimation Details

As mentioned in Section 6, flights are identified by significant changes, in the negative range, of the correlation between stocks and Treasuries. Recalling equation (1), the coefficient γ_b, measures the change in the correlation between the stock and Treasury returns when moving from the benchmark to the crisis period. The sum of the coefficients $\beta_b + \gamma_b + \gamma_b^*$ represents the correlation level between the returns of the safe asset and of the stock index,

[36]The indicators in Baele et al. (2014) that are most closely defined on the basis of volatility and correlations yield frequency of flight incidences that are very close to those discussed in this study. For example, one of the indicators models the spread between returns for stocks and bonds by an univariate regime switching, where one of the three volatility regimes corresponds to flights. The flight regime is characterized by larger spreads than in the other regimes. The outcomes of regime switches models rely heavily on the second moments of the return distributions. This indicator yields a percentage of flights of 7.98%. The daily flight indicator discussed in this study yields, a frequency of 8.1%, over the same sample used in Baele et al.

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during the crisis period. In this context, a flight-to-safety is a market dynamic in which the change in correlation (i.e., the estimated coefficient $\hat{\gamma}_b$) and the correlation level (i.e., the sum $\hat{\beta}_b + \hat{\gamma}_b + \hat{\gamma}_b^*$) are both negative, the coefficient $\hat{\gamma}_b$ is significant, and, finally, the average of the daily returns of the safe (risky) asset over the crisis window is positive (negative).[38] Note that when Treasury returns are positive, then Treasury yields are declining. A flight-from-safety is a flight in reverse, that is, it is a market condition in which Treasuries depreciate and stocks appreciate. Presently, the estimates of equation (1) provide evidence of a flight-from-safety from Treasuries to stocks during the crisis period month starting in τ_0 when $\hat{\gamma}_b$ is negative and significant, the expression $\hat{\beta}_b + \hat{\gamma}_b + \hat{\gamma}_b^*$ is negative, and the average return over the crisis period on the Treasury benchmark (on the stock aggregate portfolio) is negative (positive).

A negative contagion episode between Treasuries and stocks is characterized by negative average returns over the crisis period, and by a significant increase in the return correlation. Hence, there is negative contagion during the crisis month starting with observation τ_0 if equation (1) yields a significant and positive coefficient $\hat{\gamma}_b$, the value of the sum $\hat{\beta}_b + \hat{\gamma}_b + \hat{\gamma}_b^*$ is positive, and both the average returns on the benchmark Treasury and on the stock market aggregate portfolio are negative. Positive contagion is defined analogously, but for the Treasury and stock index average returns being positive. For any given month flights to and from safety, as well as negative and positive contagion, are mutually exclusive market scenarios.[39]

[38] For consistency with the benchmark and crisis period structure of equation (1), it is assumed that the disturbances e_t cluster over the dates of the crisis and benchmark periods. Furthermore, time-t and time-$(t-1)$ error terms are allowed to be correlated. Thus, an error term e_t with t falling neither into the crisis nor into the benchmark period is potentially correlated with the lagged error term e_{t-1}. See the appendix for alternative variance corrections.

[39] The significance of the coefficient γ in equation 1 is determined on the basis of the 0.05 threshold. Relying on the 0.1 level yields virtually indistinguishable flight and contagion indicators, as only one additional flight-to-safety episode, in May 2009, is identified.

Equation (1) is estimated for a sequence of overlapping rolling samples consisting of the daily returns for two (calendar) years. The first day of each rolling sample falls on the first available trading date of the first calendar month included in the rolling sample. The step between the first observation of two consecutive rolling samples is one calendar month. In each rolling sample the crisis period, over which the variable D_{τ_0} equals one, includes only the observations falling into the last calendar month of the rolling sample. Put differently, no observation following the crisis periods is considered in the estimation of the incidence of market instability in the last month of each rolling sample. Excluding the observations following the crisis period serves the purpose of alleviating concerns of a look-ahead bias.[40]

The design of equation (1) implies that flights and contagion are identified by deviations from the *status quo* emerging during the benchmark period. The use of rolling benchmark periods captures the evolution of the information set of market participants, so that flights and contagion are defined with respect to recent market activities, rather than with respect to some ideal period of "normal" markets. In fact, the benchmark period itself may include episodes of market instability.

Empirically, $r_{s,t}$ is the series of daily returns on the US value-weighted market portfolio from the Centre for Research in Security Prices, CRSP, whereas $r_{b,t}$ is the CRSP daily return on the 10-year Treasury.[41] The first month for which the incidence of market instability can be assessed using the proposed methodology is June 1963. The most recent month for which the incidence of flight and contagion is evaluated is December 2016.

The real business cycle literature has fruitfully explored the changes in unconditional

[40] This precaution is particularly important for any study of market instability analyzing asset co-movements over a sample including the 2007-2009 financial crisis. The large market swings characteristic of that period may artificially raise the bar employed to detect market instability episodes occurring in periods preceding the summer of 2007, by inflating the standard errors.

[41] Variable 2000007 from the CRSP KYTREASNOX series. The series starts on June 14, 1961. The KYTREASNOX returns are from a monthly rebalanced portfolio of Treasuries with homogeneous maturities.

contemporaneous correlations aggregate output and the real interest rate. Using quarterly data, the contemporaneous correlation between output and real interest rate is negative when limiting the analysis to the pre-1985 sample, but positive during the great moderation (Brault and Khan (2018)).[42]

Alternative Specifications

This section of the appendix verifies that the conclusions of this paper are robust to variations on the methodology employed to identify flight and contagion episodes. The first alternative specification is designed to closely follow the approach suggested in Baur and Lucey (2009) who rely on benchmark and crisis periods of fixed width, consisting of 50 and 20 trading days, respectively. Each crisis period starts with the first day of the calendar month and includes the following 19 trading days, for a total of 20 trading days. Column two in Table 16 reports the frequency of flights and contagion episodes obtained using the 50/20 specification. For convenience, the first column of the same table also reports the frequencies of flight and contagion episodes relied upon in the body of the article.

The frequencies reported in Table 16 for the 50/20 combination are for episodes of market instability that are identified on the basis of fix-width months of 20 trading days. Table 17 reports the stratified average of the annualized monthly return of the value-minus-growth strategy defining the value premium HML, as well as for five size-based high-minus-low book-to-market strategies. For each 20-day crisis period, the monthly returns on each value-minus-growth strategy are calculated as the sum of the corresponding 20 daily returns.

In the 1961-2016 sample, the average number of trading days in a given calendar month

[42] For instance Iacoviello (2005) proposes a model that implies a negative correlation between the real interest rate and output. Basu and Bundick (2017) find a positive correlation between the same indicators, whereas Smets-Wouters (2007) proposes that alternative assumptions on the utility of the representative agent would imply insignificant or negative contemporaneous correlations.

Table 16: Frequencies of Flights and Contagion, Alternative Specifications

Incidence of Flights and Contagion 10Y Treasury			
Sample Period	Cal. Month	NW	50/20 Daily
n	643	643	$13,319$
Flight to Safety	54 (8.40)	59 (9.37)	1099 (8.25)
Flight from Safety	46 (7.15)	47 (7.46)	1000 (7.51)
Negative Contagion	42 (6.53)	44 (6.98)	1004 (7.54)
Positive Contagion	94 (14.62)	96 (15.24)	2185 (16.40)

Note: The table reports the number of flights and contagion episodes, for the months from June 1963 to December 2016. Frequencies, in brackets, are calculated over the number (n) of crisis windows in the sample. Flight and contagion episodes are identified using the daily returns of the CRSP value-weighted stock market portfolio and of the 10-year Treasury.

is 20.75, with some relevant variations. Months in which economic shocks cause market to shut-down tend to include fewer trading days than expected, with respect to the standard trading calendar in tranquil times. Case in point, September 2001 includes only 11 trading days, due to market closure. The variability in the number of trading days falling in each calendar month, as potentially endogenous to the forces causing market instability, have the potential of affecting the identification of flights and contagion episodes. Econometrically, the effect stems from the role of the parameter γ, in equation 1 in determining the incidence of market instability, where γ is the coefficient of the indicator characterizing the crisis period. Naturally, the precision of this parameter estimate may be greatly impaired whenever a small number of observations falls during the crisis window. As calendar months are, nevertheless, familiar time units, the results discussed in the body of this article refer to a model in which the benchmark and crisis periods consist of two and one calendar months, respectively. An additional reason to prefer flight and contagion indicators defined on the basis of calendar months is that the CRSP series of daily returns on the 10-year Treasury is based on the performance of a portfolio that is rebalanced at the end of each calendar month.

The results presented in the body of the paper are obtained using indicators of flights and contagion episodes that are estimated for a sequence of two (calendar) year rolling samples. In each of these samples, the last calendar month is the crisis period, so that no observation following the crisis periods is considered in the estimation of the incidence of market instability. Excluding the observations following the crisis period serves the purpose of eliminating concerns of a look-ahead bias. I deem this precaution particularly important for any study of market instability that analyzes asset co-movements over a sample including the 2007-2009 financial crisis, as the large market swings characteristic of that period might artificially raise the bar for market instability episodes occurring in periods preceding the summer of 2007 to be acknowledged. This bias may occur as the estimates of the variance of the coefficient in equation 1 may be artificially inflated by the strong volatility observed in the 2007-2009 period. Nevertheless, the estimation of the 50/20 specification of equation 1 that relies on the full 1961-2016 sample for each choice of the crisis window yields indicators of flight and contagion that are very similar to those reported in Table 16 and, therefore, also to those discussed in Section 6.[43]

The crisis window is assigned to the start of the calendar month, both for the 50/20 trading day specification, and, naturally, for the calendar month approach adopted in the body of the article. From this perspective, the time-frame offered by the calendar month still plays a role in determining the frequency of market instability, in both specifications. This consideration ushers the motivation for the next robustness check, in which the step between two contiguous two-year rolling sample shrinks from one calendar month to one trading day, while maintaining the 50/20 structure implemented in Baur and Lucey (2009). Hence, this specification of equation 1 considers two-year overlapping rolling samples, each characterized

[43]The tetrachoric correlation between the 50/20 indicators obtained from two-year rolling samples, summarized in Table 16, and those obtained using the 50/20 structure and estimating equation 1 using the full sample, land in the range 0.90 for all flight and contagion indicators.

Table 17: Stratified Averages on FC 50/20 Specification

50/20	VMG	ME1	ME2	ME3	ME4	ME5
Flight to Safety	7.71 (1.48)	27.97** (3.44)	15.36* (1.81)	19.20** (2.54)	−3.16 (−0.44)	−7.11 (−1.10)
Flight from Safety	3.68 (0.68)	−6.20 (−0.98)	−11.03 (−1.69)	0.88 (0.12)	6.07 (0.82)	23.02** (2.60)
Negative Contagion	16.07** (3.27)	26.42** (3.89)	17.86** (2.24)	20.23** (3.11)	15.28** (2.33)	15.28** (2.34)
Positive Contagion	−1.80 (−0.57)	0.35 (0.07)	−0.21 (−0.05)	−1.82 (−0.38)	−3.24** (−2.34)	−1.93 (−0.37)
Sample Average	4.48** (3.11)	10.35** (4.97)	6.46** (3.11)	6.71** (3.14)	2.96 (1.42)	2.60 (1.29)

Note: This table summarizes, by column, the stratified averages of the annualized monthly returns on the HML portfolio, and on five size-based value-minus-growth portfolios. The column M1 refers to the value premium for stocks falling in the size quintile with lowest market capitalization. Stratification of the value gains is with respect to the flight and contagion indicators obtained following the specification of Baur and Lucey (2009), which features benchmark and crisis periods of 50 and 20 trading day, respectively. The identification of these indicators rely on monthly average returns, where a month is approximated by 20 trading days starting, from the first day of the calendar month. For each 20-day crisis period, monthly returns are calculated as the sum of the corresponding 20 daily returns. Annualized returns are obtained multiplying these 20-day returns times 12. The t-statistic values, which are reported in brackets, are corrected for autocorrelation.

by a 50 and 20-day benchmark and crisis period, which are one trading day apart, rather than spaced by a calendar month. The motivation for this robustness check is that the starting date of the crisis period is sometimes crucial in determining the extend of a market instability episodes (e.g., Baur and Lucey (2009)). Indeed, referring to calendar months, while convenient, superimposes a time structure that needs not be relevant in determining market participants' reactions to shocks. This estimation-intensive approach yields one set of values of the flight and contagion indicators per trading day, rather than per calendar month. Naturally, these indicators are highly autocorrelated, which is an expected feature in daily measures of market instability.[44]

Baur and Lucey (2009) note that longer crisis windows (e.g., over 30 days) tends to yield smaller and insignificant coefficient estimates.[45] A long crisis window may lump separate

[44]For example, one of the indicators of flights proposed in Baele et al. (2014) shows that a trading day over which a flight takes place has 94.7% chances to be followed by a flight during the following day.

[45]On the other hand, shorter crisis periods reduce the reliability of the estimate of the key coefficient γ_b

Table 18: Stratified averages, FC daily rolling samples, specification 50/20

50/20 Daily	VMG	ME1	ME2	ME3	ME4	ME5
Flight to Safety	11.48** (2.55)	32.47** (4.71)	20.95** (3.27)	21.78** (2.97)	5.42 (0.77)	−5.63 (−1.00)
Flight from Safety	4.85 (1.27)	−2.48 (−0.55)	−4.88 (−1.09)	−0.66 (−0.12)	4.70 (0.90)	24.25** (4.35)
Negative Contagion	14.12** (4.7)	24.46** (6.1)	20.53** (4.51)	19.19** (4.52)	13.96** (3.35)	8.97** (2.33)
Positive Contagion	−2.41 (−1.22)	−0.93 (−0.38)	−0.41 (−0.14)	−1.60 (−0.63)	−3.12 (−1.28)	−3.19 (−0.95)
Sample Average	4.48** (3.11)	10.35** (4.97)	6.46** (3.11)	6.71** (3.14)	2.96 (1.42)	2.60 (1.29)

Note: This table summarizes, by column, the stratified averages of the annualized 20-day average returns on the HML portfolio, and on five size-based value-minus-growth portfolios. The column M1 refers to the value premium for stocks falling in the size quintile with lowest market capitalization. Returns over the rolling 20-day windows are calculated using daily returns on these six value strategies, using daily returns spanning from June 1963 to December 2016. For each 20-day crisis period, monthly returns on the value-minus-growth strategies are calculated as the sum of the corresponding 20 daily returns. Annualized returns are obtained multiplying these 20-day returns times 12. The stratification of the value gains is with respect to the flight and contagion indicators obtained following the specification of Baur and Lucey (2009), which features benchmark and crisis periods of 50 and 20 trading day, respectively, but calculated using two-year, one-day-step, rolling samples. The t-statistic values, which are reported in brackets, are corrected for autocorrelation.

crisis episodes together. Further, a longer crisis period may end up covering both a given episode of market instability, as well as market's response to it, which could cloud the relationship between the variable of interest (i.e., the value premium) and the effects of flight and contagion. To assess the extent to which this paper's conclusions are associated with short crisis period (i.e., one month), I consider a specification of equation 1 with both the benchmark and the crisis periods of two calendar months. To avoid overlapping crisis periods, I consider two-year rolling subsamples starting two calendar months apart. The last column in Table 16 reports the frequencies of these two-month flight and contagion indicators. The corresponding stratified averages are in Table 19, in annualized terms. Annualized returns are calculated multiplying times six the two-month cumulative return.

The frequencies of flights and contagion for the two-month crisis periods are very similar

in equation 1.

to those obtained from the other specifications. The main results underlying the conclusions of this paper are however only broadly supported by the stratified averages reported in Table 19. The value premium is large during negative contagion, across firm size categories and during flight-from-safety episodes, for large caps. The small and medium size value-minus-growth strategies yield economically endearing, but statistically insignificant, returns during flight-to-safety months.

A significant difference between the one and two-month crisis period analysis is that positive contagion months are associated with strong spreads between the returns on value and growth stocks. This result is very different from what documented using one-month crisis periods, as in that case positive contagion tends to be associated with an insignificant value premium. A possible interpretation of this difference is that a prolonged period of favorable growth outlook disproportionately benefit firms that are asset-poor but own a large share of intangible assets, as the decrease in borrowing costs, typical of positive contagion episodes, fails to provide a comparable advantage to high book-to-market equities. From this perspective, it is consistent that the only category for which the value premium is insignificant during positive contagion is that of large caps. For these firms, in fact, the value of the growth option is less relevant than the effect of leverage rates. The comparison of the performance of large caps during positive contagion and flight-from-safety months in Table 19 confirms this interpretation of the results. The two types of market instability differ only for the dynamics of borrowing costs, as both are characterized by buoyant expectations of aggregate growth. The stratified averages suggest that highly leveraged value firms appear to be riskier than growth equities, when leverage costs rise.

Table 19: Stratified averages. FC specification with two calendar months benchmark and crisis windows

Two Cal. Months	VMG	ME1	ME2	ME3	ME4	ME5
Flight to Safety	9.89 (1.11)	19.36 (1.48)	14.48 (1.13)	22.15 (1.48)	−0.20 (−0.01)	−0.9 (−0.01)
Flight from Safety	9.59* (1.84)	8.36 (1.32)	2.12 (0.38)	10.86 (1.45)	7.50 (0.94)	21.76** (3.01)
Negative Contagion	14.39** (3.13)	21.78** (3.49)	18.74** (2.52)	16.25** (2.26)	16.64** (2.37)	13.57** (2.26)
Positive Contagion	4.80 (1.54)	9.41** (2.28)	7.32* (1.65)	9.30** (2.28)	7.23* (1.94)	1.74 (0.38)
Sample Average	4.48** (3.11)	10.35** (4.97)	6.46** (3.11)	6.71** (3.14)	2.96 (1.42)	2.60 (1.29)

Note: This table summarizes, by column, the stratified averages of the annualized monthly returns on the HML portfolio, and on five size-based value-minus-growth portfolios. The column M1 refers to the value premium for stocks falling in the size quintile with lowest market capitalization. Monthly average returns are from June 1963, to December 2016. The stratification of these value gains is with respect to the flight and contagion indicators obtained for a specification of equation 1 with benchmark and crisis periods of two calendar months. The estimation relies on overlapping rolling samples, with rolling step equal to two calendar months. The t-statistic values, which are reported in brackets, are corrected for autocorrelation.

Table 20: Stratified averages, on calendar months, with Newey West FC variables

Newey West		ME1	ME2	ME3	ME4	ME5
Flight to Safety	54 (8.40)	42.13** (4.31)	32.93** (3.33)	35.75** (2.87)	14.73 (1.23)	1.92 (0.23)
Flight from Safety	46 (7.15)	−10.24 (−0.98)	−11.96 (−1.17)	6.44 (0.46)	8.47 (0.57)	23.99 (1.17)
Negative Contagion	42 (6.53)	10.69 (1.54)	−0.56 (−0.08)	8.18 (1.19)	−6.12 (−0.86)	−4.35 (−0.60)
Positive Contagion	94 (14.62)	−6.60 (−0.82)	0.46 (0.06)	−2.87 (−0.43)	−4.48 (−0.57)	−6.08 (−0.65)
Sample Average	4.48** (3.11)	10.35** (4.97)	6.46** (3.11)	6.71** (3.14)	2.96 (1.42)	2.60 (1.29)

Note: This table summarizes, by column, the stratified averages of the annualized monthly returns on the HML portfolio, and on five size-based value-minus-growth portfolios. The column M1 refers to the value premium for stocks falling in the size quintile with lowest market capitalization. Stratification of the value gains is with respect to the (calendar) monthly flight and contagion indicators obtained with Newey West variance correction with one month lag. Annualized returns are obtained multiplying these 20-day returns times 12. The t-statistic values, which are reported in brackets, are corrected for autocorrelation.

Appendix B: Stratified Averages with Bootstrap

This section reports the stratified averages over the flight episodes indicators for the returns on the HML portfolio and on the value-minus-growth strategies within the size quintiles, for over the flight episodes indicators. Standard errors calculated using bootstrap with replacement. As the flights indicators are estimated variables with unknown distribution, bootstrap techniques are preferable to the use of asymptotic variance estimators. In Table 21 the flight indicators are estimated as described in Section 6, that is using rolling regressions.

Table 22 reports the stratified average of the value premium for the DCC-based flight indicators. Following the literature, the DCC is evaluated using daily returns. P-values are obtained using bootstrap with replacement.

Table 21: Stratified averages of the Value Premium with Bootstrap p-values

	VMG	ME1	ME2	ME3	ME4	ME5
Flight to Safety	13.24** (0.03)	27.43** (0.00)	18.92** (0.00)	26.40** (0.00)	5.17 (0.12)	−0.95 (0.22)
Flight from Safety	6.86 (0.06)	−2.66 (0.17)	−4.92 (0.11)	5.70 (0.11)	4.57 (0.14)	25.50** (0.00)
Sample Average	4.48** (0.00)	10.35** (0.00)	6.46** (0.00)	6.71** (0.00)	2.96** (0.03)	2.60** (0.05)

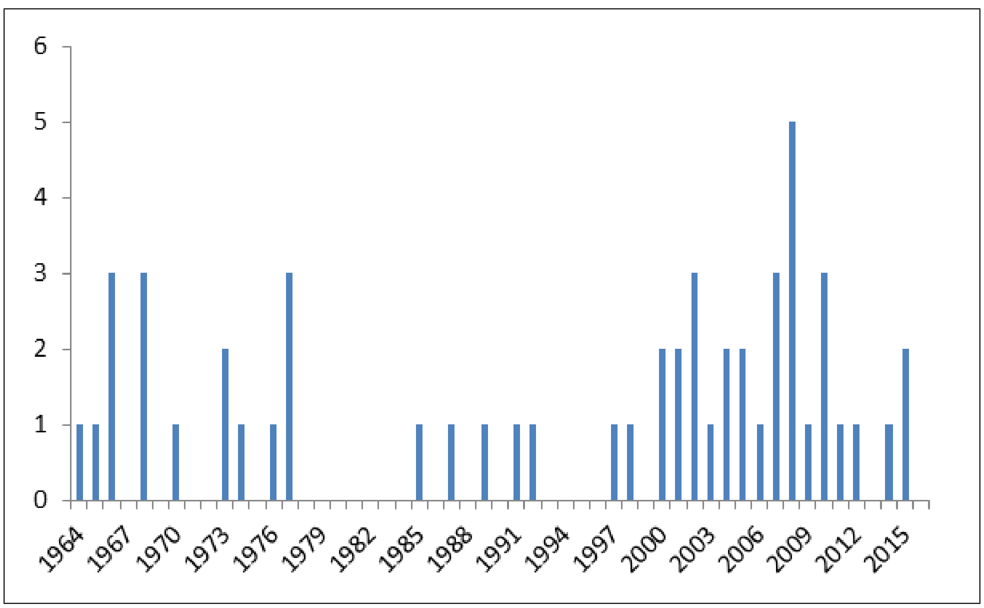
Note: The table summarizes, by column, the stratified averages of the annualized monthly returns on the HML portfolio, and on five size-based value-minus-growth portfolios. The column M1 refers to the value premium for stocks falling in the size quintile with lowest market capitalization. Stratification is according to the indicators of flight-to-safety, flight-from-safety episodes. Monthly returns are from June, 1963 to December, 2016. The p-values are obtained with bootstrap with replacement.

Table 22: Value premium stratified averages for DCC-based flights, with Bootstrap p-values

	$n = 13,341$	VMG	ME1	ME2	ME3	ME4	ME5
Flight to Safety	1,381 (10.35)	−1.06 (0.38)	25.24** (0.00)	2.59 (0.25)	8.79** (0.00)	2.57 (0.12)	−29.93** (0.00)
Flight from Safety	1,401 (10.50)	3.34* (0.05)	−13.78** (0.00)	1.10 (0.41)	−1.02 (0.42)	1.69 (0.19)	25.70** (0.00)
Sample Average		1.93** (0.00)	4.41** (0.00)	2.88** (0.00)	2.95** (0.00)	1.33* (0.01)	1.14 (0.03)

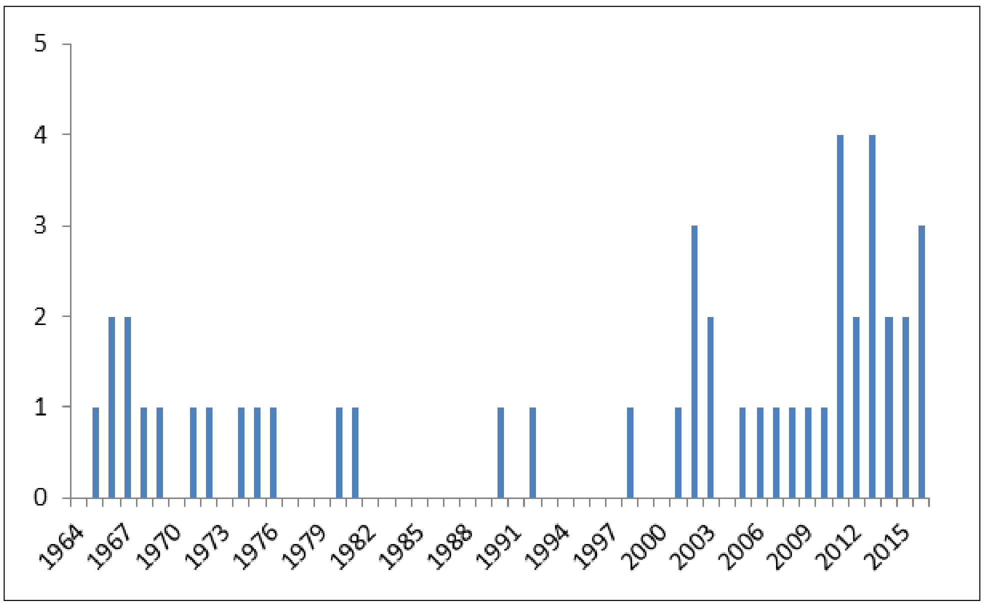
Note: The first two rows of results report the stratified averages of the value premium over the DCC-based indicators for flight-to-safety and flight-from-safety episodes. The series of daily returns on the value-minus-growth portfolios are calculated using the stock universe or the equities falling in the size quintiles. The average daily returns (in basis points) are calculated over the period from June 1963 to December 2016. The p-values are obtained through bootstrap with replacement. The size group with lowest market capitalization is identified by M1.

Figure 1: Flight-to-Safety Episodes



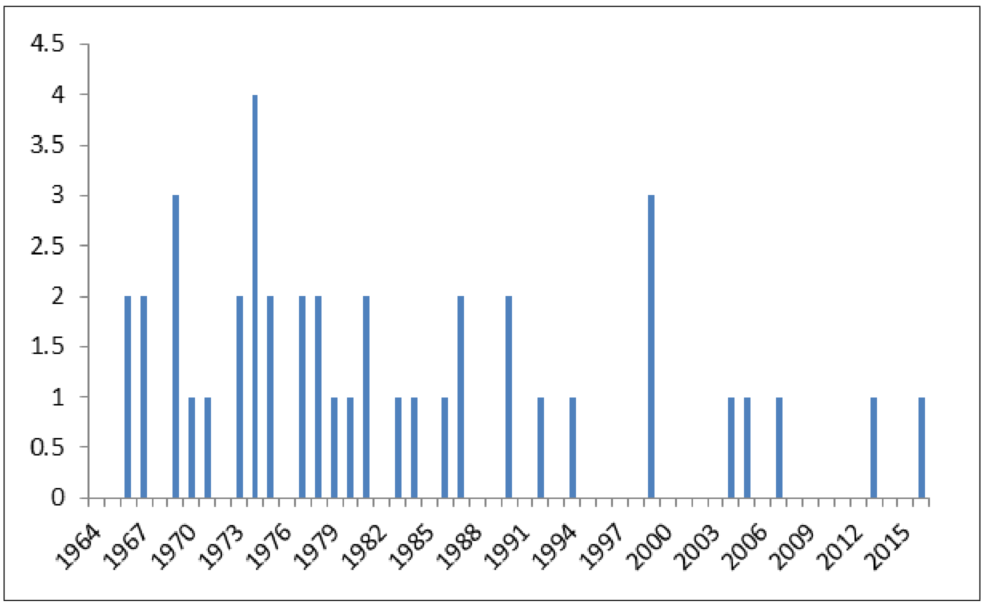
Note: The figure plots the number of flight-to-safety months, per year, from January 1964 to December 2016. Flight-to-safety episodes are identified using the daily returns of the CRSP value-weighted stock market portfolio and the returns on the CRSP monthly rebalanced Treasury portfolio with 10-year maturity. The year 1964 is the first complete calendar year in the sample.

Figure 2: Flight-From-Safety Episodes



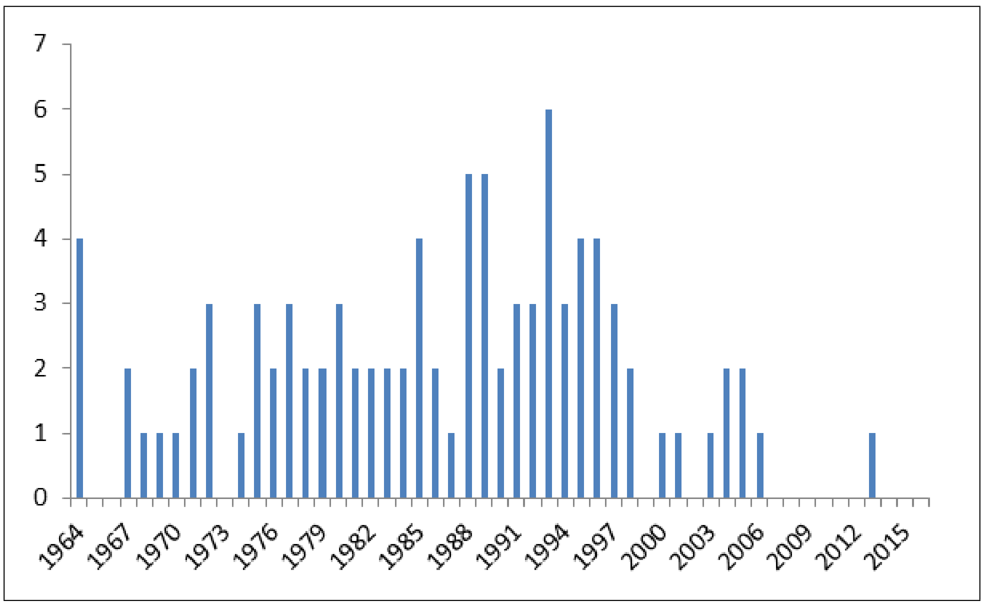
Note: The figure plots the number of flight-from-safety months, per year, from January 1964 to December 2016. Flight-from-safety episodes are identified using the daily returns of the CRSP value-weighted stock market portfolio and the returns on the CRSP monthly rebalanced Treasury portfolio with 10-year maturity. The year 1964 is the first complete calendar year in the sample.

Figure 3: Negative Contagion Episodes



Note: The figure plots the number of negative contagion episodes, per year, from January 1964 to December 2016. Negative contagion episodes are identified using the daily returns of the CRSP value-weighted stock market portfolio and the returns on the CRSP monthly rebalanced Treasury portfolio with 10-year maturity. The year 1964 is the first complete calendar year in the sample.

Figure 4: Positive Contagion Episodes



Note: The figure plots the number of positive contagion months, per year, from January 1964 to December 2016. Positive contagion episodes are identified using the daily returns of the CRSP value-weighted stock market portfolio and the returns on the CRSP monthly rebalanced Treasury portfolio with 10-year maturity. The year 1964 is the first complete calendar year in the sample.

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