



# The non-linear trade-off between return and risk and its determinants

John Cotter <sup>a</sup>, Enrique Salvador <sup>b,\*</sup>

<sup>a</sup> Smurfit School of Business, University College Dublin, Carysfort Avenue, Blackrock, Co. Dublin, Ireland

<sup>b</sup> Department of Accounting and Finance, Universitat Jaume I, Avda. Sos Baynat s/n, Castellón de La Plana, Spain

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## ABSTRACT

We estimate a discrete approximation of the risk-return trade-off for the US market by using the whole universe of stocks from July 1963 to September 2017. We find the relationship between return and total risk to be time-varying and also dependent on the level of risk considered. The proposed positive trade-off is mainly observed during low volatility periods and when we move from low risk up to medium-high risk investments. However, the direction of the trade-off is inverted for the highest risk alternatives especially during high volatility periods. The temporal variation of the risk-return trade-off can be explained by a series of sentiment, macro, credit risk, liquidity and corporate variables. All these determinants suggest that the positive relationship between return and risk is more evident during periods where economic, financial and market conditions improve.

## 1. Introduction

The relation between expected return and risk has motivated many studies in the financial literature. Most asset pricing models are based on this fundamental trade-off, so understanding the dynamics of this relation is a key issue in finance. The first studies establishing a theoretical link between expected return and risk propose a positive linear relationship between returns and systematic risk (Sharpe, 1964; Merton, 1973). The traditional CAPM theory predicts that only systematic risk should be priced in equilibrium and any role for idiosyncratic risk is completely excluded through diversification. Following this model, asset pricing models in financial economics tend to predict that only systematic risk should affect returns. However, the role of idiosyncratic risk in asset pricing is important as investors are exposed to it for reasons such as portfolio constraints or transaction costs. Also, previous studies report that both individual investors' portfolios and mutual fund portfolios are surprisingly undiversified (Barber and Odean, 2000; Benartzi and Thaler, 2001). Therefore, subsequent research have considered idiosyncratic risk, besides systematic risk, when analyzing the risk-return trade-off (Ang et al., 2005; Jiang and Lee, 2006).

The empirical literature has tested the implications of the risk-return trade-off (using definitions of risk as systematic and idiosyncratic) in two dimensions: first, papers such as Brennan et al. (2004), Lo and Wang (2006) and Petkova (2006) focus on the cross-sections of excess stock returns. Most of these works include additional factors other than market returns to provide an improved description of the dispersion in excess portfolio returns in the cross-section. Second, studies such as Whitelaw (2000), Brandt and Kang (2004), Ghysels et al. (2005) and Guo et al. (2009) focus on the time-series aggregate of the risk-return trade-off. These papers try to unmask a fundamental relationship between return and risk in financial data using different time-series analysis techniques. Under this second line, many different settings of the risk-return relationship could be examined including the returns of assets and the risk of the market similar to a SML relation, the returns of the market on the risk of the market, and alternative specifications.

\* Corresponding author.

E-mail addresses: [john.cotter@ucd.ie](mailto:john.cotter@ucd.ie) (J. Cotter), [esalvado@uji.es](mailto:esalvado@uji.es) (E. Salvador).

This study aims to shed light on the dynamics of the risk-return trade-off in the time-series dimension proposing an alternative methodology. More specifically, we are modeling the relationship between return and total risk, encompassing both systematic and idiosyncratic risk. Many previous studies analyzing the relationship between return and risk empirically obtain controversial results for the different definitions of risk. Campbell (1987), Glosten et al. (1993), Whitelaw (1994) and Brandt and Kang (2004) find a negative relation between these variables,<sup>1</sup> while other authors such as Ghysels et al. (2005), Guo and Whitelaw (2006), Ludvigson and Ng (2007) and Lundblad (2007) find a positive trade-off. There are others studies, such as Baillie and De Gennaro (1990) and Campbell and Hentschel (1992), that find non-significant estimates for this risk-return trade-off.

Given the mixed and inconclusive evidence about the positive linear risk-return trade-off postulated by Sharpe (1964) and Merton (1973), recent studies have developed alternative models to define the dynamics of the risk-return trade-off. Mayfield (2004) defines the intertemporal component in the ICAPM model of Merton (1973), i.e., the shifts in the investment opportunity set, as changes in the level of market volatility. With this definition, he is able to generate periods of low volatility and high ex-post returns as well as periods of high volatility and low ex-post returns, with a higher risk premium in periods of high volatility. Whitelaw (2000) modifies the dynamics of consumption and allows for a state-dependent consumption-generating process. His model generates a complex, non-linear and time-varying relationship between return and risk, replicating most of the features of the risk-return trade-off observed in the data. There are also theoretical models that advance a step further and introduce a state-dependent dynamic in investors' behavior/preferences or their utility functions. Campbell and Cochrane (1999) develop a consumption-based model with external habit formation that is very successful in describing the characteristics of aggregated asset prices. A key feature of their model is a state-dependent risk aversion of the investor that increases when the levels of consumption approach the level of the habit. Bekaert and Engstrom (2015) propose an extension of the previous model through a more sophisticated consumption process introducing the BEGE (bad environment-good environment) model. This model facilitates reproduction of features of macro-economic data, stocks and option prices. Other authors, such as Cechetti et al. (2000), also consider the representative agents' risk aversion or the market risk aversion as time-varying.

Motivated by the literature that suggest that the relationship between return and risk is nonlinear and time-varying, we present a new flexible approach to describe the temporal dynamics of the total risk-return trade-off. Several assumptions have been taken as customary in previous studies to empirically analyze the aggregated risk-return trade-off in the time-series dimension. The most common is to consider constant prices of risk (Bali et al., 2005). The second, to assume specific dynamics for the sources of risk in the model. Finally, the empirical model is established in a discrete time economy instead of the continuous time economy used in the equilibrium model of the theoretical approach. Most of the empirical papers studying the risk-return trade-off use at least one of these assumptions with the GARCH-M framework being a heavily applied technique. Table 1 reports the estimates for the traditional GARCH-M model  $r_t = \alpha + \beta\sigma_t^2 + \varepsilon_t$ , where  $\sigma_t^2$  is defined as a GARCH(1,1) model, for a variety of cases: return of market on risk of market, return of asset on risk of asset and return of asset on risk of market.<sup>2</sup>

Panel A displays the results when we use two common proxies for the market portfolio: the CRSP NYSE-NYSE MKT-NASDAQ Equally-Weighted Portfolio and the CRSP NYSE-NYSE MKT-NASDAQ Value-Weighted Portfolio. Evidence for a positive risk-return trade-off is obtained when using the Equally-Weighted Portfolio as a proxy for the market portfolio but the relationship turns out to be not significant for the Value-Weighted Portfolio. These results suggest that the aggregation method from individual stocks to form the market portfolio is relevant for the description of the risk-return trade-off. If we look at how the linear assumption of the risk-return trade-off works at the individual equity level, the picture is even more complex. Panel B shows results when we regress individual excess returns on individual volatility. From our set of 4,577 stocks with continuous return data, 880 of them display a linear positive risk-return trade-off. The largest part of the sample leads to a rejection of the linear risk-return trade-off: 3,465 stocks fail to identify any linear pattern. Finally, only 212 stocks show a negative linear relationship between return and risk. The top plot in Fig. 1 shows the estimated  $\beta$  coefficients in the GARCH models for our 4,577 stocks with their associated t-stats. The majority of the densities of the estimated parameters remain around zero and the majority of the associated t-stats lie within the non-significant bounds  $\pm 1.96$ . Similar results are obtained when regressing individual excess returns on market volatility, as displayed in panel C. We observe that the majority of stocks (4,055 stocks) do not show a significant linear relationship between individual excess returns and market volatility while only 397 indicate the proposed linear positive relationship. The bottom plot in Fig. 1 shows graphically how the majority of cases remain within the non-significant bounds while the significant results are more prominent on the positive side. Finally, Panel D displays the average estimated coefficients for the whole universe of stocks in the previous two cases: when using individual or market volatility as regressors. In any of these last cases, we also fail to find a significant linear pattern in the aggregated time-series of returns. Based on this pervasive evidence, it is not surprising that there are controversial conclusions for a linear risk-return trade-off in the literature.

In this paper we proceed to investigate further alternative specifications of the risk-return trade-off. Based on the general partial relation  $\frac{\partial E(R)}{\partial V}$ , we depart from two common assumptions made in previous empirical studies: first, the dynamics for the sources of risk are not defined by a time-series econometric model; instead, we take advantage of the cross-section of stocks to obtain different estimates of market risk across time. Second, we do not restrict the relationship between return and risk to be constant but we allow for time-variation. Our non-parametric approach allows a greater flexibility in the description of the risk-return trade-off not pre-defined by any functional form but just by the observed data itself. This allows us to uncover potential non-linearities intrinsic to the risk-return trade-off. To do so, we determine five levels of risk within the market at every point of time and we approximate the discrete partial relation  $\frac{\Delta E(R)}{\Delta V}$  by using the difference between the portfolios with lower risk and higher risk. This allows for an

<sup>1</sup> See Abel (1988) and Backus and Gregory (1992) for theoretical models that support a negative risk-return relation.

<sup>2</sup> In this case, instead of a GARCH-M model we use a standard OLS regression.

**Table 1**

Regression results risk-return trade-off full sample. This table reports the estimates for the GARCH-M regressions (robust standard errors in parenthesis) using the whole universe of stocks available in CRSP with at least 10 years of continuous data. The top panel shows the estimates of market excess returns on conditional volatility in a GARCH-M framework  $r_{m,t} = \alpha + \beta\sigma_{m,t}^2 + \varepsilon_t$  for two aggregated indexes: the CRSP NYSE/NYSE MKT/NASDAQ Equally-Weighted Portfolio and the CRSP NYSE/NYSE MKT/NASDAQ Value-Weighted Portfolio. Panel B displays the number of stocks that shows a significant negative risk-return trade-off, no significant risk-return trade-off and a significant positive risk-return trade-off in regressions of individual excess returns on individual conditional volatilities  $r_{i,t} = \alpha + \beta\sigma_{i,t}^2 + \varepsilon_t$ . Panel C shows the number of stocks that shows a significant negative risk-return trade-off, no significant risk-return trade-off and a significant positive risk-return trade-off in regressions of individual excess returns on market volatility  $r_{i,t} = \alpha + \beta\sigma_{m,t}^2 + \varepsilon_t$ . The bottom panel reports the average values of the coefficients for the 4,577 individual stocks in both cases: when using individual volatility as a regressor ( $r_{i,t} = \alpha + \beta\sigma_{i,t}^2 + \varepsilon_t$ ) and when using market volatility as a regressor ( $r_{i,t} = \alpha + \beta\sigma_{m,t}^2 + \varepsilon_t$ ). The symbols \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively.

Panel A.- Regression results aggregated portfolios				
$r_{m,t} = \alpha + \beta\sigma_{m,t}^2 + \varepsilon_t$				
	Equally-Weighted		Value-Weighted	
Coefficient	$\alpha$	$\beta$	$\alpha$	$\beta$
	-0.0077	0.4505***	0.0022	0.2098
(std. error)	(0.0082)	(0.1805)	(0.0057)	(0.1493)
Panel B.- Number of stocks with significant coefficient				
$r_{i,t} = \alpha + \beta\sigma_{i,t}^2 + \varepsilon_t$				
	t-stat < 1.96 significant negative	-1.96 non significant	< t-stat < 1.96	t-stat > 1.96 significant positive
Number of stocks (total of 4,557)	212	3,465		880
Panel C.- Number of stocks with significant coefficient				
$r_{i,t} = \alpha + \beta\sigma_{m,t}^2 + \varepsilon_t$				
	t-stat < 1.96 significant negative	-1.96 non significant	< t-stat < 1.96	t-stat > 1.96 significant positive
Number of stocks (total of 4,557)	105	4,055		397
Panel D.- Regression results individual stocks (average values)				
	$r_{i,t} = \alpha + \beta\sigma_{i,t}^2 + \varepsilon_t$		$r_{i,t} = \alpha + \beta\sigma_{m,t}^2 + \varepsilon_t$	
Coefficient	$\alpha$	$\beta$	$\alpha$	$\beta$
	-0.0049	0.1802	-0.0229	0.4158
(std. error)	(0.0252)	(0.2334)	(0.1492)	(0.4443)

analysis of the temporal implications of this relationship by using information embedded in the cross-section of stocks. We investigate large sample portfolios where considerable unique risk may have been diversified away. However, this diversification is far from perfect so we are analyzing the relationship between return and total risk,<sup>3</sup> including idiosyncratic risk and systematic risk.

Using monthly excess market return data from 1963 to 2017, we find a time-varying relationship between return and total risk across our sample period, with periods of positive and negative risk-return trade-off. We show that the consideration of different levels of risk in the market allows us to unmask this fundamental trade-off. However, this expected relationship between return and risk is not observed at all periods of time and for all levels of risk. Regarding the temporal dimension, the results show that there are periods in low-volatility states when a positive and significant relationship between return and risk exists, supporting most theoretical models. However, there are other periods in high-volatility states when this trade-off is not observed or is even negative. Thus, the assumption of a linear risk-return trade-off may fail to uncover this fundamental relationship because this trade-off depends on the state of the market.<sup>4</sup> Also, the risk-return trade-off is clearly observed for investments between the categories of “low risk” up to “medium-high” risk. When increasing the level of risk within these categories we do observe a significant higher reward. However, investments classified as “high risk” not only do not pay the expected return according to the level of risk involved but also lead to lower returns than less risky counterparts.

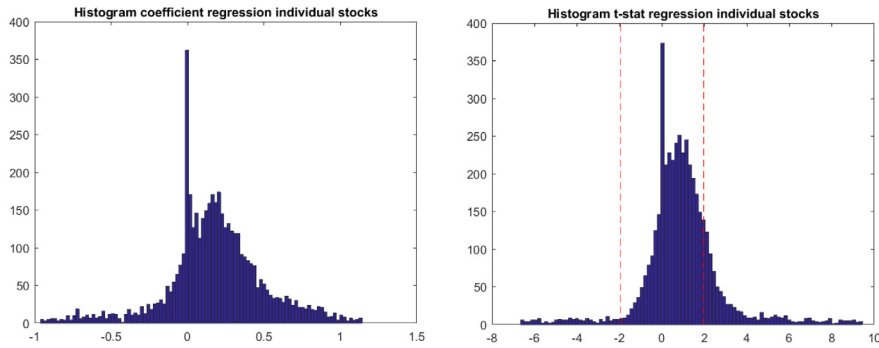
Finally, we also analyze which are the key drivers of this non-linear risk-return trade-off and under which market conditions the risk-return trade-off is likely to be observed. The linkage between the time-varying risk-return trade-off and business cycles is mixed. We observe a clear negative relationship between return and risk during recessions, but there are certain periods of economic expansion that also show a negative relationship. Therefore, we cannot describe the evolution of the risk-return trade-off as procyclical or counter-cyclical since it can be both. To gain a deeper understanding about what determines the time variation of the risk-return trade-off, we regress our discrete approximation on a battery of variables that have been shown to have some predictive power on expected returns.<sup>5</sup> We consider several variables from five groups of determinants: sentiment, macro, credit risk, liquidity and corporate.

<sup>3</sup> Along the paper, we refer to total risk when discussing our results for the risk-return trade-off.

<sup>4</sup> To illustrate, the use of a time frame with many periods corresponding to low-volatility states would result in a positive and significant risk-return trade-off. However, if, in the chosen time frame, there were a high number of high-volatility states, it would result in a negative and significant trade-off. Non-significant estimates for the relation between return and risk would likely be found in samples with a similar number of high and low-volatility periods.

<sup>5</sup> The literature about determinants of the risk-return trade-off is scarce. Liu (2017) tries to provide some evidence on this matter by analyzing the links between the risk-return dynamics and a set of major macroeconomic variables. We extend the results in Liu (2017) by looking at other determinants beyond macro factors.

(a) Regressions of stock return on individual risk  $r_{i,t} = a + \beta\sigma_{i,t} + \varepsilon_{i,t}$



(b) Regressions of stock return on market risk  $r_{i,t} = a + \beta\sigma_{m,t} + \varepsilon_{i,t}$

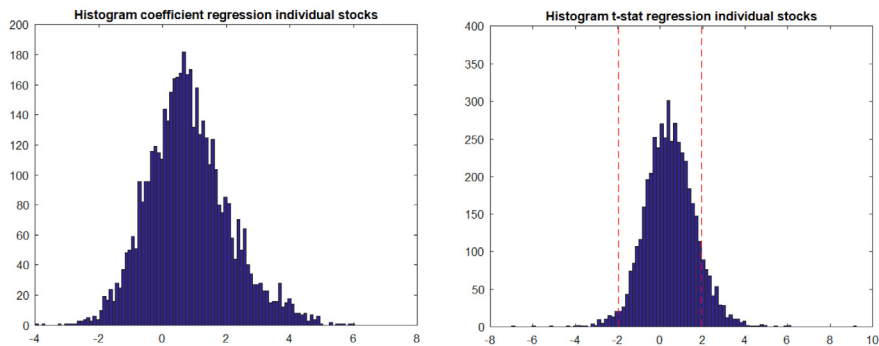


Fig. 1. Histograms for estimated  $\beta$  coefficients and t-stats of individual stocks. (Note: This figure shows the histogram of the estimated values of the betas and the associated t-stats (red dashed vertical lines represent significance at 5% level) for the 99% windorised universe of stocks available in CRSP with at least 10 years of continuous data in the following two cases: when regressing individual stock returns on individual volatility in the GARCH-m model  $r_{i,t} = a + \beta\sigma_{i,t}^2 + \varepsilon_t$  (top plot) and when regressing individual stock returns on market risk using a standard regression model  $r_{i,t} = a + \beta\sigma_{m,t}^2 + \varepsilon_t$  (bottom plot).). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

We find that most of the variables included in the regressions covary significantly with our proxy of the risk-return trade-off. Corporate variables are the major determinants of our approximation of the risk-return trade-off followed (at a considerable distance) by liquidity and credit risk variables. We obtain a strong positive relationship between the risk-return trade-off and consumer sentiment, inflation, industrial production growth, the liquidity factor and the size factor. On the other hand, we uncover a consistent negative relationship between the risk-return trade-off and the default spread, the illiquidity factor, the operating profitability and the investment factor. These results support the idea that periods of time where we observe increases in consumer sentiment, production, liquidity and decreases in credit risk are the ones where we can get a good reward for the risk taken.

The rest of the paper is organized as follows. Section 2 develops the empirical framework used in the paper and provides a description of the data. Section 3 presents the main empirical results. Section 4 analyzes which are the main determinants of the observed non-linear risk-return trade-off, and Section 5 concludes.

## 2. Methodology

Our starting point is the general partial relation between return and risk  $\frac{\partial E(R_t)}{\partial V_t}$ . Most papers analyzing a linear risk-return trade-off proposed a regression of the expected returns on conditional volatilities as a test to validate a constant relationship between return and risk. These papers express this general partial relation  $\frac{\partial E(R_t)}{\partial V_t}$  in discrete terms  $\frac{\Delta E(R_t)}{\Delta V_t}$  and use a regression approach of the form  $E(R_t) = \beta V_t + \gamma X_t$  to uncover a linear relation  $\frac{\Delta E(R_t)}{\Delta V_t} = \beta$ . Literature has used both univariate and multifactor frameworks (including a wide set of proxies for additional risk factors in  $X_t$ ) to uncover a potential linear relationship between return and risk.

The methodology we propose in this paper is also based on the general partial relation between return and risk in discrete terms  $\frac{\Delta E(R_t)}{\Delta V_t}$ , but with different assumptions than previous studies. First, we allow for a time-varying relationship, so for every period  $t$ , the relationship can take a different value  $\frac{\Delta E(R_t)}{\Delta V_t} = \beta_t$ . Second, we do not impose a functional form on the risk-return trade-off, so we do not restrict the shape of this relation to be linear or to a certain type of non-linearity. Third, the estimation for market risk is not done by using a single aggregated market portfolio. We use the whole universe of stocks at every point of time to determine

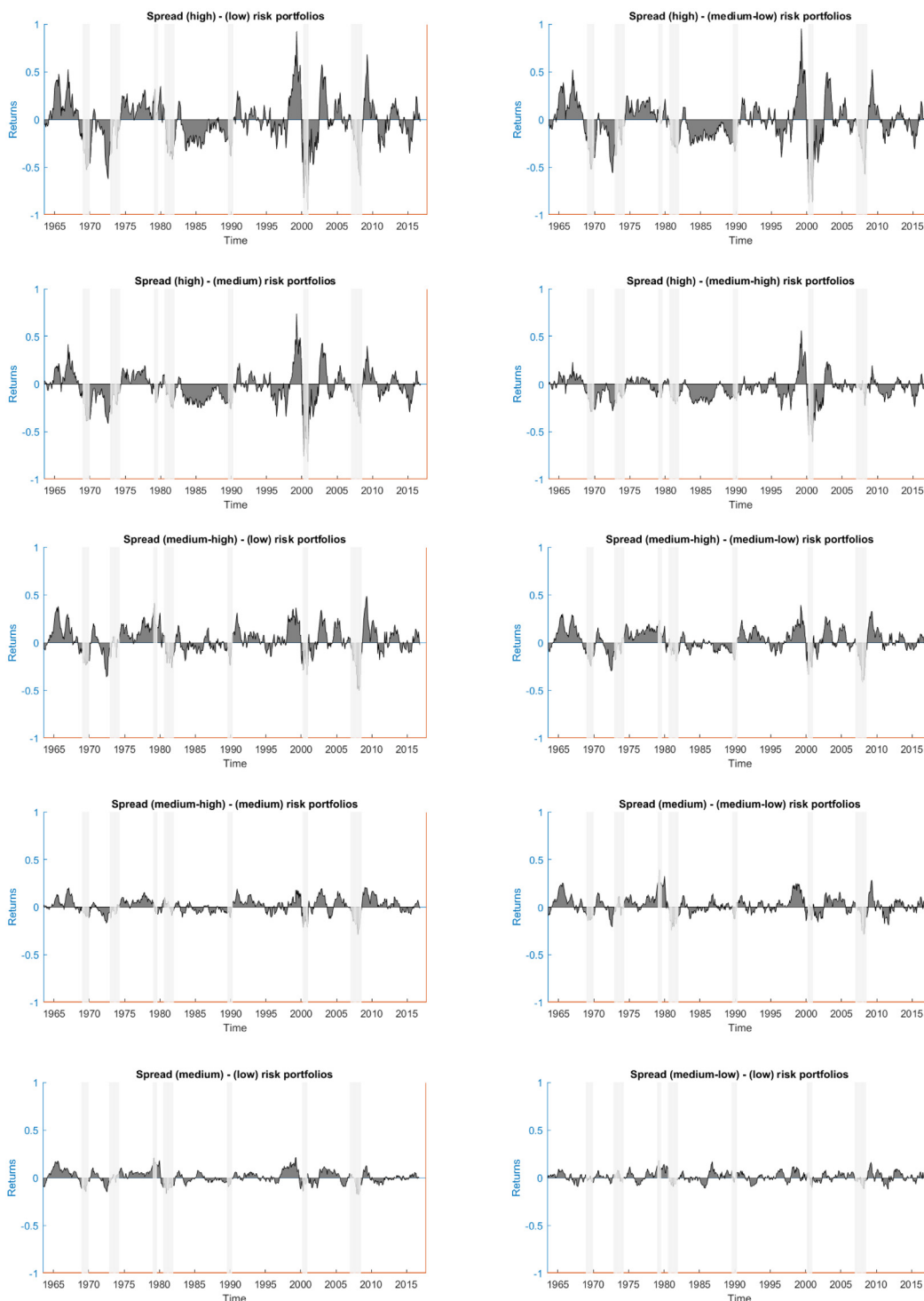


Fig. 2. Spread portfolios with different levels of volatility. (Note: This figure plots the annualized spread return between the different combinations of riskier portfolios and the less risky portfolios over the full sample period July 1963 to September 2017. The four top figures use the portfolio labeled as Q5 for the high risk portfolio and the four spreads using combinations with the other less risky portfolios. The next three figures use the portfolio labeled as Q4 for the medium-high risk portfolio and the three spreads using combinations with the other less risky portfolios. The next two figures below use the portfolio labeled as Q3 for the medium risk portfolio and the two spreads using combinations with the other less risky portfolios. The last figure uses the portfolio labeled as Q2 for the medium-low risk portfolio and its spread with the low-risk portfolio. Shaded areas correspond to recession periods according to NBER.)

five levels of risk within the market.<sup>6</sup> Using these different portfolios we can observe at every point of time the value of the relation  $\frac{\Delta E(R_t)}{\Delta V_t}$  just by looking at the difference between the portfolios with lower risk and the portfolios with higher risk. In this sense, we are visualizing how the market rewards higher risks at different points in time.

The estimation of the risk-return trade-off at every point of time  $\beta_t = \frac{\Delta E(R_t)}{\Delta V_t}$  is obtained by the difference between the returns of lower risk portfolios and higher risk portfolios. The interpretation of the magnitudes of our risk-return trade-off is more intuitive than in previous studies. Instead of defining how much is the change in expected return as an increase of an “additional unit of risk”, our spread portfolio represent how much is the change in expected return as an increase in a higher category of risk. For example, the spread between level 5 and level 1 risk portfolios represent the expected return if we move from a low risk investment to a high risk investment; the spread between level 4 and level 1 risk portfolios represent the expected return if we move from a low risk investment to medium-high risk investment, and so on.

The construction of the portfolios for the five levels of total risk is as follows. We collect daily and monthly return data on all the NYSE, NYSE America, and NASDAQ stocks available within the CRSP (Center for Research in Security Prices) database. Our sample covers 29,746 stocks for the period ranging from July 1963 to September 2017. We drop observations for which the monthly returns exceeds 100%, so as to avoid outliers that could result from compiling errors in the dataset<sup>7</sup> (Lambert and Hubner, 2013). For every month  $t$ , we sort portfolios into five different quintiles based on each stock’s daily total variance. We use a window of 60 days to compute the value of the variance that we use for sorting the stocks into the different portfolios. We rebalance the risk-sorted portfolios every month by updating the values of the estimated variances of every stock and creating again the five value-weighted quintiles.<sup>8</sup> We end up with five time-series of 651 observations reflecting different levels of risk in the market at every point in time.

Based on previous literature that showed strong evidence for a state-dependent risk-return trade-off (Nyberg, 2012; Ghysels et al., 2014), we also condition our time-varying risk-return trade-off to the state of the market, i.e.  $\beta_{t,s_t} = \frac{\Delta E(R_t)}{\Delta V_t} | s_t$ . The unobservable variable  $s_t$  governing the shifts in the state is inferred by estimating a regime-switching GARCH model on the values of the market portfolio. In that way we can distinguish the periods where the market is in a low volatility state and the periods where the market is in a high volatility state.

### 3. Empirical results

#### 3.1. Risk-sorted portfolios

Table 2 reports the summary statistics of the five risk-sorted portfolio returns. The column in the left shows the summary statistics for the low risk portfolio (Q1) returns and columns moving to the right represent the returns for the other portfolios when we increase its risk profile one category. Panel A displays the results for the full sample period July 1963 to September 2017. All portfolios show significant positive average values. The shape of the static relationship between return and risk during the whole sample period appears to be positive for low risk portfolios (Q1) until medium-high risk portfolios (Q4), where the observed average return increases as the level of risk in these portfolios increase. However, this positive relationship is not observed for the high risk portfolios (Q5). Despite being the riskiest investment during the sample period, this does not reward the investors with higher returns. In fact, the average return for this high risk portfolio is the lowest.

Panel B and C of Table 2 show the statistics of the risk-sorted portfolios during periods of high and low volatility. We discriminate between volatility periods by fitting a Regime-Switching GARCH model to the excess returns of the CRSP Value-Weighted Portfolio.<sup>9</sup> This model gives us an estimation of the probability of being in a state of low (high) volatility at each period of time. We use this probability to consider if each time point belongs to a low (high) volatility state. Results for the average returns of the risk-sorted portfolios are different when we condition them to the volatility state. For low volatility states, all average returns are positive and significant. In this case, the shape of the static relationship between return and risk is positive for the whole range of portfolios from low risk portfolios (Q1) to high risk portfolios (Q5). During low volatility periods, the high risk portfolios do reward investors with a higher average return. However, when we condition results to high-volatility states results suggest a different picture. For these periods, all portfolios show positive returns except for the high risk portfolios (Q5) where we find returns not significantly different from zero. This means that high risk investments available in the market do not reward investors with a positive return during these periods of high volatility. This preliminary evidence suggest the existence of a state-dependent risk-return trade-off, which we explore next in a greater detail.

#### 3.2. Risk-sorted portfolio spreads

The purpose of analyzing the risk-return trade-off is to measure the reward that higher risk options offer to investors. Our discrete approximation to the risk-return trade-off  $\frac{\Delta E(R_t)}{\Delta V_t}$  is the following. The denominator of this relationship is given by the different risk-sorted portfolios: a change in risk implies a change in the category of a risk-sorted portfolio, where Q1 represents “low risk”

<sup>6</sup> These categories of risk are similar to the ones used by analysts: Level 1: low risk; Level 2: medium-low risk, Level 3: medium risk; Level 4: medium-high risk; Level 5: high risk.

<sup>7</sup> We also drop from our sample stocks with no market equity data and missing variance of daily returns.

<sup>8</sup> On the suggestion of a referee we also checked and confirmed that these variance quintile portfolios had correspondingly levels of covariances.

<sup>9</sup> We also conditioned our results on the states inferred by fitting a Markov-Switching model on the CRSP Value-Weighted portfolio, obtaining similar results for all analysis through the paper. Results available on request.



**Table 2**

Summary statistics for the risk-sorted portfolios. This table shows monthly summary statistics for five different portfolios according to the level of risk (portfolios are labeled as Q1, Q2, Q3, Q4 and Q5 depending on the level of risk: least risky portfolio is labeled as Q1 and riskiest portfolio as Q5) over the period of July 1963 to September 2017. The portfolios are formed monthly on the variance of daily returns using NYSE breakpoints. The variance is estimated using 60 days of lagged returns. Panel A reports results for the full sample period of 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Regime-Switching GARCH model to the market portfolio. The  $p$ -value for the mean is obtained through the  $t$ -test statistic  $\frac{\hat{\mu}}{\hat{s}/\sqrt{n}}$  where  $\hat{\mu}$  is the estimated mean and  $\hat{s}$  is the estimated long-run variance of the risk-sorted portfolio (adjusted for heteroskedasticity and serial correlation using an AR(1)-GARCH(1,1) model) and  $n$  is the sample size. The symbols \*\*\*, \*\* and \* represent significance at 1%, 5% and 10%, respectively.

Panel A.- Risk-sorted returns: Full sample					
	Q1	Q2	Q3	Q4	Q5
Mean	0.0091***	0.0098***	0.0103***	0.0133***	0.0069**
( $p$ -value)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0218)
Median	0.0115	0.0124	0.0133	0.0121	0.0073
Maximum	0.1309	0.1558	0.1977	0.2553	0.2895
Minimum	-0.1636	-0.2146	-0.2499	-0.2969	-0.3085
Std. Dev	0.0340	0.0429	0.0507	0.0612	0.0792
Observations	651	651	651	651	651
Panel B.- Risk-sorted returns: Low volatility periods					
	Q1	Q2	Q3	Q4	Q5
Mean	0.0120***	0.0125***	0.0137***	0.0163***	0.0163***
( $p$ -value)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0011)
Median	0.0138	0.0157	0.0171	0.0177	0.0221
Maximum	0.0606	0.0750	0.0875	0.1152	0.1716
Minimum	-0.0418	-0.0788	-0.0790	-0.1030	-0.1166
Std. Dev	0.0204	0.0241	0.0297	0.0346	0.0489
Observations	177	177	177	177	177
Panel C.- Risk-sorted returns: High volatility periods					
	Q1	Q2	Q3	Q4	Q5
Mean	0.0080***	0.0088***	0.0090***	0.0094***	0.0034
( $p$ -value)	(0.0000)	(0.0000)	(0.0002)	(0.0016)	(0.3633)
Median	0.0095	0.0111	0.0108	0.0070	0.0006
Maximum	0.1309	0.1558	0.1977	0.2553	0.2895
Minimum	-0.1636	-0.2146	-0.2499	-0.2969	-0.3085
Std. Dev	0.0378	0.0480	0.0565	0.0685	0.0876
Observations	474	474	474	474	474

and Q5 represents “high risk”. The numerator of this relationship measures the expected return for the change in risk from one risk category to the other. Therefore, the difference in the returns of the risk-sorted portfolios gives us an estimate of this discrete risk-return relationship: how much is the return obtained by the investor if she chooses a higher risk alternative.

Table 3 reports the statistics for all the possible combinations of risk-sorted portfolio spreads. Panel A shows the results for the full sample and we condition the estimates to low and high volatility periods in Panel B and C. If we consider the unconditional results, we observe two main features of the risk-return trade-off. First, the relationship between return and risk is significantly positive for all combinations from low levels of risk up to medium-high levels of risk. In terms of magnitude, an investor shifting from a low risk strategy to a medium-high risk investment has obtained an average monthly return 0.22% higher (average annual return of 2.64% higher). For the other levels of risk, an investor has also obtained a significant higher average return in riskier investments but the magnitude is lower. Second, the relationship between return and risk for high levels of risk is negative. This means that investors choosing high risk investments have earned significantly less returns than investors choosing less risky options. The magnitude for the negative returns is substantial: in the mildest case, when we compare the spread return of high risk portfolios to the low risk portfolios, an investor taking the riskiest alternative has obtained a lower monthly return of 0.22% (annual return of 2.64%); in the worst case, the average monthly return of the riskiest investment is 0.44% lower (5.28% lower in annual terms). These results give us a non-linear description of the risk-return trade-off similar to the one obtained by Rossi and Timmermann (2010): at low-medium levels of volatility, a positive risk-return trade-off is observed, but this relationship becomes inverted for high levels of risk.

When we condition the estimates to different volatility states, we uncover a state-dependent risk-return trade-off. For low-volatility states, the positive relationship between return and risk extends to all portfolios from the low risk to the high risk portfolios. During these periods of stability, an investor shifting to a riskier option is rewarded with a higher return in all cases.<sup>10</sup> Opposite to the unconditional results where we got a negative premium for high risk portfolios, an investor holding the high risk portfolio during low volatility states would earn an average of 0.43% more than an investor choosing the low risk alternative (5.16% higher in annual terms). For high-volatility states, the shape of the risk-return trade-off is more complex. We observe again a significant negative

<sup>10</sup> The only exception is for the case of medium-high risk portfolios and high risk portfolio where the spread returns are not different from zero.

**Table 3**

Summary statistics for the spread portfolios. This table shows monthly summary statistics for the spreads (differences) of five different portfolios according to the level of risk (portfolios are labeled as Q1, Q2, Q3, Q4 and Q5 depending on the level of risk: least risky portfolio is labeled as Q1 and riskiest portfolio as Q5) over the period of July 1963 to September 2017. The portfolios are formed monthly on the variance of daily returns using NYSE breakpoints. The variance is estimated using 60 days of lagged returns. Panel A reports results for the full sample period of 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Regime-Switching GARCH model to the market portfolio. The  $p$ -value for the mean is obtained through the  $t$ -test statistic  $\frac{\hat{\mu}}{\hat{\sigma}/\sqrt{n}}$  where  $\hat{\mu}$  is the estimated mean and  $\hat{\sigma}$  is the estimated long-run standard deviation of the spread portfolio (adjusted for heteroskedasticity and serial correlation using an AR(1)-GARCH(1,1) model) and  $n$  is the sample size. The symbols \*\*\*, \*\* and \* represent significance at 1%, 5% and 10%, respectively.

Panel A.- Spread returns: Full sample										
	Q5-Q1	Q5-Q2	Q5-Q3	Q5-Q4	Q4-Q1	Q4-Q2	Q4-Q3	Q3-Q1	Q3-Q2	Q2-Q1
Mean	-0.0022***	-0.0029***	-0.0035***	-0.0044***	0.0022***	0.0015***	0.0010***	0.0013***	0.0005***	0.0007***
( $p$ -value)	(0.0009)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0000)	(0.000)	(0.0000)
Median	-0.0045	-0.0041	-0.0040	-0.0051	0.0015	0.0012	0.0001	0.0013	0.0008	-0.0006
Maximum	0.2969	0.3561	0.2844	0.1648	0.2255	0.1913	0.1196	0.1500	0.0717	0.0825
Minimum	-0.2851	-0.2698	-0.2615	-0.2226	-0.1634	-0.1057	-0.1148	-0.1017	-0.0837	-0.0749
Std.Dev	0.0633	0.0548	0.0454	0.0328	0.0414	0.0312	0.0221	0.0285	0.0180	0.0187
Risk aversion	-4.8698	-7.9911	-12.2816	-24.5093	8.0810	8.1796	9.4826	7.7944	6.4164	7.8775
Panel B.- Spread returns: Low volatility periods										
	Q5-Q1	Q5-Q2	Q5-Q3	Q5-Q4	Q4-Q1	Q4-Q2	Q4-Q3	Q3-Q1	Q3-Q2	Q2-Q1
Mean	0.0043***	0.0036***	0.0026***	0.0000	0.0043***	0.0038***	0.0025***	0.0017***	0.0012***	0.0005*
( $p$ -value)	(0.0004)	(0.0003)	(0.0034)	(0.9654)	(0.0000)	(0.0000)	(0.0000)	(0.0015)	(0.0022)	(0.0918)
Median	0.0026	0.0032	0.0022	-0.0016	0.0058	0.0029	0.0027	0.0049	0.0022	-0.0012
Maximum	0.1324	0.1401	0.1103	0.0881	0.0786	0.0713	0.0554	0.0524	0.0477	0.0438
Minimum	-0.1026	-0.0850	-0.0703	-0.0635	-0.0618	-0.0547	-0.0709	-0.0679	-0.0437	-0.0437
Std.Dev	0.0429	0.0365	0.0299	0.0255	0.0288	0.0224	0.0175	0.0211	0.0138	0.0144
Risk aversion	15.0877	15.3226	13.5417	0.0000	30.2817	36.1905	53.0612	18.2796	21.4286	13.5135
Panel C.- Spread returns: High volatility periods										
	Q5-Q1	Q5-Q2	Q5-Q3	Q5-Q4	Q4-Q1	Q4-Q2	Q4-Q3	Q3-Q1	Q3-Q2	Q2-Q1
Mean	-0.0046***	-0.0055***	-0.0057***	-0.0061***	0.0014***	0.0006	0.0004	0.0011***	0.0003**	0.0008***
( $p$ -value)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0023)	(0.1050)	(0.4924)	(0.0000)	(0.0320)	(0.0000)
Median	-0.0075	-0.0076	-0.0080	-0.0066	-0.0000	-0.0005	-0.0007	-0.0002	-0.0003	-0.0004
Maximum	0.2969	0.3561	0.2844	0.1648	0.2255	0.1913	0.1196	0.1500	0.0717	0.0825
Minimum	-0.2851	-0.2698	-0.2615	-0.2226	-0.1634	-0.1057	-0.1148	-0.1017	-0.0837	-0.0749
Std.Dev	0.0693	0.0601	0.0498	0.0358	0.0452	0.0338	0.0235	0.0308	0.0194	0.0201
Risk aversion	-9.2369	-13.6364	-18.3280	-31.4136	4.5603	2.9268	2.5000	5.8824	3.5294	7.8431

relationship between high risk and the other lower risk alternatives: in the worst case, an investor choosing the risky investment during these periods would have earned a monthly average return of 0.61% less (7.32% in annual terms) than the same investor choosing a medium-high alternative. Obviously, the promised reward-to-risk is not holding in these investments. Also interestingly, the positive risk-return trade-off observed for the other levels of risk also vanishes during periods of high volatility. Only the spreads involving the low risk portfolio (Q1) show a significant positive reward.

The last row of each panel represents the level of risk aversion – assumed to be constant over the sample period (volatility states) – of the representative investor in the ICAPM model that can explain the observed portfolio spread returns. We estimate the risk aversion (RA) implied by each portfolio spread returns using the ratio between the difference in the average return and the difference in the standard deviation of each pairwise combination of risk-sorted portfolios  $R_i, R_j$ , i.e.  $RA_{i,j} = \frac{E(R_i) - E(R_j)}{\sqrt{Var(R_i) - Var(R_j)}}$ . For instance, the risk aversion for the spread Q3-Q2 is computed using the average values and the standard deviations for the Q3 and Q2 portfolios, i.e.  $RA_{3,2} = \frac{(0.0103 - 0.0098)}{(0.0507 - 0.0429)} \times 100 = 6.4164$ .

For the unconditional estimates using the full sample, risk aversion levels range from 6.41 to 9.48 to explain the observed spreads of the low risk to medium-high risk portfolios. However, the ICAPM would need negative values for the risk aversion coefficient to explain the spreads with the high risk alternatives. Therefore, showing a linear positive (even a positive) relationship between return and risk seems a challenging task given this evidence. Estimates of the parameters of risk aversion for periods of low and high volatility confirm this finding: the estimates for the parameter that explain the spreads of the low risk to medium-high risk portfolios stay in positive values (from 13.51 to 53.06 in the low volatility state and from 2.5 to 7.8 in the high volatility state). However, the coefficient of risk aversion for the spreads involving the high risk portfolios during high volatility states are very different, taking large negative values.

Moreover, the magnitude of the coefficients of risk aversion in low-volatility states is higher than those corresponding to the high-volatility states. This finding provides evidence for pro-cyclical risk aversion, already discussed in several previous studies. Using options on the S&P100 and the S&P500, Bliss and Panigirtzoglou (2004) find that risk aversion is higher during periods of low volatility. These authors do not give an explanation for this result; they simply recommend developing theoretical models to capture these effects. This interpretation is also in line with papers such as Salvador et al. (2014) and Ghysels et al. (2014) who document that the Merton model holds over samples excluding financial crises, considering these periods as “flight-to-quality” regimes. The separation of the traditional risk-return relation from financial crises leads to fundamental changes in the relation.



Furthermore, other related papers, such as [Kim and Lee \(2008\)](#), have reported similar evidence in obtaining a significant risk-return trade-off during boom periods that is less clear during crisis periods. [Fig. 2](#) provides further evidence on this matter. It displays the annualized returns for all the combinations of spread returns over the sample period together with NBER business cycles (gray areas). We clearly observe that the risk-return relationship varies over time showing the time-varying nature of investment opportunities. However, the relationship with business cycles is not that clear. The negative trade-off obtained during recessions (evident for the recessions of the year 1981–82, the early 2000s recession and the Great Recession) is in line with a pro-cyclical risk-return trade-off. However, there are periods of economic boom where the observed relationship is also negative (the most evident during the 80s). Therefore, we cannot simplify the risk-return to be defined as pro-cyclical or counter-cyclical. These figures show evidence that the cyclical variation of the risk-return trade-off can be both. In this regard, [Section 4](#) performs a deeper analysis on the dynamics of the risk-return relation and its determinants.

### 3.3. Robustness checks

In this section we discuss the sensitivity of our results to two assumptions: the weighting scheme in the risk-sorted portfolios and the lag length to estimate stock volatility. Given the results obtained in the preliminary GARCH-M analysis (where data support the positive risk-return trade-off for equally-weighted stocks, but not for value-weighted stocks), we might think that stock-weighting matters in uncovering this trade-off. Panel A of [Table 4](#) reports the summary statistics of the five risk-sorted portfolio returns when using equally-weighted portfolios. In general, the results under the equal weighting scheme are very similar to the case using value-weighted portfolios. All portfolios show significant positive average values and the average return increases with the level of risk except for the high risk portfolio (Q5), where the average return is the lowest among the risk-sorted portfolios. When looking at the results after conditioning to the volatility state, we do observe that the high risk portfolio (Q5) rewards investors with a higher average return during these periods. However, for high volatility periods, the high risk portfolio (Q5) offers a lower return than other portfolios, and is not statistically significant at a 5% level.

The other sensitivity test relates to the window length used to estimate the volatility of individual stocks. In the baseline results, we use a 60-day truncation which sorts the individual stocks on relatively short-term variance. Past studies argued that stock volatility has long-memory dynamics ([Corsi, 2009](#)), so this truncation may not be enough to capture this persistence. Panel B of [Table 4](#) reports the summary statistics of the five risk-sorted portfolio returns when we use one year of past daily observations to estimate stock volatility. Results are again qualitatively similar with small differences worth noting. All portfolios show positive average values but the high risk portfolio (Q5) average returns are not significant. We also observe that the direction of the risk-return trade-off is negative for the medium-high (Q4) and high (Q5) risk-sorted portfolios. For the conditioned results on the volatility states, however, we obtain similar evidence to the main case. For low volatility states, we get a positive relationship between riskier investments and their average return, even for the high (Q5) risk-sorted portfolios. When we condition results to high volatility states, the medium-high (Q4) and high (Q5) risk-sorted portfolios do not reward investors with a significant positive return during these periods.

As a final robustness check, in Panel C of [Table 4](#) we display the results for the five risk-sorted portfolio returns when using equally-weighted portfolios and one year of past daily observations to estimate stock volatility. All portfolios show positive average values but the high risk portfolio (Q5) average returns are significantly negative in this case. The observed positive risk-return trade-off during low volatility periods also blurs somewhat with an insignificant result for the high (Q5) risk-sorted portfolio. For high volatility periods, we also observe a more pronounced outperformance of low-risk investments while the high-risk portfolio (Q5) have significant negative returns.

## 4. Determinants of the risk-return trade-off

In this section we provide new insights about variables that can explain the time-varying dynamics of the risk-return trade-off. Our approach consists of regressing the time-series of spread returns of the risk-sorted portfolios (which we consider an estimate of the discrete risk-return trade-off) on a set of explanatory variables. This analysis is in line with previous studies ([Liu, 2017](#)) who have examined determinants of the risk-return relation, albeit in a different setting.

In incorporating the variables we tried to keep a balance between the number of variables in each one of the following categories: Sentiment, Macro, Credit risk, Liquidity and Corporate variables. All these categories have been proposed as potential determinants of the risk-return trade-off and introduced in many asset pricing models. [Baker and Wurgler \(2006\)](#) find that a wave of investor sentiment has larger effects on securities whose valuations are highly subjective and difficult to arbitrage. [Ludvigson and Ng \(2007\)](#) find that macroeconomic factors, when combined with other predictor variables, are also useful for estimating the risk-return trade-off. Also, in the literature on macro-finance, [Cochrane \(2017\)](#) looks to establish a link between asset prices and economic fluctuations. [Pastor and Stambaugh \(2003\)](#) and [Amihud \(2002\)](#) conclude that liquidity is a relevant state variable when determining expected returns. Finally, corporate variables are considered as key determinants of expected returns since the pioneer work of [Fama and French \(1993\)](#). The specific details for each explanatory variable included in this section are summarized in [Table 5](#).<sup>11</sup>

<sup>11</sup> We examined summary statistics and pairwise correlations between these variables. The correlations are generally close to zero, thereby reflecting different sources of variation of the risk-return trade-off and minimizing potential multicollinearity issues. Results available on request.

**Table 4**

Sensitivity of results to the weighting scheme and lag selection. This table shows monthly summary statistics for five different portfolios according to the level of risk (portfolios are labeled as Q1, Q2, Q3, Q4 and Q5 depending on the level of risk: least risky portfolio is labeled as Q1 and riskiest portfolio as Q5) over the period of July 1963 to September 2017. In Panel A we show the results where we consider equally-weighted portfolios formed monthly on the variance of daily returns using NYSE breakpoints and the variance is estimated using 60 days of lagged returns. In Panel B we show the results where we consider value-weighted portfolios formed monthly on the variance of daily returns using NYSE breakpoints and the variance is estimated using one year of lagged returns. In Panel C we show the results where we consider equally-weighted portfolios formed monthly on the variance of daily returns using NYSE breakpoints and the variance is estimated using one year of lagged returns. The first 5 columns within each panel report results for the full sample period of 1963:07 to 2017:09. The remaining columns display the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model of the market portfolio. The  $p$ -value for the mean is obtained through the  $t$ -test statistic  $\frac{\hat{\mu}}{\hat{\sigma}/\sqrt{n}}$  where  $\hat{\mu}$  is the estimated mean and  $\hat{\sigma}$  is the estimated long-run standard deviation of the risk-sorted portfolio (adjusted for heteroskedasticity and serial correlation using an AR(1)-GARCH(1,1) model) and  $n$  is the sample size. The symbols \*\*\*, \*\* and \* represent significance at 1%, 5% and 10%, respectively.

EW Portfolios															
	All Portfolios					LV States					HV States				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
Mean	0.0116***	0.0128***	0.0138***	0.0144***	0.0103***	0.0138***	0.0156***	0.0169***	0.0183***	0.0174***	0.0108***	0.0117***	0.0127***	0.0129***	0.0077*
( $p$ -value)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0006)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0005)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0593)
Median	0.0141	0.0172	0.0176	0.0176	0.0088	0.0141	0.0188	0.0197	0.0222	0.0170	0.0141	0.0150	0.0165	0.0153	0.0049
Maximum	0.1754	0.2434	0.2673	0.3049	0.4171	0.0843	0.0962	0.1005	0.1053	0.2311	0.1754	0.2434	0.2673	0.3049	0.4171
Minimum	-0.1839	-0.2464	-0.2686	-0.2878	-0.3047	-0.0457	-0.0592	-0.0759	-0.0821	-0.1078	-0.1839	-0.2464	-0.2686	-0.2878	-0.3047
Std. Dev.	0.0321	0.0426	0.0497	0.0581	0.0797	0.0188	0.0236	0.0285	0.0322	0.0493	0.0358	0.0478	0.0555	0.0650	0.0883
Observations	651	651	651	651	651	177	177	177	177	177	474	474	474	474	474
VW Portfolios lag 1 year															
	All Portfolios					LV States					HV States				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
Mean	0.0091***	0.0100***	0.0098***	0.0085***	0.0044	0.0115***	0.0134***	0.0153***	0.0166***	0.0172***	0.0082***	0.0087***	0.0077***	0.0055	-0.0004
( $p$ -value)	(0.0000)	(0.0000)	(0.0000)	(0.0039)	(0.2094)	(0.0000)	(0.0000)	(0.0000)	(0.0006)	(0.0031)	(0.0000)	(0.0001)	(0.0083)	(0.1324)	(0.9240)
Median	0.0103	0.0134	0.0127	0.0122	0.0096	0.0130	0.0147	0.0200	0.0177	0.0205	0.0082	0.0111	0.0081	0.0094	0.0046
Maximum	0.1386	0.1712	0.1721	0.2502	0.2961	0.0604	0.0661	0.1079	0.1278	0.2035	0.1386	0.1712	0.1721	0.2502	0.2961
Minimum	-0.1726	-0.2588	-0.3119	-0.3603	-0.4351	-0.0414	-0.0626	-0.1073	-0.1259	-0.1557	-0.1726	-0.2588	-0.3119	-0.3603	-0.4351
Std. Dev.	0.0342	0.0477	0.0598	0.0769	0.0946	0.0199	0.0241	0.0339	0.0451	0.0557	0.0382	0.0503	0.0668	0.0857	0.1048
Observations	651	651	651	651	651	177	177	177	177	177	474	474	474	474	474
EW Portfolios lag 1 year															
	All Portfolios					LV States					HV States				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
Mean	0.0097***	0.0105***	0.0100***	0.0058*	-0.0097**	0.0116***	0.0133***	0.0164***	0.0133***	0.0051	0.0090***	0.0094***	0.0076**	0.0030	-0.0152***
( $p$ -value)	(0.0000)	(0.0000)	(0.0000)	(0.0645)	(0.0140)	(0.0000)	(0.0000)	(0.0000)	(0.0085)	(0.4238)	(0.0000)	(0.0000)	(0.0105)	(0.4445)	(0.0020)
Median	0.0118	0.0142	0.0140	0.0080	-0.0039	0.0124	0.0164	0.0220	0.0154	0.0067	0.0102	0.0120	0.0111	0.0053	-0.0078
Maximum	0.1047	0.1666	0.1862	0.2775	0.3681	0.0514	0.0852	0.1085	0.1813	0.2691	0.1047	0.1666	0.1862	0.2775	0.3681
Minimum	-0.1583	-0.2308	-0.2862	-0.3486	-0.4802	-0.0409	-0.0650	-0.1007	-0.1253	-0.1969	-0.1583	-0.2308	-0.2862	-0.3486	-0.4802
Std. Dev.	0.0314	0.0447	0.0614	0.0824	0.1095	0.0188	0.0251	0.0365	0.0512	0.0676	0.0349	0.0501	0.0684	0.0912	0.1211
Observations	651	651	651	651	651	177	177	177	177	177	474	474	474	474	474

**Table 5**

Summary details of determinants of the risk-return trade-off. This table contains summary details of the independent variables employed for the regression-based analysis of Section 4. The variables include sentiment variables (investor, consumer), real economy series (inflation, unemployment and IP growth), credit risk proxies (default, term and TED spreads), (il)liquidity variables (based on Pastor and Stambaugh (2003) and Amihud (2002)) and corporate variables (size, book-to-market, investment and profitability factors). All variables are computed at monthly frequency for the sample period 1963:07 to 2017:09. Variable definitions are presented, with FRED series codes given in parenthesis.

Sentiment variables	
Variables	Definition and construction
Investor sentiment ( $ΔIS_t$ )	Investor sentiment index of Baker and Wurgler (2006) in units of original index, with higher values corresponding to more positive investor outlook (obtained from authors' website)
Consumer sentiment ( $ΔCS_t$ )	Consumer sentiment index of University of Michigan in units of original index, with higher values corresponding to more positive consumer outlook (obtained from FRED)
Macro variables	
Inflation ( $INFL_t$ )	Level of US CPI inflation expressed as monthly percentage (series CPIAUCSL from FRED)
Unemployment ( $ΔUNP_t$ )	National US unemployment rate expressed as a percentage (series UNRATE from FRED)
IP growth ( $ΔIP_t$ )	Month-on-month percentage growth rate of US industrial production (transformation of series INDPRO from FRED)
Credit risk variables	
Default spread ( $ΔDS_t$ )	Difference between Moody's Seasoned BAA and AAA corporate bond yields (series BAA and AAA from FRED)
Term spread ( $ΔTS_t$ )	Difference between 10-year and 3-month US Treasury yields expressed in percentage points (series GS10 minus TB3MS, both obtained from FRED)
TED spread ( $ΔTED_t$ )	Difference between the interest rates for three-month U.S. Treasuries contracts and the three-month Eurodollars contract as represented by the London Interbank Offered Rate (LIBOR) (series TEDRATE obtained from FRED)
Liquidity variables	
Pastor liquidity ( $LIQ_t$ )	Liquidity factor of Pastor and Stambaugh (2003) in units of original index (obtained from authors' website)
Amihud illiquidity ( $ΔILLIQ_t$ )	Changes in the illiquidity factor of Amihud (2002) obtained using the whole universe of stocks in CRSP.
Corporate variables	
SMB ( $SMB_t$ )	Size factor of Fama and French (1993) in units of original index (obtained from authors' website)
HML ( $HML_t$ )	Book-to-market factor of Fama and French (1993) in units of original index (obtained from authors' website)
RMW ( $RMW_t$ )	Profitability factor of Fama and French (2015) in units of original index (obtained from authors' website)
CMA ( $CMA_t$ )	Investment factor of Fama and French (2015) in units of original index (obtained from authors' website)

We start our analysis by considering the following contemporaneous fixed-effects panel regression<sup>12</sup> using the ten combinations of spread returns and, as robustness, the spreads using each one of the five categories of risk:

$$\beta_{it} = \gamma_0 + \gamma_1 X_{it} + \varepsilon_{it} \tag{1}$$

where  $\beta_{it}$  indicates a single spread portfolio and  $X_t$  reflects an individual explanatory variable in Table 5.

Table 6 reports the R-squared of the panel regressions in (1) for each one of the explanatory variables as individual regressors. Panel A shows the results for the full sample where each row represent the spread portfolios included in the panel regression.<sup>13</sup> There are certain variables which provide higher R-squares for any spread portfolios included in the regression: consumer sentiment, default spread, Pastor liquidity and the corporate variables. Special mention to corporate variables who provide a higher fit for the spread portfolios returns than the other variables. Results are also reported for low and high volatility periods in panels B and C. Conditioning the panel regressions to the volatility states reveal further insights about the role of the explanatory variables on the dynamics of the risk-return trade-off. The picture during high volatility states is similar to the one described above, but additional variables such as inflation and the Amihud illiquidity measure also play a significant role. However, the results during low volatility periods seem quite different. Variables with little importance during high volatility periods such as investor sentiment and the term spread become relevant, besides the operating profitability factor.

Our next analysis consists in regressing the combinations of spread returns on the different sub-groups of sentiment, macro, credit risk, liquidity and corporate variables as follows:

$$\text{Sentiment variables: } \beta_{it} = \gamma_0 + \gamma_1 \Delta IS_{it} + \gamma_2 \Delta CS_{it} + \varepsilon_{it} \tag{2a}$$

$$\text{Macro variables: } \beta_{it} = \gamma_0 + \gamma_1 INFL_{it} + \gamma_2 \Delta UNP_{it} + \gamma_3 \Delta IP_{it} + \varepsilon_{it} \tag{2b}$$

$$\text{Credit risk variables: } \beta_{it} = \gamma_0 + \gamma_1 \Delta DS_{it} + \gamma_2 \Delta TS_{it} + \gamma_3 \Delta TED_{it} + \varepsilon_{it} \tag{2c}$$

$$\text{Liquidity variables: } \beta_{it} = \gamma_0 + \gamma_1 LIQ_{it} + \gamma_2 \Delta ILLIQ_{it} + \varepsilon_{it} \tag{2d}$$

$$\text{Corporate variables: } \beta_{it} = \gamma_0 + \gamma_1 SMB_{it} + \gamma_2 HML_{it} + \gamma_3 RMW_{it} + \gamma_4 CMA_{it} + \varepsilon_{it} \tag{2e}$$

where  $\beta_{it}$  indicates a single spread portfolio and the variables on the right-hand side of the equations are defined in Table 5.

<sup>12</sup> The Hausman test reject random effects in favor of fixed effects. Results available from authors upon request.

<sup>13</sup> The results in the row labeled as “all” include the 10 spread portfolios; the results in the row labeled as “Q5spreads” include the 4 spreads involving the returns of the Q5 portfolio, i.e: Q5-Q1, Q5-Q2, Q5-Q3 and Q5-Q4; the results in the row labeled as “Q4spreads” include the 4 spreads involving the returns of the Q4 portfolio, i.e: Q4-Q1, Q4-Q2, Q4-Q3 and Q5-Q4, and so on.

**Table 6**

Explanatory power of individual determinants of the risk-return trade-off. This table reports the explanatory power of each factor by regressing the estimated risk-return trade-off (computed by using all combinations of returns spreads of the risk-sorted portfolios over time) on a constant and an individual regressor from the sentiment variables (investor, consumer), real economy series (inflation, unemployment and IP growth), credit risk proxies (default, term and TED spreads), (il)liquidity variables (based on [Pastor and Stambaugh \(2003\)](#) and [Amihud \(2002\)](#)) and corporate variables (book-to-market, investment and profitability factors) using panel-regressions. Values reported are the adjusted R-squared obtained from each regression. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all spread portfolios in the panel regression. The second row only includes the four spreads involving the portfolio labeled as Q5. The third row only includes the four spreads involving the portfolio labeled as Q4, and so on.

Panel A.- Full sample regression														
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA
All	0.0029	0.0242	0.0148	0.0017	0.0022	0.0294	0.0001	0.0026	0.0271	0.0124	0.3141	0.0817	0.1704	0.1234
Q5 spreads	0.0016	0.0278	0.0146	0.0017	0.0033	0.0299	0.0003	0.0004	0.0220	0.0147	0.4531	0.1136	0.2895	0.1556
Q4 spreads	0.0052	0.0245	0.0167	0.0024	0.0022	0.0313	0.0001	0.0029	0.0278	0.0132	0.3355	0.0836	0.1764	0.1254
Q3 spreads	0.0030	0.0210	0.0137	0.0017	0.0019	0.0255	0.0001	0.0025	0.0247	0.0112	0.2744	0.0690	0.1468	0.1048
Q2 spreads	0.0024	0.0216	0.0150	0.0016	0.0019	0.0249	0.0001	0.0028	0.0283	0.0121	0.2705	0.0654	0.1429	0.1026
Q1 spreads	0.0041	0.0284	0.0170	0.0016	0.0018	0.0400	0.0009	0.0079	0.0393	0.0125	0.2677	0.0821	0.1149	0.1375
Panel B.- Low-volatility regime regressions														
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA
All	0.0170	0.0035	0.0009	0.0008	0.0030	0.0015	0.0206	0.0003	0.0151	0.0023	0.3903	0.0085	0.1111	0.0141
Q5 spreads	0.0203	0.0041	0.0009	0.0010	0.0028	0.0012	0.0244	0.0001	0.0149	0.0061	0.5336	0.0238	0.1688	0.0196
Q4 spreads	0.0200	0.0023	0.0013	0.0005	0.0023	0.0018	0.0134	0.0001	0.0119	0.0032	0.3778	0.0047	0.1004	0.0090
Q3 spreads	0.0165	0.0027	0.0008	0.0006	0.0030	0.0015	0.0153	0.0002	0.0127	0.0023	0.3294	0.0049	0.0929	0.0093
Q2 spreads	0.0194	0.0032	0.0007	0.0008	0.0052	0.0019	0.0166	0.0007	0.0156	0.0026	0.3366	0.0028	0.0995	0.0077
Q1 spreads	0.0117	0.0057	0.0008	0.0009	0.0028	0.0014	0.0351	0.0001	0.0221	0.0001	0.3873	0.0090	0.0979	0.0266
Panel C.- High-volatility regime regressions														
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA
All	0.0019	0.0331	0.0224	0.0024	0.0015	0.0349	0.0005	0.0043	0.0288	0.0253	0.3028	0.1057	0.1805	0.1527
Q5 spreads	0.0007	0.0375	0.0216	0.0019	0.0024	0.0346	0.0001	0.0007	0.0217	0.0260	0.4433	0.1399	0.3091	0.1885
Q4 spreads	0.0038	0.0353	0.0252	0.0036	0.0017	0.0375	0.0004	0.0048	0.0310	0.0259	0.3287	0.1129	0.1929	0.1615
Q3 spreads	0.0019	0.0292	0.0209	0.0025	0.0013	0.0304	0.0005	0.0042	0.0268	0.0255	0.2659	0.0917	0.1565	0.1329
Q2 spreads	0.0013	0.0296	0.0229	0.0025	0.0010	0.0293	0.0007	0.0050	0.0304	0.0241	0.2603	0.0884	0.1508	0.1306
Q1 spreads	0.0034	0.0380	0.0259	0.0027	0.0014	0.0484	0.0032	0.0032	0.0431	0.0322	0.2477	0.1058	0.1174	0.1661

**Table 7**

Explanatory power of sub-groups of determinants to the risk-return trade-off This table reports the explanatory power of each category of factors by regressing the estimated risk-return trade-off (computed by using all combinations of returns spreads of the risk-sorted portfolios over time) on a constant and all sentiment variables (investor, consumption), all real economy series (inflation, unemployment and IP growth), all credit risk proxies (default, term and TED spreads), all (il)liquidity variables (based on Pastor and Stambaugh (2003) and Amihud (2002)) or all corporate variables (book-to-market, investment and profitability factors) using panel regressions. Values reported are the adjusted R-squared obtained from each regression. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all spread portfolios in the panel regression. The second row only includes the four spreads involving the portfolio labeled as Q5. The third row only includes the four spreads involving the portfolio labeled as Q4, and so on.

Panel A.- Full sample					
	Sentiment	Macro	Credit	Liquidity	Corporate
All	0.0264	0.0176	0.0297	0.0347	0.4398
Q5 spreads	0.0289	0.0183	0.0307	0.0320	0.6462
Q4 spreads	0.0288	0.0198	0.0316	0.0359	0.4617
Q3 spreads	0.0234	0.0161	0.0257	0.0315	0.3808
Q2 spreads	0.0234	0.0174	0.0253	0.0355	0.3737
Q1 spreads	0.0317	0.0194	0.0427	0.0462	0.3814
Panel B.- Low volatility regime					
	Sentiment	Macro	Credit	Liquidity	Corporate
All	0.0225	0.0056	0.0219	0.0170	0.4230
Q5 spreads	0.0268	0.0056	0.0258	0.0203	0.5927
Q4 spreads	0.0240	0.0050	0.0151	0.0147	0.3995
Q3 spreads	0.0209	0.0054	0.0167	0.0147	0.3531
Q2 spreads	0.0246	0.0080	0.0185	0.0177	0.3612
Q1 spreads	0.0195	0.0054	0.0363	0.0221	0.4299
Panel C.- High volatility regime					
	Sentiment	Macro	Credit	Liquidity	Corporate
All	0.0339	0.0244	0.0355	0.0437	0.4461
Q5 spreads	0.0377	0.0241	0.0351	0.0385	0.6571
Q4 spreads	0.0375	0.0280	0.0385	0.0460	0.4790
Q3 spreads	0.0302	0.0228	0.0311	0.0398	0.3894
Q2 spreads	0.0301	0.0247	0.0305	0.0441	0.3801
Q1 spreads	0.0399	0.0280	0.0545	0.0610	0.3783

Table 7 confirms the previous findings when we run the panel regressions in (2a) to (2e). Corporate variables are the most relevant determinants that define the time-variation of the risk-return trade-off, independently of the volatility state. Also interestingly, all categories explain better the dynamics of the risk-return trade-off during high volatility periods. The improvement in the R-squared of liquidity and macro factors is noteworthy during these periods. On the other hand, credit and sentiment variables have a relatively higher impact compared to other groups during low-volatility periods.

Our final model includes all explanatory variables in Table 5 as potential determinants of the risk-return trade-off as follows:

$$\beta_{it} = \gamma_0 + \gamma_1 \Delta I S_{it} + \gamma_2 \Delta C S_{it} + \gamma_3 \Delta I N F L_{it} + \gamma_4 \Delta U N P_{it} + \gamma_5 \Delta I P_{it} + \gamma_6 \Delta D S_{it} + \gamma_7 \Delta T S_{it} + \gamma_8 \Delta T E D_{it} + \gamma_9 \Delta L I Q_{it} + \gamma_{10} \Delta I L L Q_{it} + \gamma_{11} \Delta H M L_{it} + \gamma_{12} \Delta R M W_{it} + \gamma_{13} \Delta C M A_{it} + \epsilon_{it} \tag{3}$$

where  $\beta_{it}$  indicates a single spread portfolio and the variables on the right-hand side of the equations are defined in Table 5.

Table 8 reports the estimates of the variable coefficients for the panel regressions in (3) along with the adjusted R-squared. Confirming the results presented above, there are certain main drivers whose relationship with the risk-return trade-off is robust in any volatility state: default spread, the two liquidity variables and three of the corporate variables (size, operating profitability and investment factors). The default spread has a significant negative covariance with the risk-return trade-off, so that the higher the default spread, the lower the observed risk-return trade-off. Impact for the two liquidity variables give the same conclusion: the higher liquidity, the higher observed risk-return trade-off. Note that there is a positive relation with the liquidity factor and a negative relation with the illiquidity factor. Also, the two corporate variables reflecting operating profitability and investment show a negative relationship with the risk-return trade-off while the size factor is positively related.

Analyzing other potential relevant variables, we observe that inflation and consumer sentiment covary positively with the risk-return trade-off for most of the cases analyzed, although the evidence is weaker for the low risk spread portfolios during low-volatility states. Also, IP growth shows a significant positive co-movement with the risk-return trade-off for the high risk portfolio spreads during all volatility states. The rest of the determinants show a residual role and their significance is reduced to a small number of spreads during certain periods of time.

These results are confirmed when we obtain the estimates for each sub-group of explanatory variables as in Eqs. (2a) to (2e) which are displayed in Table 9. Panel A shows that the results for full sample regressions reinforce the positive relationship between all macro variables, consumer sentiment, Pastor liquidity and the size factor with the risk-return trade-off. On the other hand, there

**Table 8**

Panel regressions for the risk-return trade-off on the full set of determinants. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of returns spreads of the risk-sorted portfolios over time) on a constant and the complete set of determinants (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all spread portfolios in the panel regression. The second row only includes the four spreads involving the portfolio labeled as Q5. The third row only includes the four spreads involving the portfolio labeled as Q4, and so on. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0085**	0.0187***	0.5404***	0.3200***	0.2080***	-1.2544***	-0.1261	-0.0633	0.0300***	-0.4289***	0.5039***	0.0140	-0.4663***	-0.5069***	0.4515
Q5 spreads	-0.0033	0.0197*	0.6046**	0.5624**	0.3675***	-1.0193	0.6394	0.1287	0.0130	-0.6425***	0.7867***	-0.0664***	-0.8362***	-0.7252***	0.6538
Q4 spreads	-0.0120	0.0116	0.4998**	0.0651	0.1616**	-1.1110	-0.1666	-0.0665	0.0244	-0.3691**	0.4495***	-0.0097	-0.3955**	-0.4248**	0.4754
Q3 spreads	-0.0075	0.0127	0.4331***	0.1830	0.1473*	-0.8779	-0.1283	-0.0645	0.0240	-0.3263**	0.3737**	-0.0057	-0.3392	-0.3689**	0.3919
Q2 spreads	-0.0073	0.0158**	0.5571**	0.2669	0.1676	-0.8327	-0.1889	-0.1086	0.0341***	-0.4002*	0.4153	0.0045	-0.3782	-0.4172*	0.3867
Q1 spreads	-0.0125*	0.0336***	0.6071*	0.5221**	0.1963	-2.4312***	-0.7863**	-0.2207**	0.0546**	-0.4061*	0.4943*	0.0071	-0.3824	-0.5988**	0.4062
Panel B.- Low volatility state regressions															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0149*	0.0048**	0.0658*	0.0639	0.0739	-2.1810***	-0.1558	-0.2289	0.0037	0.0136	0.6914***	-0.0047	-0.3632***	-0.3525***	0.4539
Q5 spreads	-0.0059	-0.0081**	0.1839***	0.2462**	0.2548**	-2.5062*	-1.5724*	-0.6369	-0.0124	-0.1571*	0.9977**	-0.1513**	-0.6364***	-0.4204*	0.6305
Q4 spreads	-0.0251	-0.0065**	0.0177	-0.0189	-0.1208	-1.3822	-0.5597	-0.5801	-0.0106	0.0110	0.6411***	-0.0067	-0.2173	-0.2325	0.4413
Q3 spreads	-0.0151	-0.0041	0.0333	0.0131	-0.0460	-1.4884	-0.1275	-0.2997	-0.0025	0.0072	0.5194**	0.0035	-0.2407	-0.2376	0.3734
Q2 spreads	-0.0168	-0.0038	0.0332	-0.0081	0.0292	-1.8454**	0.2442	-0.3324	0.0051	0.0011	0.5723*	0.0266	-0.2917	-0.2773**	0.3908
Q1 spreads	-0.0116	-0.0015	0.0610	0.0870	0.0230	-3.6829***	1.2363	0.7046	0.0021	-0.2055**	0.7264	0.1042	-0.4297*	-0.5947***	0.4817
Panel C.- High volatility state regressions															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0064*	0.0241***	0.6844***	0.4348***	0.2379***	-1.0276***	-0.1536	-0.0358	0.0322**	-0.7882***	0.4770***	0.0154	-0.4659***	-0.5269***	0.4556
Q5 spreads	-0.0017	0.0239*	0.7404*	0.9137**	0.4628***	-0.7779	0.7340	0.2232	0.0124	-0.9552**	0.7686***	-0.0644***	-0.8342***	-0.7519***	0.6607
Q4 spreads	-0.0098	0.0170	0.6516*	0.1383	0.1909**	-0.9108	-0.1635	-0.0100	0.0279	-0.6515**	0.4244***	-0.0096	-0.4021**	-0.4463**	0.4866
Q3 spreads	-0.0057	0.0172	0.5589***	0.2539	0.1657	-0.6977	-0.1457	-0.0339	0.0261	-0.5933**	0.3528**	-0.0062	-0.3407	-0.3857**	0.3995
Q2 spreads	-0.0049	0.0214***	0.7288*	0.3337	0.1745	-0.5957	-0.2274	-0.0810	0.0362***	-0.7367*	0.3904	0.0040	-0.3782	-0.4381*	0.3915
Q1 spreads	-0.0101*	0.0414***	0.7425*	0.5343	0.1956	-2.1557***	-0.9653**	-0.2771**	0.0582**	-1.0040**	0.4491	-0.0007	-0.3747	-0.6114**	0.4064



**Table 9**

Regression analysis sub-groups of determinants of the risk-return tradeoff. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of returns spreads of the risk-sorted portfolios over time) on a constant and the complete set of determinants (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor) and specific subsets of determinants including all the sentiment, macro, credit risk, liquidity and corporate determinants. Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all determinants in the panel regression while other rows results when we include a specific subgroup of determinants. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions all spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0085**	0.0187***	0.5404***	0.3200***	0.2080***	-1.2544***	-0.1261	-0.0633	0.0300***	-0.4289***	0.5039***	0.0140	-0.4663***	-0.5069***	0.4515
Sentiment	-0.0127***	0.1337***													0.0264
Macro			1.6979***	-0.4069***	0.2184***										0.0176
Credit risk						-5.5698***	-0.3443***	0.0227							0.0297
Liquidity									0.1050***	-1.0231***					0.0347
Corporate											0.5324***	-0.0136	-0.4702***	-0.5307***	0.4398
Panel B.- Low volatility state regressions all spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0149*	0.0048**	0.0658*	0.0639	0.0739	-2.1810***	-0.1558	-0.2289	0.0037	0.0136	0.6914***	-0.0047	-0.3632***	-0.3525***	0.4539
Sentiment	-0.0624***	0.0847***													0.0225
Macro			0.5818***	1.5991**	0.3153**										0.0056
Credit risk						-4.1648***	1.5172***	1.2983***							0.0219
Liquidity									0.0564**	-0.1430					0.0170
Corporate											0.6820***	-0.0031	-0.4006***	-0.3565***	0.4230
Panel C.- High volatility state regressions all spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0064*	0.0241***	0.6844***	0.4348***	0.2379***	-1.0276***	-0.1536	-0.0358	0.0322**	-0.7882***	0.4770***	0.0154	-0.4659***	-0.5269***	0.4556
Sentiment	-0.0075***	0.1519***													0.0339
Macro			2.0329***	-0.7128***	0.1363***										0.0244
Credit risk						-5.5196***	-0.0593	-0.5318							0.0355
Liquidity									0.0999***	-2.0312***					0.0437
Corporate											0.5112***	-0.0165	-0.4655***	-0.5535***	0.4461

is a negative relationship between the default spread, Amihud illiquidity and the investment and operating profitability factors with the risk-return trade-off. These results also hold when we consider separately low and high-volatility states. Panel B and C of [Table 9](#) show that the direction of these relationships is practically the same in all cases. Robustness results of [Tables 8](#) and [9](#) are summarized in [Appendix A](#). In these results, we repeat the regression analysis excluding certain subgroups of determinants and we consider different spread combinations. We observe consistent patterns regardless of the specification proposed.<sup>14</sup>

Taking together all these interdependencies, we observe a higher reward to risk during periods of increases in the consumer sentiment, increases in the liquidity of the markets, increases in the production of the real economy and decreases in the levels of credit risk. Significant variables in each one of the five categories presented (Sentiment, Macro, Credit Risk, Liquidity and Corporate) point out to this direction. We argue that when all these ingredients are on the table, it is the best time to embrace risk; otherwise, and contrary to the misleading conception that higher risk implies a higher return, we are likely to get a reward that does not meet our expectations.

## 5. Conclusion

We empirically analyze the risk-return trade-off for the US market under a flexible framework that allows for time variation in the relationship. In contrast to previous studies who use a single market portfolio to compute risk, we take advantage of the whole cross-section of stocks to obtain estimates of five categories of risk at each point of time. Our definition of the discrete risk-return trade-off is obtained by the returns of the spread portfolios between higher risk alternatives and lower risk alternatives. Moreover, given the emerging debate in the literature about the direction of the state-dependent risk-return trade-off, we also condition our estimates to different volatility states observed in the market.

Our main results show that the proposed positive relationship between return and risk holds on average most of the time and for most risk categories. Regarding the temporal dimension, we uncover a positive and significant risk-return trade-off in the states governed by low volatility. However, this evidence is less clear during high-volatility states. Regarding the different levels of risk, the positive risk-return trade-off is observed for low risk investments up to medium-high risk investments. However, the relationship between return and risk for the high risk portfolios is less clear, with a significantly negative trade-off during high volatility states. The investments within the high risk category are likely to be the ones causing the controversy in the risk-return literature. If we assume a constant risk aversion coefficient (as in Merton's ICAPM model) to explain the returns of the spread portfolios, we need large negative values for the spreads including high risk alternatives. Moreover, our results also support the findings of previous papers that document that during low-volatility states the estimated risk aversion is higher than during high-volatility periods.

Finally, we conduct panel regressions to unmask potential determinants of the risk-return trade-off. We include a wide set of sentiment, macro, credit risk, liquidity and corporate variables. Corporate variables are the ones that covary more with our estimates of the risk-return trade-off. Also, all groups of determinants are more relevant in explaining the risk-return dynamics during high volatility states. Regarding the direction of the relationship, the proposed positive relation between return and risk is more evident during periods of increases in consumer sentiment, liquidity and production and decreases of credit risk.

## CRedit authorship contribution statement

**John Cotter:** Resources, Supervision, Writing – review & editing, Project administration. **Enrique Salvador:** Conceptualization, Methodology, Software, Data curation, Writing – original draft.

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## Appendix A. Robustness determinants risk-return trade-off

See [Tables A.1–A.10](#).

## Appendix B. Robustness determinants risk-sorted portfolios

See [Tables B.1–B.6](#).

<sup>14</sup> [Appendix B](#) also summarizes a regression analysis of the determinants of the raw risk-sorted portfolio returns in [Table 2](#) on the set of determinants of [Table 5](#). Results are similar to those encountered for the portfolio spreads but with a less important role played by macro factors.

**Table A.1**

Regression analysis determinants of the risk-return trade-off excluding sentiment variables. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of returns spreads of the risk-sorted portfolios over time) on a constant and the complete set of determinants except the sentiment variables (inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all spread portfolios in the panel regression. The second row only includes the four spreads involving the portfolio labeled as Q5. The third row only includes the four spreads involving the portfolio labeled as Q4, and so on. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions													
	Inflat.	Unemp.	IP growth	Default Spread	TED Spread	Term Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	0.5865***	0.3909***	0.2248***	-1.3148***	-0.1076	-0.0902	0.0294**	-0.4331***	0.5059***	-0.0153	-0.4692***	-0.5133***	0.4500
Q5 spreads	0.6301*	0.5817**	0.3816***	-1.1058	0.6462	0.1034	0.0131	-0.6440**	0.7911***	-0.0648***	-0.8373***	-0.7290***	0.6535
Q4 spreads	0.5559*	0.1749	0.1762**	-1.1215	-0.1400	-0.0810	0.0232	-0.3754**	0.4481***	-0.0140	-0.3994**	-0.4322**	0.4724
Q3 spreads	0.4714***	0.2478	0.1598*	-0.9121	-0.1119	-0.0807	0.0233	-0.3301**	0.3743*	-0.0074	-0.3417	-0.3741**	0.3903
Q2 spreads	0.5965**	0.3278*	0.1818	-0.8835	-0.1730	-0.1288	0.0336***	-0.4038*	0.4169	0.0034	-0.3808	-0.4226*	0.3853
Q1 spreads	0.6787**	0.6222**	0.2247*	-2.5512***	-0.7593**	-0.2637**	0.0538**	-0.4112*	0.4990*	0.0062	-0.3869	-0.6088**	0.4031
Panel B.- Low volatility state regressions													
	Inflat.	Unemp.	IP growth	Default Spread	TED Spread	Term Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	0.0164	0.1906*	-0.0925	-1.8655***	-0.6059	0.1419	0.0083	-0.1457	0.6514***	-0.0141	-0.3260***	-0.2924***	0.4275
Q5 spreads	0.1206	0.3359*	-0.1697*	-2.2202**	-1.6203**	0.0501	0.0065	-0.3624**	0.9456**	-0.1382**	-0.5431***	-0.3426***	0.6023
Q4 spreads	0.0917	0.0564	-0.1138	-1.7191**	-0.7128*	-0.1910	0.0028	-0.1686	0.5997***	0.0040	-0.2408*	-0.2207*	0.4055
Q3 spreads	0.0299	0.1423	-0.0547	-1.4289***	-0.4189	0.0072	0.0056	-0.1279	0.4885**	0.0020	-0.2303*	-0.2066*	0.3569
Q2 spreads	0.0074	0.2745	0.0108	-1.6649**	-0.2055	0.0426	0.0151	-0.1609	0.5400*	0.0215	-0.2728	-0.2402**	0.3652
Q1 spreads	-0.1678*	0.1439	-0.1351	-2.2943**	-0.0689	0.8007	0.0301**	-0.0913	0.6832*	0.0403	-0.3430*	-0.4520**	0.4378
Panel C.- High volatility state regressions													
	Inflat.	Unemp.	IP growth	Default Spread	TED Spread	Term Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	0.7948***	0.5174**	0.2907***	-1.2181***	-0.0184	-0.0841	0.0315***	-0.6645***	0.4762***	-0.0062	-0.4806	-0.5587	0.4592
Q5 spreads	0.8824*	1.0030***	0.5231***	-0.9979	1.0752	0.1649	0.0120	-0.8054**	0.7733***	-0.0485**	-0.8587***	-0.7870**	0.6669
Q4 spreads	0.7354*	0.2300	0.2357**	-1.0454	-0.0316	-0.0406	0.0273	-0.5073*	0.4186***	-0.0094	-0.4130**	-0.4752**	0.4929
Q3 spreads	0.6360***	0.2974	0.2002	-0.8283	-0.0535	-0.0676	0.0257	-0.4832*	0.3507*	-0.0019	-0.3508	-0.4091**	0.4016
Q2 spreads	0.8150*	0.3129	0.2017	-0.7451	-0.1593	-0.1247	0.0361***	-0.5950**	0.3890	0.0097	-0.3895	-0.4629*	0.3945
Q1 spreads	0.9054*	0.7436**	0.2927*	-2.4738***	-0.9229**	-0.3527**	0.0564**	-0.9316***	0.4496	0.0191	-0.3909	-0.6595**	0.4081

**Table A.2**

Regression analysis determinants of the risk-return trade-off excluding macro variables. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of returns spreads of the risk-sorted portfolios over time) on a constant and the complete set of determinants except the sentiment variables (inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all spread portfolios in the panel regression. The second row only includes the four spreads involving the portfolio labeled as Q5. The third row only includes the four spreads involving the portfolio labeled as Q4, and so on. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions												
	Investor Sentim.	Consumer Sentim.	Default Spread	Term Spread	TED Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0094**	0.0229***	-1.4749***	-0.0775	-0.1165*	0.0312**	-0.4251***	0.5070**	-0.0158	-0.4654***	-0.5053***	0.4489
Q5 spreads	-0.0044	0.0264*	-1.3134	0.7529	0.0414	0.0142	-0.6312**	0.7895***	-0.0665***	-0.8362***	-0.7240**	0.6507
Q4 spreads	-0.0126	0.0156	-1.3357	-0.0128	-0.0116	0.0261	-0.3709**	0.4523***	-0.0109	-0.3949**	-0.4242**	0.4726
Q3 spreads	-0.0081	0.0159	-1.0554*	-0.0961	-0.1027	0.0251	-0.3252**	0.3762*	-0.0072	-0.3384	-0.3678**	0.3895
Q2 spreads	-0.0082	0.0194**	-1.0421*	-0.1597	-0.1491**	0.0354***	-0.3986*	0.4187	0.0020	-0.3770	-0.4152*	0.3839
Q1 spreads	-0.0138**	0.0371***	-2.6283***	-0.7568*	-0.2563**	0.0554**	-0.3995*	0.4984*	0.0034	-0.3806	-0.5954**	0.4038
Panel B.- Low volatility state regressions												
	Investor Sentim.	Consumer Sentim.	Default Spread	Term Spread	TED Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0113**	-0.0077	-1.9150***	-0.6394*	0.1213	0.0084	-0.1359	0.6531***	-0.0117	-0.3046***	-0.2837***	0.4285
Q5 spreads	-0.0092	-0.0140*	-2.3235**	-1.6211**	0.0215	-0.0046	-0.3430**	0.9456**	-0.1359**	-0.5263***	-0.3385**	0.6019
Q4 spreads	-0.0161	-0.0128*	-1.8493**	-0.7706*	-0.2027	-0.0016	-0.1540	0.6024***	0.0078	-0.2105*	-0.2060	0.4087
Q3 spreads	-0.0115*	-0.0068	-1.4894***	-0.4549	-0.0053	0.0056	-0.1180	0.4917**	0.0050	-0.2076	-0.1975*	0.3590
Q2 spreads	-0.0156	-0.0045	-1.7144**	-0.2494	0.0301	0.0133	-0.1482	0.5478*	0.0271	-0.2390	-0.2285**	0.3683
Q1 spreads	-0.0044	-0.0006	-2.1985**	-0.1014	0.7627**	0.0295**	0.0840	0.6781*	0.0374	-0.3395*	-0.4469***	0.4370
Panel C.- High volatility state regressions												
	Investor Sentim.	Consumer Sentim.	Default Spread	Term Spread	TED Spread	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0085**	0.0338***	-1.3864***	-0.0537	-0.1191	0.0338**	-0.6620***	0.4724***	-0.0416	-0.4806***	-0.5420***	0.4570
Q5 spreads	-0.0041	0.0362*	-1.2447	1.1439	0.0777	0.0131	-0.8053**	0.7646***	-0.0599	-0.8619***	-0.7697**	0.6622
Q4 spreads	-0.0116	0.0269*	-1.2609	-0.0726	-0.0855	0.0308	-0.5104*	0.4187***	-0.0126	-0.4125***	-0.4596***	0.4918
Q3 spreads	-0.0072	0.0248*	-0.9740	-0.0916	-0.0947	0.0278	-0.4859*	0.3490*	-0.0078	-0.3504	-0.3963**	0.3997
Q2 spreads	-0.0064	0.0300***	-0.9021	-0.2279	-0.1446	0.0382***	-0.6057**	0.3867	-0.0005	-0.3882	-0.4480*	0.3919
Q1 spreads	-0.0132**	0.0511***	-2.5502***	-1.0152*	-0.3483**	0.0592**	-0.9029**	0.4432	0.0079	-0.3901	-0.6362**	0.4083

**Table A.3**

Regression analysis determinants of the risk-return trade-off excluding credit risk variables. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of returns spreads of the risk-sorted portfolios over time) on a constant and the complete set of determinants except credit risk variables (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all spread portfolios in the panel regression. The second row only includes the four spreads involving the portfolio labeled as Q5. The third row only includes the four spreads involving the portfolio labeled as Q4, and so on. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions												
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp	IP growth	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0080**	0.0241***	0.6084***	0.2370*	0.2173***	0.0332**	-0.4671***	0.5064***	-0.0125	-0.4716***	-0.5103***	0.4500
Q5 spread	-0.0032	0.0211	0.6243*	0.5413**	0.3821***	0.0118	-0.6651**	0.7933***	-0.0572***	-0.8400***	-0.7294**	0.6529
Q4 spreads	-0.0115	0.0165	0.5626*	-0.0101	0.1689**	0.0275	-0.4036**	0.4515***	-0.0088	-0.4003**	-0.4277**	0.4737
Q3 spreads	-0.0071	0.0167	0.4828**	0.1214	0.1539*	0.0264	-0.3535**	0.3751*	-0.0051	-0.3428	-0.3712**	0.3907
Q2 spreads	-0.0069	0.0202**	0.6080**	0.2001	0.1750	0.0369***	-0.4268*	0.4158	0.0037	-0.3816	-0.4192*	0.3856
Q1 spreads	-0.0112*	0.0457***	0.7643**	0.3331	0.2064	0.0633***	-0.4863*	0.4963*	0.0051	-0.3933	-0.6041**	0.3998
Panel B.- Low volatility state regressions												
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp	IP growth	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0110*	-0.0014	0.0227	0.0159	-0.0832	0.0133*	-0.1584*	0.6498***	-0.0007	-0.3128***	-0.2876***	0.4261
Q5 spreads	-0.0080	-0.0031	0.0559	0.1161	-0.1611*	0.0079	-0.3765**	0.9315**	-0.1159**	-0.5434***	-0.3529**	0.5969
Q4 spreads	-0.0161	-0.0064	0.0828	-0.1544	-0.1096	0.0032	-0.1730*	0.5934***	0.0205	-0.2180*	-0.2127*	0.4053
Q3 spreads	-0.0113*	-0.0021	0.0364	-0.0090	-0.0489	0.0090	-0.1358	0.4869**	0.0130	-0.2143	-0.1998*	0.3568
Q2 spreads	-0.0153	-0.0002	0.0344	0.0983	0.0180	0.0160**	-0.1721	0.5418*	0.0324	-0.2481	-0.2269**	0.3664
Q1 spreads	-0.0043	0.0045	-0.0960	0.0283	-0.1140	0.0304**	0.0655	0.6958*	0.0464	-0.3403*	-0.4455***	0.4330
Panel C.- High volatility state regressions												
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp	IP growth	Pastor Liquid.	Amihud Illiquid.	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0064*	0.0354***	0.8330***	0.3721*	0.2683***	0.0355**	-0.6646***	0.4739***	-0.0054	-0.4841***	-0.5543***	0.4597
Q5 spreads	-0.0024	0.0277	0.8250*	0.9944***	0.5195***	0.0104	-0.7751**	0.7733	-0.0347**	-0.8629***	-0.7911***	0.6658
Q4 spreads	-0.0101	0.0267	0.7423*	0.0567	0.2123*	0.0318	-0.5098*	0.4198***	-0.0048	-0.4164**	-0.4691**	0.4947
Q3 spreads	-0.0057	0.0252	0.6582**	0.1826	0.1818	0.0288	-0.4806*	0.3490*	-0.0014	-0.3531	-0.4049**	0.4024
Q2 spreads	-0.0045	0.0310***	0.8493**	0.2087	0.1796	0.0393***	-0.5820**	0.3838	0.0059	-0.3908	-0.4577*	0.3953
Q1 spreads	-0.0095*	0.0618***	1.0904**	0.4182	0.2485	0.0673**	-0.9755**	0.4433	0.0083	-0.3974	-0.6486**	0.4046

**Table A.4**

Regression analysis determinants of the risk-return trade-off excluding liquidity variables. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of returns spreads of the risk-sorted portfolios over time) on a constant and the complete set of determinants except liquidity variables (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all spread portfolios in the panel regression. The second row only includes the four spreads involving the portfolio labeled as Q5. The third row only includes the four spreads involving the portfolio labeled as Q4, and so on. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions													
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0080***	0.0200***	0.5828***	0.1701	0.1977***	-1.4897***	-0.2568	-0.0761	0.5156***	-0.0146	-0.4615***	-0.5158***	0.4481
Q5 spreads	-0.0032	0.0203	0.6344*	0.4449**	0.3563***	-1.2509	0.5664	0.1232	0.7959***	-0.0674***	-0.8333	-0.7299**	0.6518
Q4 spreads	-0.0117	0.0127	0.5348*	-0.0551	0.1529**	-1.3083	-0.2737	-0.0745	0.4593***	-0.0102	-0.3916**	-0.4320**	0.4721
Q3 spreads	-0.0071	0.0138	0.4666**	0.0691	0.1393	-1.0613	-0.2322	-0.0723	0.3829*	-0.0061	-0.3354	-0.3759**	0.3886
Q2 spreads	-0.0067	0.0173**	0.6031**	0.1129	0.1570	-1.0750*	-0.3341	-0.1195	0.4278	0.0040	-0.3730	-0.4270*	0.3820
Q1 spreads	-0.0116*	0.0360***	0.6750**	0.3034	0.1829	-2.7528***	-1.0105**	-0.2373**	0.5122*	0.0066	-0.3743	-0.6140**	0.3999
Panel B.- Low volatility state regressions													
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0113**	-0.0096	0.0493	0.0386	-0.1009	-2.0357***	-0.7461**	0.1367	0.6631***	-0.0117	-0.2986***	-0.2780***	0.4284
Q5 spreads	-0.0084	-0.0204*	0.1333	0.1957	-0.1792*	-2.5841**	-1.6841***	0.0383	0.9754**	-0.1440**	-0.5175***	-0.3182*	0.6011
Q4 spreads	-0.0163	-0.0163*	0.1262	-0.1181	-0.1171	-1.9487**	-0.8018**	-0.2069	0.6105***	0.0048	-0.2033	-0.1984	0.4090
Q3 spreads	-0.0115*	-0.0086	0.0584	-0.0009	-0.0612	-1.5778**	-0.5321	0.0008	0.4986**	0.0041	-0.2031	-0.1922	0.3586
Q2 spreads	-0.0157	-0.0061	0.0457	0.0660	-0.0016	-1.8178*	-0.3941	0.0393	0.5551*	0.0263	-0.2359	-0.2230**	0.3670
Q1 spreads	-0.0047	0.0033	-0.1167	0.0507	-0.1454	-2.2408*	-0.3134	0.8118	0.6939*	0.0504	-0.3330*	-0.4580***	0.4361
Panel C.- High volatility state regressions													
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0060*	0.0341***	0.8356***	0.3382	0.2512***	-1.3782***	-0.1823	-0.0484	0.4820***	-0.0093	-0.4733***	-0.5640***	0.4570
Q5 spreads	-0.0016	0.0321	0.9468*	0.9173***	0.4904***	-1.0923	0.9778	0.2028	0.7731***	-0.0509**	-0.8560***	-0.7936**	0.6658
Q4 spreads	-0.0098	0.0263	0.7369*	0.0273	0.2007*	-1.2042	-0.1854	-0.0150	0.4265***	-0.0092	-0.4063**	-0.4768**	0.4922
Q3 spreads	-0.0053	0.0252	0.6622**	0.1494	0.1701	-0.9598	-0.1843	-0.0419	0.3561*	-0.0040	-0.3449	-0.4128**	0.3995
Q2 spreads	-0.0039	0.0318***	0.8671**	0.1477	0.1656	-0.9122	-0.3238	-0.0924	0.3952	0.0048	-0.3814	-0.4695	0.3908
Q1 spreads	-0.0096*	0.0552***	0.9651**	0.4493	0.2292	-2.7223***	-1.1960**	-0.2955***	0.4593	0.0126	-0.3780	-0.6672**	0.4032



Table A.5

Regression analysis determinants of the risk-return trade-off excluding corporate variables. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of returns spreads of the risk-sorted portfolios over time) on a constant and the complete set of determinants except corporate variables (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all spread portfolios in the panel regression. The second row only includes the four spreads involving the portfolio labeled as Q5. The third row only includes the four spreads involving the portfolio labeled as Q4, and so on. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions											
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	R <sup>2</sup>
All	-0.0152***	0.0956***	1.0958***	0.3242**	0.1446***	-3.7457***	0.0114	0.2424	0.0854***	-0.8229***	0.0777
Q5 spreads	-0.0141	0.1416**	1.4867**	0.5861**	0.2699***	-5.0964**	0.8140	0.6482	0.0978**	-1.2721***	0.0803
Q4 spreads	-0.0173	0.0797**	0.9849**	0.0758	0.1073*	-3.2884	-0.0325	0.2162	0.0725*	-0.7141**	0.0837
Q3 spreads	-0.0121*	0.0696**	0.8393**	0.1868	0.1016	-2.7139**	-0.0192	0.1697	0.0646**	-0.6159**	0.0696
Q2 spreads	-0.0123*	0.0796*	1.0023*	0.2662	0.1183	-2.8850*	-0.0584	0.1598	0.0790**	-0.7207*	0.0729
Q1 spreads	-0.0199**	0.1074*	1.1658*	0.5061**	0.1261	-4.7446**	-0.6470*	0.0179	0.1129**	-0.7915*	0.0999
Panel B.- Low volatility state regressions											
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	R <sup>2</sup>
All	-0.0374***	0.0401***	0.0878	0.6448***	0.2592***	-0.9322***	0.5693**	1.7415***	0.0709***	-0.3074**	0.0615
Q5 spreads	-0.0517**	0.0568**	0.1507	0.9343**	0.3163*	-0.7269	0.2353	2.4316***	0.0820**	-0.6200***	0.0719
Q4 spreads	-0.0369**	0.0293*	0.1897	0.4431*	0.2170**	-1.0349	0.3267	1.2313*	0.0543*	-0.3161**	0.0536
Q3 spreads	-0.0299**	0.0286*	0.0952	0.4611*	0.2123*	-0.8144***	0.4430	1.1802*	0.0525*	-0.2482	0.0529
Q2 spreads	-0.0360	0.0351**	0.0813	0.5954**	0.3082	-1.0576*	0.7336**	1.3487**	0.0673**	-0.2924	0.0640
Q1 spreads	-0.0324	0.0507**	-0.0777	0.7904**	0.2420	-1.0273*	1.1078**	2.5068**	0.0982**	-0.0600	0.0755
Panel C.- High volatility state regressions											
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	R <sup>2</sup>
All	-0.0099**	0.1238***	1.5161***	0.1631	0.0240	-3.5323***	-0.0779	0.1364	0.0820***	-1.3181***	0.0927
Q5 spreads	-0.0056	0.1829**	2.1365**	0.6162**	0.1317***	-4.9223**	0.9854*	0.5519**	0.0883*	-1.8828**	0.0932
Q4 spreads	-0.0128	0.1057**	1.3384**	-0.1249	0.0021	-3.0967**	-0.0892	0.1542	0.0721*	-1.0736**	0.1015
Q3 spreads	-0.0081	0.0913**	1.1570**	0.0263	0.0040	-2.5324*	-0.0994	0.0987	0.0628**	-0.9612**	0.0836
Q2 spreads	-0.0071	0.1046*	1.3944*	0.0262	-0.0159	-2.6174*	-0.1912	0.0700	0.0766**	-1.1234*	0.0874
Q1 spreads	-0.0160**	0.1348*	1.5543*	0.2718	-0.0018	-4.4931**	-1.0003*	-0.1928	0.1103**	-1.5499**	0.1232

**Table A.6**

Regression analysis sub-groups of determinants of the risk-return trade-off for Q5 spreads. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of the returns spreads involving the highest risk-sorted portfolios Q5 over time) on a constant and the complete set of determinants (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor) and specific subsets of determinants including all the sentiment, macro, credit risk, liquidity and corporate determinants. Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all determinants in the panel regression while other rows results when we include a specific subgroup of determinants. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions Q5 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0033	0.0197*	0.6046**	0.5624**	0.3675***	-1.0193	0.6394	0.1287	0.0130	-0.6425***	0.7867***	-0.0664***	-0.8362***	-0.7252***	0.6538
Sentiment	-0.0116	0.1888**													0.0289
Macro			2.2141**	-0.3553	0.3774**										0.0183
Credit risk						-7.6694**	0.4269	0.3311							0.0307
Liquidity									0.1211**	-1.5322**					0.0320
Corporate											0.8158***	-0.0541***	-0.8407***	-0.7429**	0.6462
Panel B.- Low volatility state regressions Q5 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0085	-0.0157*	0.1631	0.2534	-0.1686*	-2.3716**	-1.7176**	0.0388	-0.0067	-0.3433**	0.9525**	-0.1360**	-0.5242***	-0.3336**	0.6023
Sentiment	-0.0555**	0.0633**													0.0268
Macro			0.4706**	0.8392**	0.3462*										0.0056
Credit risk						-1.7626**	-0.4298*	2.6839**							0.0258
Liquidity									0.0907**	-0.5426**					0.0203
Corporate											0.9303**	-0.1251**	-0.5572***	-0.3480***	0.5927
Panel C.- High volatility state regressions Q5 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0021	0.0271	0.8721**	0.9887***	0.4994***	-0.8777	1.0487	0.2016	0.1239	-0.7617**	0.7659***	-0.0519**	-0.8584***	-0.7828**	0.6673
Sentiment	-0.0039	0.2417***													0.0377
Macro			2.9514**	-0.4841	0.2851***										0.0241
Credit risk						-8.0422***	0.5458	0.1613							0.0351
Liquidity									0.1098**	-2.8543**					0.0385
Corporate											0.7960***	-0.0364***	-0.8659***	-0.8010**	0.6571

**Table A.7**

Regression analysis sub-groups of determinants of the risk-return trade-off for Q4 spreads. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of the returns spreads involving the medium-high risk-sorted portfolios Q4 over time) on a constant and the complete set of determinants (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor) and specific subsets of determinants including all the sentiment, macro, credit risk, liquidity and corporate determinants. Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all determinants in the panel regression while other rows results when we include a specific subgroup of determinants. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions Q4 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0120	0.0116	0.4998**	0.0651	0.1616**	-1.1110	-0.1666	-0.0665	0.0244	-0.3691**	0.4495***	-0.0097	-0.3955**	-0.4248**	0.4754
Sentiment	-0.0150	0.1135**													0.0288
Macro			1.5209**	-0.5072	0.1703**										0.0198
Credit risk						-4.8547**	0.0222	-0.3376							0.0316
Liquidity									0.0899**	-0.8958***					0.0359
Corporate											0.4709***	-0.0128	-0.4007**	-0.4473***	0.4617
Panel B.- Low volatility state regressions Q4 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0164	-0.0142*	0.1411	-0.0957	-0.1129	-1.8569**	-0.8229*	-0.2062	-0.0040	-0.1494	0.6088***	0.0086	-0.2061	-0.2052	0.4098
Sentiment	-0.0390**	0.0358**													0.0240
Macro			0.3784**	0.4501*	0.2306*										0.0050
Credit risk						-1.6400*	-0.0754	1.4100*							0.0151
Liquidity									0.0585*	-0.2766**					0.0147
Corporate											0.5866**	0.0115	-0.2511**	-0.2204*	0.3995
Panel C.- High volatility state regressions Q4 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0106	0.0223	0.6709*	0.1244	0.2090**	-0.9793	-0.0822	-0.0121	0.0294	-0.4634*	0.4166***	-0.0067	-0.4124**	-0.4666**	0.4960
Sentiment	-0.0390**	0.0358**													0.0375
Macro			0.3784**	0.4501*	0.2306*										0.0280
Credit risk						-1.6400*	-0.0754	1.4100*							0.0385
Liquidity									0.0585*	-0.2766**					0.0460
Corporate											0.5866**	0.0115	-0.2511**	-0.2204*	0.4790

**Table A.8**

Regression analysis sub-groups of determinants of the risk-return trade-off for Q3 spreads. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of the returns spreads involving the medium risk-sorted portfolios Q3 over time) on a constant and the complete set of determinants (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor) and specific subsets of determinants including all the sentiment, macro, credit risk, liquidity and corporate determinants. Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all determinants in the panel regression while other rows results when we include a specific subgroup of determinants. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions Q3 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0075	0.0127	0.4331***	0.1830	0.1473*	-0.8779	-0.1283	-0.0645	0.0240	-0.3263**	0.3737**	-0.0057	-0.3392	-0.3689**	0.3919
Sentiment	-0.0103*	0.0982**													0.0234
Macro			1.2884**	-0.3477*	0.1550*										0.0161
Credit risk						-4.0779**	-0.2913	0.0057							0.0257
Liquidity									0.0792***	-0.7644**					0.0315
Corporate											0.3945*	-0.0070	-0.3419	-0.3873**	0.3808
Panel B.- Low volatility state regressions Q3 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0114*	-0.0073	0.0589	0.0374	-0.0543	-1.5006**	-0.4841	-0.0023	0.0047	-0.1173	0.4942**	0.0051	-0.2064	-0.1961*	0.3593
Sentiment	-0.0321**	0.0338**													0.0209
Macro			0.2954**	0.4514**	0.2291*										0.0054
Credit risk						-1.3495***	0.0260	1.3473*							0.0167
Liquidity									0.0546**	-0.2109					0.0147
Corporate											0.4866**	0.0095	-0.2356*	-0.2073*	0.3531
Panel C.- High volatility state regressions Q3 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0061	0.0214	0.6000**	0.2394	0.1779	-0.7496	-0.0887	-0.0394	0.0269	-0.4447*	0.3469*	-0.0019	-0.3504	-0.4033**	0.4033
Sentiment	-0.0063	0.1258**													0.0302
Macro			1.7174**	-0.5975***	0.0760										0.0228
Credit risk						-4.2214**	-0.4065	-0.1079							0.0311
Liquidity									0.0768***	-1.4967**					0.0398
Corporate											0.3751*	-0.0094	-0.3483	-0.4184**	0.3894

**Table A.9**

Regression analysis sub-groups of determinants of the risk-return trade-off for Q2 spreads. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of the returns spreads involving the medium-low risk-sorted portfolios Q2 over time) on a constant and the complete set of determinants (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor) and specific subsets of determinants including all the sentiment, macro, credit risk, liquidity and corporate determinants. Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all determinants in the panel regression while other rows results when we include a specific subgroup of determinants. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions Q2 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0073	0.0158**	0.5571**	0.2669	0.1676	-0.8327	-0.1889	-0.1086	0.0341***	-0.4002*	0.4153	0.0045	-0.3782	-0.4172*	0.3867
Sentiment	-0.0103*	0.1120*													0.0234
Macro			1.5105*	-0.3748	0.1764										0.0174
Credit risk						-4.4946*	-0.3975	-0.0278							0.0253
Liquidity									0.0956**	-0.8828*					0.0355
Corporate											0.4417	0.0016	-0.3791	-0.4388*	0.3737
Panel B.- Low volatility state regressions Q2 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0153	-0.0048	0.0356	0.1356	0.0108	-1.7129*	-0.2707	0.0318	0.0135	-0.1522	0.5464*	0.0258	-0.2412	-0.2267**	0.3683
Sentiment	-0.0389	0.0409*													0.0246
Macro			0.3369*	0.5953*	0.3275*										0.0080
Credit risk						-1.7161*	0.1930	1.5510**							0.0185
Liquidity									0.0675**	-0.2459					0.0177
Corporate											0.5475*	0.0311	-0.2736	-0.2397**	0.3612
Panel C.- High volatility state regressions Q2 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0050	0.0270***	0.7868*	0.2693	0.1757	-0.6359	-0.1951	-0.0885	0.0371***	-0.5489**	0.3829	0.0080	-0.3890	-0.4571*	0.3960
Sentiment	-0.0053	0.1431*													0.0301
Macro			2.0253*	-0.7185*	0.0621										0.0247
Credit risk						-4.6089*	-0.5912	-0.1626							0.0305
Liquidity									0.0930**	-1.7257*					0.0441
Corporate											0.4191	-0.0042	-0.3833	-0.4730	0.3801

**Table A.10**

Regression analysis sub-groups of determinants of the risk-return trade-off for Q1 spreads. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of the estimated risk-return trade-off (computed by using all combinations of the returns spreads involving the low risk-sorted portfolios Q1 over time) on a constant and the complete set of determinants (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor) and specific subsets of determinants including all the sentiment, macro, credit risk, liquidity and corporate determinants. Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all determinants in the panel regression while other rows results when we include a specific subgroup of determinants. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions Q1 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0125*	0.0336***	0.6071*	0.5221**	0.1963	-2.4312***	-0.7863**	-0.2207**	0.0546**	-0.4061*	0.4943*	0.0071	-0.3824	-0.5988**	0.4062
Sentiment	-0.0166**	0.1561**													0.0317
Macro			1.9556**	-0.4517*	0.2131										0.0194
Credit risk						-6.7523**	0.2176	-1.1218**							0.0427
Liquidity									0.1394**	-1.0405**					0.0462
Corporate											0.5392*	0.0043	-0.3891	-0.6371**	0.3814
Panel B.- Low volatility state regressions Q1 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0039	0.0006	-0.1645	0.1093	-0.1353	-2.2885**	-0.0771	0.0798	0.0296**	-0.0915	0.6843*	0.0415	-0.3352*	-0.4488***	0.4380
Sentiment	-0.0373	0.0599**													0.0195
Macro			0.3831*	0.7047*	0.2990*										0.0054
Credit risk						-1.6994*	2.7156**	0.2317							0.0363
Liquidity									0.0975**	-0.0085					0.0221
Corporate											0.6985*	0.0539	-0.3540*	-0.4613***	0.4295
Panel C.- High volatility state regressions Q1 spreads															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0113*	0.0478***	0.8398*	0.6387*	0.2449	-2.2901***	-0.9939*	-0.2895*	0.0585**	-0.8481**	0.4400	0.0177	-0.3900	-0.6477	0.4118
Sentiment	-0.0122**	0.1964**													0.0399
Macro			2.6319**	-0.8483*	0.1076										0.0280
Credit risk						-7.0084**	-1.5098**	-0.4906**							0.0545
Liquidity									0.1360**	-2.4090**					0.0610
Corporate											0.5018*	-0.0048	-0.3854	-0.6785	0.3783



**Table B.1**

Regression analysis determinants of the risk-sorted portfolios. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of all risk-sorted portfolios and simple linear regressions of each risk-sorted portfolio (Q5, Q4, Q3, Q2 and Q1) on a constant and the complete set of determinants (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all risk-sorted portfolios in the panel regression and the other rows represented simple linear regression of each individual risk-sorted portfolio. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0205***	0.1050***	0.9672***	-0.4242***	-0.0451	-3.9329***	-2.0344***	0.2742**	0.1778***	-1.5193***	0.3803	0.2001***	-0.3233	-0.9047***	0.3133
Q5	-0.0276*	0.1207**	1.4509*	0.0256	0.2488	-4.7484*	-1.5238	0.3772	0.1883***	-2.0333**	1.0096***	0.1469	-0.9922***	-1.4848***	0.5920
Q4	-0.0393**	0.1099**	1.3110*	-0.6373	-0.0255	-4.8707*	-2.5987**	0.1168	0.2035***	-1.6688***	0.5602***	0.2227	-0.4046***	-1.0844***	0.4178
Q3	-0.0211	0.1143***	1.0442	-0.1660	-0.0828	-3.9382*	-2.4453**	0.1249	0.2017***	-1.4976*	0.2566***	0.2387*	-0.1794	-0.8608***	0.3050
Q2	-0.0219*	0.1018***	0.5482	-0.5018	-0.1639	-4.1194**	-2.2030**	0.3013	0.1615***	-1.2023*	0.0903	0.1978*	-0.0229	-0.6679***	0.2328
Q1	-0.0150	0.0781***	0.4815	-0.8419	-0.2021	-1.9880	-1.4064*	0.4507	0.1342***	-1.1944***	-0.0151	0.1944**	-0.0174	-0.4258***	0.1649
Panel B.- Low volatility state regressions															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0367***	0.0142*	-0.1286	0.2149	-0.5108***	-3.3604***	-1.5113***	-0.1011	0.0916***	-0.1486	0.4473	-0.0536	-0.2934*	-0.0656	0.1973
Q5	-0.0435	0.0017	0.0025	0.4177	-0.6455	-5.2577	-2.8855**	-0.0701	0.0862*	-0.4233	1.2093***	-0.1623	-0.7128***	-0.3325	0.5376
Q4	-0.0539**	0.0037	-0.0280	-0.0478	-0.5715	-4.5713	-1.6924	-0.3968	0.0898**	-0.1648	0.7511***	0.0303	-0.2885*	-0.1613	0.3490
Q3	-0.0340	0.0311	-0.3568	0.4850	-0.3369	-3.1463	-0.3376	0.4188	0.1247***	-0.0364	0.2926***	0.0168	-0.2898	-0.1251	0.1735
Q2	-0.0183	0.0211	-0.2640	0.0924	-0.5974*	-2.2970	-1.1915	0.2824	0.0893**	0.1031	0.0837	-0.0658	-0.1505	-0.0026	0.0881
Q1	-0.0335*	0.0137	0.0030	0.1275	-0.4025	-1.5296	-1.4496	-0.7401	0.0679*	-0.2219	-0.1001	-0.0876	-0.0252	0.2934	0.1066
Panel C.- High volatility state regressions															
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0199***	0.1398***	1.4902***	-0.3476	0.0798	-3.0254***	-2.4392***	0.4717***	0.1933***	-2.7348***	0.3458	0.2849***	-0.3101	-1.0887***	0.3515
Q5	-0.0216	0.1616**	2.1879**	0.4434	0.4794	-3.7276	-1.6002	0.6330	0.2032***	-3.3442**	0.9585***	0.2434	-0.9968***	-1.7149***	0.6171
Q4	-0.0329*	0.1551**	1.9196**	-0.7091	0.0921	-3.3831	-3.1080**	0.3479	0.2258***	-2.9464***	0.4927***	0.3036	-0.4022***	-1.2934***	0.4554
Q3	-0.0148	0.1517**	1.6360**	-0.2489	-0.0323	-2.9441	-3.1344***	0.2388	0.2159***	-2.8719***	0.2139**	0.3232**	-0.1540	-1.0400***	0.3569
Q2	-0.0193	0.1292***	0.8890	-0.3647	-0.0238	-3.3990*	-2.7092**	0.4354	0.1750***	-2.4552***	0.0699	0.2837**	0.0005	-0.8248***	0.2879
Q1	-0.0109	0.1016***	0.8183	-0.8585	-0.1161	-1.1933	-1.6440*	0.7033*	0.1465***	-2.0564***	-0.0066	0.2707	0.0019	-0.5706***	0.2281

**Table B.2**

Regression analysis determinants of the risk-sorted portfolios excluding sentiment variables. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of all risk-sorted portfolios and simple linear regressions of each risk-sorted portfolio (Q5, Q4, Q3, Q2 and Q1) on a constant and the complete set of determinants except the sentiment variables (inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all risk-sorted portfolios in the panel regression and the other rows represented simple linear regression of each individual risk-sorted portfolio. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions													
	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	1.1329***	-0.2493	0.0348	-4.3647***	-1.9829***	0.1392	0.1772***	-1.5307***	0.4007*	0.2050***	-0.3321	-0.9288***	0.3006
Q5	1.6370**	0.2160	0.3401	-5.2494*	-1.4659	0.2219	0.1877***	-2.0459**	1.0336***	0.1532	-1.0020***	-1.5120***	0.5851
Q4	1.5381**	-0.3263	0.0663	-5.2707**	-2.5142**	-0.0240	0.2012***	-1.6878**	0.5763***	0.2209	-0.4181***	-1.1163***	0.4032
Q3	1.2000*	-0.0347	0.0004	-4.4328**	-2.4017**	-0.0224	0.2019***	-1.5068*	0.2813***	0.2473*	-0.1869	-0.8840***	0.2920
Q2	0.6995	-0.3545	0.0878	-4.5473**	-2.1572**	0.1703	0.1612***	-1.2122*	0.1109	0.2038*	-0.0306	-0.6900***	0.2169
Q1	0.5899	-0.7471	-0.1449	-2.3238*	-1.3754*	0.3502	0.1342***	-1.2009**	0.0015	0.2000**	-0.0227	-0.4418***	0.1555
Panel B.- Low volatility state regressions													
	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.1417*	0.5378***	-0.5084***	-3.4923***	-1.4708**	-0.0858	0.0964***	-0.1412	0.4389	-0.0643	-0.0366**	-0.0948	0.1886
Q5	-0.0452	0.8065	-0.6443	-5.2685	-2.7692*	-0.0457	0.0912*	-0.4312	1.1953***	-0.1749	-0.8011***	-0.3690*	0.5314
Q4	-0.0836	0.4338	-0.5696	-4.6003	-1.5555	-0.3672	0.0961**	-0.1727	0.7341***	0.0148	-0.3979**	-0.2064	0.3325
Q3	-0.3311	0.7773	-0.3331	-3.4398	-0.3801	0.4259	0.1299***	-0.0100	0.2895**	0.0066	-0.3550*	-0.1500	0.1636
Q2	-0.2410	0.2485	-0.5950*	-2.4961	-1.2335	0.2845	0.0924**	0.1220	0.0831	-0.0714	-0.1858	-0.0156	0.0837
Q1	-0.0074	0.4226	-0.4003	-1.6568	-1.4156	-0.7264	0.0723*	-0.2141	-0.1076	-0.0966	-0.0921	0.2667	0.0906
Panel C.- High volatility state regressions													
	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	1.5993***	-0.1793	0.2090	-3.6115***	-2.2738***	0.2843**	0.1896***	-2.9676***	0.3799*	0.2969***	-0.3120	-1.1155***	0.3395
Q5	2.3052**	0.6231	0.6275	-4.4099	-1.4136	0.4161	0.1992***	-3.6119**	0.9986***	0.2581	-0.9989***	-1.7451***	0.6049
Q4	2.1093**	-0.4075	0.2443	-4.4733	-2.8894**	0.1421	0.2196***	-3.2145***	0.5256***	0.3103*	-0.4048***	-1.3294***	0.4397
Q3	1.7116**	-0.1380	0.1021	-3.6047	-2.9768**	0.0342	0.2132***	-3.1182***	0.2540**	0.3404**	-0.1559	-1.0651***	0.3421
Q2	0.9954	-0.1999	0.0963	-3.9364**	-2.5535**	0.2624	0.1715***	-2.6711***	0.1011	0.2942**	-0.0013	-0.8500***	0.2702
Q1	0.8749	-0.7742	-0.0252	-1.6325	-1.5354	0.5664	0.1445***	-2.2223***	0.0202	0.2817**	0.0007	-0.5879***	0.2126

**Table B.3**

Regression analysis determinants of the risk-sorted portfolios excluding macro variables. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of all risk-sorted portfolios and simple linear regressions of each risk-sorted portfolio (Q5, Q4, Q3, Q2 and Q1) on a constant and the complete set of determinants except macro variables (investor sentiment, consumer sentiment, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all risk-sorted portfolios in the panel regression and the other rows represented simple linear regression of each individual risk-sorted portfolio. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions												
	Investor Sentim.	Consumer Sentim.	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0258***	0.1073***	-4.2431***	-2.1176***	0.2608**	0.1816***	-1.5417***	0.3872	0.1927***	-0.3196	-0.9020***	0.3090
Q5	-0.0294*	0.1284***	-5.2939**	-1.5152	0.2939	0.1930***	-2.0467**	1.0187***	0.1395	-0.9886***	-1.4812***	0.5892
Q4	-0.0404**	0.1141**	-5.3236**	-2.6899**	0.0839	0.2089***	-1.6995***	0.5691***	0.2137	-0.4002***	-1.0816***	0.4142
Q3	-0.0225	0.1153***	-4.2023*	-2.5625**	0.1373	0.2049***	-1.5168**	0.2648***	0.2285*	-0.1743	-0.8558***	0.3018
Q2	-0.0223*	0.1012***	-4.2553**	-2.3083***	0.3229	0.1640***	-1.2233***	0.0946	0.1919*	-0.0199	-0.6660***	0.2308
Q1	-0.0148	0.0776***	-2.1405	-1.5121*	0.4658	0.1373***	-1.2220***	-0.0115	0.1899**	-0.0151	-0.4257***	0.1656
Panel B.- Low volatility state regressions												
	Investor Sentim.	Consumer Sentim.	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0376***	0.0138**	-3.1309***	-1.4636**	-0.1841	0.0952***	-0.1713	0.4228	-0.0636	-0.3096	-0.0654	0.1892
Q5	-0.0449*	0.0026	-4.9897	-2.7604*	-0.1669	0.0915*	-0.4458	1.1793***	0.1723	-0.7306***	-0.3363*	0.5307
Q4	-0.0542**	0.0043	-4.3575	-1.6266	-0.4660	0.0955**	-0.1937	0.7218***	0.0192	-0.3095*	-0.1607	0.3404
Q3	-0.0357	0.0285	-2.9177	-0.3634	0.3239	0.1242***	-0.0498	0.2787	0.0083	-0.2978	-0.1230	0.1682
Q2	-0.0192	0.0196	-2.0175	-1.1851	0.1825	0.0932**	0.0712	0.0541	-0.0797	-0.1719	0.0008	0.0698
Q1	-0.0342*	0.0143	-1.3721	-1.3825	-0.7943	0.0716*	-0.2385	-0.1997	-0.0936	-0.0379	0.2921***	0.0955
Panel C.- High volatility state regressions												
	Investor Sentim.	Consumer Sentim.	Default Spread	Term Spread	TED Spread	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0220***	0.1417***	-3.5179***	-2.5964***	0.4011**	0.1965***	-2.8614***	0.3575	0.2689***	0.3048	-1.0756***	0.3473
Q5	-0.0253	0.1706***	-4.5137	-1.6812	0.4732	0.2070***	-3.5057**	0.9692***	0.2209	-0.9943***	-1.6913***	0.6115
Q4	-0.0354*	0.1583***	-4.5352	-3.3033***	0.2458	0.2305***	-3.1125**	0.5079***	0.2840	-0.3951***	-1.2779***	0.4493
Q3	-0.0175	0.1498***	-3.3876	-3.3792***	0.2087	0.2188***	-3.0144***	0.2291**	0.3031*	-0.1467	-1.0244***	0.3511
Q2	-0.0204	0.1290***	-3.6752*	-2.8341***	0.4081	0.1771***	-2.5353***	0.0782	0.2737**	0.0047	-0.8176***	0.2853
Q1	-0.0115	0.1008***	-1.4777	-1.7842**	0.6798*	0.1491**	-2.1392***	0.0030	0.2626**	0.0073	-0.5666***	0.2235

**Table B.4**

Regression analysis determinants of the risk-sorted portfolios excluding credit risk variables. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of all risk-sorted portfolios and simple linear regressions of each risk-sorted portfolio (Q5, Q4, Q3, Q2 and Q1) on a constant and the complete set of determinants except credit risk variables (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all risk-sorted portfolios in the panel regression and the other rows represented simple linear regression of each individual risk-sorted portfolio. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions												
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0227***	0.1199***	1.2437***	0.6664**	-0.0847	0.1942***	-1.6558***	0.3896	0.2053***	-0.3476	-0.9118***	0.2995
Q5	-0.0252	0.1369***	1.7431**	-0.2332	0.2209	0.2037***	-2.1878**	1.0242***	0.1596	-1.0196***	-1.4953***	0.5856
Q4	-0.0363**	0.1307***	1.6609**	-0.9696	-0.0633	0.2246***	-1.8392**	0.5685***	0.2241	-0.4333***	-1.0930***	0.4025
Q3	-0.0185	0.1313***	1.3416**	-0.4406	-0.1235	0.2203***	-1.6392**	0.2627***	0.2386*	-0.2036*	-0.8671***	0.2882
Q2	-0.0195	0.1174***	0.8407	-0.7555	-0.2080	0.1790***	-1.3461**	0.0999	0.2031*	-0.0486	-0.6751***	0.2101
Q1	-0.0137	0.0833***	0.6322	-0.9329	-0.2499	0.1436***	-1.2667***	-0.0075	0.2012**	-0.0329	-0.4285***	0.1569
Panel B.- Low volatility state regressions												
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0362***	0.0281***	-0.2187***	0.0897	-0.5008***	0.1047***	-0.1916	0.4244	-0.0323	-0.3144*	-0.0798	0.1903
Q5	-0.0427	0.0257	-0.1740	0.1826	-0.6297	0.1110**	-0.4929	1.1696***	-0.1249	-0.7491	-0.3621*	0.5269
Q4	-0.0535**	0.0212	-0.1381	-0.1781	-0.5611	0.1048**	-0.2214	0.7188***	0.0568	-0.3152*	-0.1751	0.3390
Q3	-0.0342	0.0384	-0.3237	0.4032	-0.3181	0.1278***	-0.0726	0.2927***	0.0268	-0.3004	-0.1233	0.1691
Q2	-0.0181	0.0308	-0.3159	-0.0262	-0.5857*	0.0995**	0.0727	0.0731	-0.0507	-0.1651	-0.0148	0.0814
Q1	-0.0328*	0.0246	-0.1419	0.0670	-0.4096*	0.0804**	-0.2440	-0.1322	0.0694	-0.0421	0.2766**	0.0932
Panel C.- High volatility state regressions												
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Pastor	Amihud	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0174***	0.1485***	1.9811***	-0.5591*	-0.0103	0.2076***	-2.9435***	0.3575	0.2868***	-0.3324	-1.0881***	0.3405
Q5	-0.0194	0.1707**	2.5511***	0.2363	0.4052	0.2159***	-3.5636**	0.9761***	0.2590	-1.0226***	-1.7210***	0.6120
Q4	-0.0297*	0.1694**	2.4409***	-1.0139	-0.0043	0.2444***	-3.2098***	0.5049***	0.2989	-0.4274***	-1.2917***	0.4412
Q3	-0.0119	0.1634***	2.1045***	-0.5102	-0.1262	0.2327***	-3.0933***	0.2215**	0.3125**	-0.1741	-1.0349***	0.3398
Q2	-0.0164	0.1401***	1.3404*	-0.6144	-0.1173	0.1911***	-2.6877***	0.0821	0.2834**	-0.0232	-0.8239***	0.2651
Q1	-0.0099	0.0991***	1.0188*	-0.8938	-0.2091	0.1537***	-2.1631***	0.0028	0.2802**	-0.0144	-0.5692***	0.2144

**Table B.5**

Regression analysis determinants of the risk-sorted portfolios excluding liquidity variables. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of all risk-sorted portfolios and simple linear regressions of each risk-sorted portfolio (Q5, Q4, Q3, Q2 and Q1) on a constant and the complete set of determinants except liquidity variables (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all risk-sorted portfolios in the panel regression and the other rows represented simple linear regression of each individual risk-sorted portfolio. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions													
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	Term Spread	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0220***	0.1128***	1.1932***	-1.1602***	-0.0917	-5.0366***	-2.7729***	0.2192**	0.4404*	0.1982***	-0.2968	-0.9550***	0.2718
Q5	-0.0245	0.1291**	1.7007**	-0.8042	0.1933	-6.0373**	-2.3198*	0.3177	1.0770***	0.1442	-0.9635***	-1.5388***	0.5668
Q4	-0.0359*	0.1189**	1.5680**	-1.4710	-0.0779	-6.1138**	-3.4399***	0.0541	0.6283***	0.2205	-0.3744***	-1.1417***	0.3756
Q3	-0.0177	0.1232***	1.2951*	-0.9738	-0.1325	-5.1262**	-3.2729***	0.0631	0.3227***	0.2369*	-0.1496	-0.9174***	0.2470
Q2	-0.0192	0.1089***	0.7490	-1.1489	-0.2037	-5.0713***	-2.8664***	0.2519	0.1431*	0.1964*	0.0009	-0.7131***	0.1808
Q1	-0.0127	0.0840***	0.6532	-1.4029*	-0.2381	-2.8343**	-1.8645**	0.4091	0.0306	0.1929**	0.0027	-0.4637***	0.1074
Panel B.- Low volatility state regressions													
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	Term Spread	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0392***	0.0169*	-0.0071	-0.0613	-0.5591***	-3.5154***	-2.2757***	-0.0575	0.4864	-0.0339	-0.2770*	-0.0764	0.1844
Q5	-0.0459*	0.0006	0.0996	0.0952	-0.7026*	-5.5807	-3.6271***	-0.0269	1.2523***	-0.1491	-0.6910	-0.3311	0.5303
Q4	-0.0565**	0.0061	0.0902	-0.3232	-0.6197	-4.7334	-2.4439**	-0.3539	0.7889***	0.0493	-0.2720	-0.1712	0.3381
Q3	-0.0375	0.0369	-0.1811	0.1454	-0.3961	-3.2498	-1.3652	0.4769	0.3422***	0.0466	-0.2712	-0.1466	0.1459
Q2	-0.0209	0.0269	-0.1302	-0.1224	-0.6346**	-2.2895	-1.9174*	0.3230	0.1165	-0.0421	-0.1401	-0.0234	0.0679
Q1	-0.0354*	0.0143	0.0863	-0.1019	-0.4429*	-1.7136	-2.0249	-0.7070	-0.0686	-0.0742	-0.0106	0.2899	0.0895
Panel C.- High volatility state regressions													
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	Term Spread	SMB	HML	RMW	CMA	R <sup>2</sup>
All	-0.0143**	0.1638***	1.8986***	-0.9693**	0.0287	-4.4388***	-3.1034***	0.4516***	0.4092*	0.2677***	-0.2703	-1.1521***	0.3026
Q5	-0.0156	0.1896**	2.6561**	-0.2355	0.4210	-5.3127*	-2.3212	0.6138	1.0278***	0.2269	-0.9551***	-1.7870***	0.5872
Q4	-0.0264	0.1817**	2.3762**	-1.4222	0.0349	-5.4619**	-3.8723***	0.3234	0.5655***	0.2825	-0.3556**	-1.3646***	0.4029
Q3	-0.0086	0.1773***	2.0770**	-0.9335	-0.0876	-4.4841*	-3.8675***	0.2156	0.2828***	0.3033	-0.1096	-1.1087***	0.2856
Q2	-0.0142	0.1508***	1.2572	-0.9266	-0.0698	-4.6744**	-3.3097***	0.4171	0.1273	0.2680*	0.0366	-0.8820***	0.2204
Q1	-0.0066	0.1197***	1.1265	-1.3287	-0.1547	-2.2609	-2.1466**	0.6880	0.0417	0.2576	0.0321	-0.6184***	0.1506

**Table B.6**

Regression analysis determinants of the risk-sorted portfolios excluding corporate variables. This table reports the estimated coefficients (where \*\*\*, \*\* and \* represents significance at 1%, 5% and 10%, respectively) from panel regressions of all risk-sorted portfolios and simple linear regressions of each risk-sorted portfolio (Q5, Q4, Q3, Q2 and Q1) on a constant and the complete set of determinants except corporate variables (investor sentiment, consumer sentiment, inflation, unemployment, industrial production growth, default spread, term spread, TED spread, Pastor and Stambaugh (2003) liquidity factor, Amihud (2002) illiquidity factor, size factor, book-to-market factor, investment factor and profitability factor). Definitions of all explanatory variables are summarized in Table 5. Panel A reports results for the full sample period 1963:07 to 2017:09. Panel B and Panel C displays the estimates for periods of low volatility and high volatility according to the inferred probabilities by fitting a Markov-Switching GARCH model to the market portfolio. Within each panel, the first row includes all risk-sorted portfolios in the panel regression and the other rows represented simple linear regression of each individual risk-sorted portfolio. In the last column we display the adjusted R-squared of the corresponding regression.

Panel A.- Full sample regressions											
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	Term Spread	Pastor	Amihud	R <sup>2</sup>
All	-0.0332***	0.1692***	1.3806**	-0.5909**	-0.1002	-5.9810**	-1.8390***	0.4470**	0.2343***	-1.8349***	0.1641
Q5	-0.0445	0.2825***	2.5700**	-0.1221	0.1156	-10.0582***	-1.1877	0.9656	0.3126***	-2.8527**	0.1776
Q4	-0.0487***	0.1999***	1.9009**	-0.8025	-0.1011	-7.6475**	-2.3165*	0.3896	0.2789***	-2.1085**	0.2056
Q3	-0.0280***	0.1599***	1.3182*	-0.3584	-0.1239	-5.3493**	-2.2633**	0.2038	0.2470***	-1.7157*	0.1958
Q2	-0.0274**	0.1204***	0.6659	-0.6760	-0.1907	-4.6648**	-2.1061**	0.2434	0.1893***	-1.2960*	0.1694
Q1	-0.0172*	0.0833***	0.4480	-0.9959	-0.2011	-2.1853	-1.3214	0.4326	0.1440***	-1.2017**	0.1382
Panel B.- Low volatility state regressions											
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	Term Spread	Pastor	Amihud	R <sup>2</sup>
All	-0.0579**	0.0497**	-0.1610*	0.4076	-0.2867**	-3.0673***	-0.5602	1.0085	0.1338***	-0.2884	0.0775
Q5	-0.0993**	0.0951	-0.0404	1.1550	-0.0336	-3.6489	-0.3719	2.9538*	0.1994**	-0.7844	0.1092
Q4	-0.0796***	0.0585	0.0116	0.5002	-0.1660	-4.0595	-0.2500	1.3533	0.1625***	-0.3793	0.1066
Q3	-0.0516**	0.0588	-0.3665	0.5722	-0.1850	-3.1779	0.2150	1.1852	0.1554***	-0.1075	0.0964
Q2	-0.0271	0.0298	-0.3109	0.0353	-0.5686*	-2.2051	-0.9475	0.5472	0.0964**	0.0695	0.0709
Q1	-0.0320*	0.0092	-0.0988	-0.2247	-0.4803*	2.2454	-1.4465	-0.9969	0.0552	-0.2403	0.0763
Panel C.- High volatility state regressions											
	Investor Sentim.	Consumer Sentim.	Inflat.	Unemp.	IP growth	Default Spread	Term Spread	Term Spread	Pastor	Amihud	R <sup>2</sup>
All	-0.0267***	0.2190***	1.9241**	-0.9803***	-0.1644***	-5.0800**	-2.2281***	0.5427**	0.2443***	-3.5153***	0.1981
Q5	-0.0312	0.3653***	3.6333**	-0.4874	-0.0592	-9.0178**	-1.4397	0.9843	0.3150***	-5.0215**	0.2097
Q4	-0.0408**	0.2624***	2.5691**	-1.4756	-0.2319	-6.5837**	-2.8725*	0.4539	0.2933***	-3.9426***	0.2454
Q3	-0.0218	0.2048***	1.8436*	-0.8705	-0.2241	-4.3266*	-2.8936**	0.2319	0.2562***	-3.4929***	0.2392
Q2	-0.0258*	0.1514***	0.8937	-0.8703	-0.1442	-3.9864*	-2.5067**	0.3465	0.2009***	-2.8440***	0.2091
Q1	-0.0139	0.1111***	0.6807	-1.1977	-0.1631	-1.4855	-1.4277	0.6969	0.1561***	-2.2753***	0.1760

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