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The conditional size premium and intertemporal risk

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Abstract

The size premium only appears in states with good expected stock returns as given by several state variables, such as the aggregate book-to-market. The annual premium is 15% when this variable is within the top 33% in historical terms and an insignificant 0.4% otherwise. This renders the unconditional tests about the size premium inaccurate: For example, the unconditional evidence in the literature supporting the intertemporal risk explanation of the size premium is absent in a conditional sense. Indeed, the conditional and unconditional intertemporal hedging properties of the small stocks for most ICAPM state variables are inconsistent with their positive premium.

JEL classification: G11, G12, G14.

Keywords: State variables, Intertemporal CAPM, Size premium, Conditional tests, Subsamples.

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1. Introduction

Extending the results in Pontiff and Schall (1998), who find that the book-to-market of the Dow Jones index forecasts both the size premium and the returns on the market, I show that the conditional structure of the size premium is given by

$$E[R^{SMB}_{t+1}|z_t \geq z^*] = \mu_{SMB,z} > 0$$
$$E[R^{SMB}_{t+1}|z_t < z^*] = 0, \quad (1)$$

where $E[R^{SMB}_{t+1}|z_t \geq z^*]$ is the expected return on the SMB portfolio of Fama and French (1996) given that a state variable, z_t, which forecasts **positive** stock market conditions (higher market returns, lower volatility, and/or higher Sharpe ratios), is at or above a certain threshold, z^*.[1] The thresholds, z^*, are such that the size premium is absent around 80% of the time considering most state variables. This implies that the unconditional tests in the literature involving the size premium tend to be biased towards results that are valid exactly for the subsample in which the premium is absent.

Some of the problems connected with the unconditional tests follow from their weak statistical power. One example is the wrong dismissal of the size premium as being either spurious or arbitraged away based on its low unconditional statistical significance since the publication of Banz (1981). A related issue is to conclude that a given asset pricing model explains the size related risks because of its ability to price the 25 double-sorted portfolios of Fama and French (1996) in unconditional empirical tests. These traditional test assets only

[1] The state variables are the median BM of all CRSP stocks (MBM), the value weighted BM of all CRSP stocks (VBM), the Dow Jones' BM of Pontiff and Schall (1998) (DJBM), the earnings-price ratio of all S&P Composite stocks (EP), the term spread (TMS), the default spread (DFY), the Treasury bill rate (TBL), and the percent equity issuing of Baker and Wurgler (2000) (EQIS). The scaled-price ratios (MBM, VBM, DJBM, EP), followed by the interest rate related variables (TMS, DFY and TBL) are at least marginally related to the existence of the size premium, while the firms' issuing activity (EQIS) is only weakly related to the size premium in the first part of the sample. I have also considered the investment to capital ratio of Cochrane (1991) (IK), the **lagged** dividend yield of Ball (1978) (DY), and the SMB^* of Maio and Santa-Clara (2012), but I cannot find any relation between these state variables and the returns on the SMB portfolio.

span the size related risks around 20% of the time. So whether the models explain the size related premiums actually tends to remain unanswered in those tests.

The unconditional evidence supporting the intertemporal risk explanation of the size premium in Maio and Santa-Clara (2012), which is absent in a conditional sense, is an example of even bigger issues surrounding the unconditional tests related to the size premium: The test seems conclusive but gives the wrong answer. This intertemporal risk discussion is particularly important because it is the foundation of the typical argument for the inclusion of the size factor in empirical asset pricing models such as in Fama and French (1996, 2015) or Hou, Xue, and Zhang (2015). The idea is that the size factor corresponds to a mimicking portfolio for a state variable within the Intertemporal CAPM framework (ICAPM) of Merton (1973). This creates a theoretical distinction between these factor models and other "ad hoc" models that include, for example, the momentum factor in Carhart (1997).

I show that the ICAPM argument for the inclusion of the size premium lacks empirical support in general. This happens both conditionally, also considering the SMB^* state variable introduced by Maio and Santa-Clara (2012), and unconditionally, based on many other state variables. The conditional structure in Eq. (1) implies that for a mean reverting state variable, the size premium covaries negatively with shocks to news about future investment opportunities, $\Delta z_{t+1} = z_{t+1} - z_t$:[2]

$$Cov\left(R_{t+1}^{SMB}, \Delta z_{t+1}\right) < 0. \tag{2}$$

This renders the existence of the positive size premium, $\mu_{SMB,z}$ in Eq. (1), inconsistent with the ICAPM. The small stocks provide a positive payoff precisely when the future market conditions deteriorate. And with such intertemporal hedging properties, the small stocks should have a negative premium in equilibrium. Instead, the conditional mean return on the SMB portfolio, $\mu_{SMB,z}$, ranges from 7% to 15% per year depending on the state variable considered.

[2] Appendix B contains a detailed derivation of this result.

I obtain the relation between each state variable and the size premium using a procedure similar to the one applied in the cross-section performed by Fama and French (1992), for example. Their standard procedure is to sort the stocks into portfolios based on a characteristic and to analyze the differences in the mean return on these portfolios. I add a third step to this procedure by sorting the years into groups based on the value of the state variable in June of year t, and examining the differences in the average size premium until June of $t+1$ among these states (groups of years).

The first empirical challenge is that it is only possible to sort the years within a given sample. Under the assumption that eventual time trends in the state variables are unexpected, it is crucial that this sample is available to the agents at each point in time to avoid a forward looking bias. So the sorting must follow a recursive procedure: Using only the past years as a reference group, I calculate the (backward looking) percentile ranking of the deviations of the state variable from its historical mean for each year t. Next, I assign each year to a percentile group based on how far from its own historical mean the state variable in that particular year is. For example, I create two groups (in general with different number of years) with a breakpoint at the 50% percentile, five groups with breakpoints at multiples of 20%, and so on. I report the results for two, three, five, seven, and ten percentile groups. For all the state variables that I consider, the size premium in **each** of the individual groups, except the top group(s), tends to be insignificant. Aggregating all the years together, except the ones in the top percentile group, also yields insignificant size premiums in line with the description of the size premium in Eq. (1). Souza (2016) offers an explanation for this dynamics of the size premium based on the ideas in Berk (1995) in the presence of time varying risk premiums.[3]

[3] The intuition of Berk (1995) is that the market value of equity, ME_i, decreases with the required return, $E[R^i_{t+1}]$ (considering a simple one period formulation):

$$ME_i = \frac{E[CF_{i,t+1}]}{E[R^i_{t+1}]}. \tag{3}$$

This creates the negative relation between (market) size and expected returns that corresponds to the size premium because the ranking by size is inversely related to the ranking by expected returns. However, Considering the preference for in-sample (Cochrane, 2008; Campbell and Thompson, 2008) or out-of-sample (Welch and Goyal, 2008) predictability, the results in this paper are closer to the former. The sorting procedure is free from forward looking bias, but the analysis is still mostly in-sample because I report the optimal number of percentile groups based on the full sample estimations. The similarity of the results in two separate subsamples (before and after 1960) for most state variables suggests that the conditional structure is stable. But a completely out-of-sample analysis would require a recursive choice of the optimal number of percentile groups and a recursive update of the expected premium as well.[4]

On the other hand, it is also possible that the eventual shifts in the state variables reflect expected changes in the aggregate risk premiums. In this case, it is more appropriate to consider the full sample to sort the years into groups. This includes forward looking information in the construction of the percentile groups but yields the same qualitative results.[5] The qualitative results are also the same when I use a double sort by size and CAPM betas to calculate the size premium. Hence, the variation in the market risk premium does not explain the dynamics of the size premium over time either.

The inconsistencies between the size premium and the ICAPM restrictions are also robust to a possible misspecification of the wealth portfolio considering the critique in Roll (1977). I

the ranking by size is not exactly the inverse of a ranking by expected returns because the expected cash flows, $E[CF_{i,t+1}]$, also affect the market size. Souza (2016) shows that the ranking by size will align with the (inverse) ranking by expected returns (overcoming differences in expected cash flows) as long as the required returns are above a certain threshold (i.e., if the discount rates/risks are "high enough"). Rearranging Eq. (3) and considering, for example, the book-value of equity, BE_i, as a proxy for the expected cash flows, gives the familiar BM of Fama and French (1996) that can be used as a better proxy for the expected returns:

$$E[R^i_{t+1}] \approx \frac{BE_i}{ME_i}. \tag{4}$$

Hence, in the risky states, Eq. (4) implies that the BM of the stocks should be large and Eq. (3) implies that the ranking by size should align with the ranking by expected returns. This generates the size premium **in these risky states only**. In fact, Eq. (4) holds for the scaled-price ratios in general, such as the scaled-price state variables that I use later in the analysis. In the low-risk states, the scaled-price ratios like the BM should be small, the differences in expected cash flows should dominate the size ranking (instead of the differences in expected returns), and the size premium should not exist.

[4]Along these lines, Souza (2016) obtains an average out-of-sample R^2 of around 26% forecasting the returns on the SMB portfolio, considering the split in each year between 1967 and 2005 and the cyclically adjusted PE of Shiller (2015) as the state variable.

[5]Available in the online Appendix C.1.

consider the relation between the size premium and the returns on Treasury bonds, corporate bonds, real estate, human capital and consumption growth as possible alternative proxies for the wealth portfolio. Usually, the state variables do not predict the returns on these other parts of the wealth portfolio. And when they do, it tends to be in a way that still renders the size premium inconsistent with the ICAPM. Furthermore, the predictive relations are particularly absent exactly in the years in which the size premium arises. The biggest exception to the lack of predictability in the years in which we observe the size premium is long term (five-year) consumption growth: Several state variables conditionally forecast positive consumption growth in those years. The result still renders the size premium inconsistent with the ICAPM but supports the connection between time varying risk premiums and the business cycle as in Boons, Duarte, de Roon, and Szymanowska (2016), Mclean and Zhao (2014), or Næs, Skjeltorp, and Ødegaard (2011), for example.

The first strand of the literature to which this paper belongs relates to confirming and detailing the existence and pervasiveness of the stylized facts commonly used in empirical asset pricing as in Fama and French (2012) or Asness, Moskowitz, and Pedersen (2013), for example. The unconditional significance of the size premium has eroded over time in line with the fact that most of the state variables have been historically low since 1985. Still, variables such as the default spread indicate a size premium in five of the years in the recent period between 2002 and 2012. In fact, for samples starting in 1975, 1980, or every five years until 2005, the size premium conditioned on the median BM or on the default spread is the most significant and usually has the largest point estimate compared to the unconditional means of the value, profitability, and investment premiums of Fama and French (2015), the momentum premium of Carhart (1997), or even the market premium.[6] Therefore, based on significance and magnitude, the conditional size premium seems to replace the momentum premium as the biggest CAPM anomaly. But the results also stress the importance of conditioning information as in Hansen and Richard (1987) considering that risk premiums

[6]This is the period (after the Oil Shock) that Welch and Goyal (2008) consider crucial to analyze the stability of the predictive relations with the market premium.

vary over time (Cochrane, 2011). For example, the results challenge the ability of the 25 double sorted Fama-French portfolios to unconditionally span the risk dimension related to size. This compromises their relevance as test assets.

The paper also contributes to the more fundamental discussion about the size premium as a compensation for risk, as in Daniel and Titman (1997), Davis, Fama, and French (2000), Chordia, Goyal, and Shanken (2015), and more specifically Maio and Santa-Clara (2012) in terms of intertemporal risk. It reveals the lack of empirical support for the intertemporal risk explanation of the size premium, contrary to the conclusions in Maio and Santa-Clara (2012).

Finally, the paper contributes to the literature on empirical work about the ICAPM in conditional or unconditional forms as in Boons (2016), Koijen, Lustig, and Van Nieuwerburgh (2016), Maio (2013), Maio and Santa-Clara (2012), Bali (2008), or Ang, Hodrick, Xing, and Zhang (2006), for example. The link between the variation in expected returns on the market over time and the variation in average returns in cross section that generates the size premium is not generally consistent with the ICAPM, neither in conditional nor unconditional forms.

The remainder of the paper is roughly arranged in terms of explaining the results in Table 1, which shows the inconsistency between the ICAPM restrictions and the existence of a positive size premium. In Section 2, I briefly present the ICAPM model and its testable predictions deriving the sign of the predicted premiums in Table 1, for example. In Section 3, I describe the data and the classification variables used to sort the years into high or low risk states to perform the conditional tests. In Section 4, I present the empirical evidence supporting the description of the conditional size premium in Eq. (1) and perform several robustness checks. This explains the sign of $cov(R_{t+1}^{SMB}, \Delta z_{t+1})$ in Table 1. In Section 5, I estimate the conditional and unconditional covariance risk prices associated with each state variable based on the aggregate stock market. In Section 6, I show that considering the relation between the state variables and the other parts of the wealth portfolio and consumption growth does not change the results in Table 1. In Section 7, I summarize the findings of the paper.

[Place Table 1 about here]

2. Theoretical background

Let us consider a simplified continuous time version of the ICAPM of Merton (1973) based on a representative agent to obtain the restrictions placed by the model on the risk premiums. This version, in which the state variable forecasts the first two moments of the stock returns, is similar to the one in Maio and Santa-Clara (2012), who also provide a more detailed explanation of its testable implications.

The returns on each of the N risky assets, i, follow a diffusion process:

$$\frac{dS_i}{S_i} = \mu_i(z,t)dt + \sigma_i(z,t)d\xi_i, \qquad i = 1, ..., N, \tag{5}$$

where S_i is the price of asset i, $d\xi_i$ is a standard Brownian motion, and $\sigma_{ij}dt$ is the covariance between assets i and j.

Both the mean, μ_i, and the volatility, σ_i, of the investment opportunities change with the state variable, z, which also follows a diffusion process:

$$dz = a(z,t)dt + b(z,t)d\xi_z, \tag{6}$$

where $d\xi_z$ is a standard Brownian motion and $\sigma_{iz}dt$ is the covariance between asset i and the state variable, z.

For simplicity, the risk free asset has a constant instantaneous return, r:

$$\frac{dB}{B} = rdt. \tag{7}$$

So the agent chooses how much to consume, C, and what fraction of his wealth, W, to allocate to each asset i, ω_i. His wealth evolves as

$$dW = \sum_{i=1}^{N} \omega_i(\mu_i - r)W dt + (rW - C)dt + \sum_{i=1}^{N} \omega_i W \sigma_i d\xi_i, \tag{8}$$

and the choices of C and ω_i maximize his lifetime utility subject to the budget constraint (8),

$$J(W, z, t) = \max_{C,\omega_i} E_t \left[\int_{s=t}^{\infty} U(C, s) ds \right], \tag{9}$$

where $J(W, z, t)$ is the value function associated with the agent's optimization.

In this formulation, the risk premium for asset i is given by two risk components:

$$\mu_i - r = \gamma \sigma_{im} + \gamma_z \sigma_{iz}. \tag{10}$$

The first component is related to market risk: The parameter of relative risk aversion, $\gamma \equiv -W J_{WW}(W, z, t)/J_W(W, z, t)$, multiplies the covariance between the returns on asset i and the market returns, σ_{im}, with $J_{WW}(.)$ being the change in the marginal value of wealth. The second component is the intertemporal risk premium associated with the changes in the state variable, z. The risk price of the state variable,

$$\gamma_z \equiv -\frac{J_{Wz}(W, z, t)}{J_W(W, z, t)}, \tag{11}$$

multiplies the covariance between the returns on asset i and the state variable, σ_{iz}. $J_W(.)$ is the marginal value of wealth and $J_{Wz}(.)$ is the cross-derivative of the marginal value of wealth with respect the state variable. $J_{Wz}(.)$ expresses how the marginal value of wealth changes when the state variable changes. In discrete time, we approximate Eq. (10) by

$$E_t(R_{i,t+1}) - R_{f,t+1} = \gamma cov_t(R_{i,t+1}, R_{m,t+1}) + \gamma_z cov_t(R_{i,t+1}, \Delta z_{t+1}), \tag{12}$$

where $R_{i,t+1}$ is the return on asset i, $R_{f,t+1}$ is the risk free rate, $R_{m,t+1}$ is the return on the market, and Δz_{t+1} is the innovation in the state variable.

2.1. The ICAPM restrictions on the size premium

The second component in Eq. (12) is what could explain the existence of the size premium within an ICAPM framework. For example, if a given state variable forecasts positive market conditions, the marginal value of wealth decreases when the variable increases: $J_{Wz}(.) < 0$ and Eq. (11) give $\gamma_z > 0$. So an asset with returns that covary positively with innovations on this state variable earns a positive intertemporal risk premium in equilibrium (and vice versa).

This is why the size premium is inconsistent with the ICAPM: The excess returns on small stocks covary negatively with the innovations on several state variables that forecast positive market conditions, as in Eq. (2). The SMB portfolio provides intertemporal hedge and should have a negative premium in equilibrium according to the ICAPM because it pays off exactly when the investment opportunities deteriorate.

2.2. Conditioning down

Under the assumption that the factor risk prices are constant, which is the basis for the conclusions in Maio and Santa-Clara (2012), the law of iterated expectations gives the unconditional equivalent of Eq. (12):

$$E(R_{i,t+1}) - R_{f,t+1} = \gamma cov(R_{i,t+1}, R_{m,t+1}) + \gamma_z cov(R_{i,t+1}, \Delta z_{t+1}). \tag{13}$$

But if the factor risk prices are time varying, the model does not condition down in general, and Eq. (13) does not necessarily hold.[7] Indeed, the description of the size premium in Eq. (1) implies that the factor risk prices are only constant within the group of years in the high (or low) risk states. So I split the sample into high and low risk years to investigate

[7] Cochrane (2005) explains in chapter 8 a few other restrictive situations in which the model in fact conditions down despite the time varying risk premiums.

the consistency between the size premium and the ICAPM restrictions in a conditional sense as well.[8]

3. Data and variables

I show how the data confirm the description of the size premium in Eq. (1) by primarily looking into what happens to the returns on the SMB portfolio in the different states of the economy and how these state variables relate to the investment set. The data reduction obtained by the Fama/French portfolios is useful because it captures the covariances in returns that are supposedly related to the excess returns. From a theoretical perspective, this means that we only need to explain why there is a premium associated with a given portfolio, as stressed in Lewellen, Nagel, and Shanken (2010). From an empirical perspective, the size related covariance in returns allows us to investigate if this common movement corresponds to a risk premium, restricting attention to the SMB portfolio only. Another advantage is that the SMB portfolio is constructed as a double sort by value and size, being relatively free of value effects.

3.1. The state variables

The candidate state variables are the median BM of all CRSP stocks (MBM), the value weighted BM of all CRSP stocks (VBM), the Dow Jones' BM of Pontiff and Schall (1998) (DJBM), the earnings-price ratio (EP), the term spread (TMS), the default spread (DFY), the Treasury bill rate (TBL), and the percent equity issuing of Baker and Wurgler (2000) (EQIS).

I also consider the investment to capital ratio of Cochrane (1991) (IK), the **lagged** dividend yield of Ball (1978) (DY), and the SMB^* of Maio and Santa-Clara (2012), but I do

[8] Another alternative to dealing with the time varying risk prices is to try to explicitly model the factor risk prices as a function of the state variable - for example, by including additional risk factors related to the state variable in the equation, as in Jagannathan and Wang (1996), Lettau and Ludvigson (2001), and Maio (2013).

not find a relation between these other state variables and the returns on the SMB portfolio. The values of the state variables in year t correspond the end of june of year t. The EQIS is an exception because it is only available at the end of the year. In this case, the effective EQIS in (June of) year t is the average of the values in the previous year and the end of that year: $EQIS_{(june)t} = \frac{EQIS_{end-of-year,t-1} + EQIS_{end-of-year,t}}{2}$.

Using data from Goyal's website, I obtain (with the time span in brackets):

- DJBM (1921-2015): The ratio of book value to market value for the Dow Jones Industrial Average. For the months from March to December this is computed by dividing the book value at the end of the previous year by the price at the end of the current month. For the months of January and February, this is computed by dividing the book value at the end of the year two years ago by the price at the end of the current month.
- EP (1871-2015): The difference between the log of earnings and the log of prices, with earnings given as 12-month moving sums of earnings on the S&P 500 index.
- TMS (1920-2015): The difference between the long term yield on government bonds and the Treasury bill. The long term government bond yield data are from Ibbotsons Stocks, Bonds, Bills, and Inflation Yearbook.
- DFY (1919-2015): The difference between BAA- and AAA-rated corporate bond yields obtained from FRED.
- TBL (1920-2015): Treasury bill rates before 1933 are the U.S. Yields On Short-Term United States Securities, Three-Six Month Treasury Notes and Certificates, Three Month Treasury series in the NBER Macrohistory database. Treasury bill rates from 1934 to 2005 are the 3-Month Treasury Bill: Secondary Market Rate from the economic research database at the Federal Reserve Bank at St. Louis (FRED).
- EQIS (1928-2015): The ratio of equity issuing activity as a fraction of total issuing activity.
- IK (1947-2015): The ratio of aggregate (private nonresidential fixed) investment to

aggregate capital for the whole economy.

- DY (1871-2015): The difference between the log of dividends and the log of **lagged** prices. The dividends are 12-month moving sums of dividends paid on the S&P 500 index.

From the Kenneth French data library, I obtain:

- MBM (1926-2015): The median BM of all CRSP stocks for (the end of June of) year t is the book equity for the last fiscal year end in $t-1$ divided by the market value of equity in December of $t-1$.
- VBM (1926-2015): The value weighted average of the BM of all CRSP stocks calculated in a similar way as the MBM.
- SMB^* (1926-2015): The difference between the market-to-book ratios of small and big stocks, using the six portfolios double sorted by size and BM:

$$SMB^* = \frac{MB_{SL} + MB_{SM} + MB_{SH}}{3} - \frac{MB_{BL} + MB_{BM} + MB_{BH}}{3}, \tag{14}$$

  where MB_{SL}, MB_{SM}, MB_{SH}, MB_{BL}, MB_{BM}, and MB_{BH} are the market-to-book ratios of small-growth, small-middle BM, small-value, big-growth, big-middle BM, and big-value portfolios, respectively.

Table 2 presents summary statistics for the state variables, assuming they follow a first order AR process. The state variables are stationary in the sample, in line with the fact that they are essentially ratios that cannot increase or decrease forever. In addition, the correlations between innovations in the variables are generally weak. But some of the scaled-price variables or interest rate related variables tend to show a higher correlation within their groups. Fig. 1 shows the evolution of the state variables over time between 1926 and 2015.

[Place Table 2 about here]

[Place Figure 1 about here]

3.1.1. The backward looking state classification

I classify each year based on how the state variable in that year compares to the variable's own past values. This ranking is free from forward looking bias and essentially assumes that the eventual trends on the state variables are unexpected.[9] In particular, I classify the years according to how the state variable deviates from its historical mean in that period. The process has three steps. The first step is to recursively find the historical mean of each state variable in year t, z_t, considering a series that starts in year t_0:

$$\overline{z}_t = \sum_{i=t_0}^{t} \frac{z_i}{t - t_0 + 1}, \tag{15}$$

where z_i is the value of the state variable in year i.

The second step is to calculate the difference between the value of z_t, and its historical mean estimated until the previous year:

$$Dev_{z,t} = z_t - \overline{z}_{t-1}, \tag{16}$$

where $Dev_{z,t}$ is the deviation of the state variable in year t from its historical mean, considering only the past years.

The final step is to compare the deviation from the mean in that particular year with the past deviations. This is the variable that I will use later to assign each year to a given percentile group based on how far from its mean the state variable is in that given year. I calculate the percentile rank, $\Gamma_{z,t}$, for the observed deviation in time t, $Dev_{z,t}$, compared with the past deviations,

$$\Gamma_{z,t} = \frac{\sum_{i=t_0}^{t} \left(I_{\{Dev_{z,i} < Dev_{z,t}\}} + 0.5 I_{\{Dev_{z,i} = Dev_{z,t}\}} \right)}{t - t_0 + 1}, \tag{17}$$

where $I_{\{.\}}$ is the indicator function.

[9] Alternatively, the online Appendix C.1 presents the qualitatively similar results considering a forward looking classification variable, assuming that the changes in the state variables are actually expected.

In terms of data points, I require at least two observations in each step, so I lose the first three of them. If the series starts in 1926, the first percentile ranking is available from 1929, for example.

Table 3 presents summary statistics for the percentile rankings, again assuming that they follow a first order AR process. The correlations between innovations in the variables are generally weak and are similar to what happens to the original state variables.

[**Place Table 3 about here**]

3.2. The returns data

All the returns and variables in year t start in July. This guarantees that the composition of the Fama/French portfolios does not change, given that a new portfolio is formed every June. For example, the return on the SMB portfolio in year t is from July in t to the end of June in $t+1$. In addition, I use annual data in the empirical analysis to avoid the short term reversal in returns that generates the results in, for instance, Vassalou and Xing (2004), as explained in Da and Gao (2010).

I obtain the stock returns from the Kenneth French data library: The size premium (SMB), the value premium (HML), and the market premium (MP) between 1926 and 2015; the momentum premium (MOM) between 1927 and 2015; and the profitability premium (RMW), the investment premium (CMA), and the 25 portfolios double sorted by size and market beta between 1963 and 2015.

From Goyal's webpage, I obtain the market variance ($SVAR$), which is the sum of squared daily returns on the S&P Index, between 1885 and 2015 and the bond returns: The returns on long term Treasury bonds (R_{LT}) and the returns on long term corporate bonds (R_{CORP}), both between 1926 and 2015.

From Shiller's website, I obtain the per capita consumption growth data between 1890 and 2009, and the returns on real estate as the net change in Shiller's real home price index between 1890 and 2014.

Finally, I obtain the returns on human capital considering labor income growth as in Jagannathan and Wang (1996) between 1931 and 2015. The sources are the NIPA Tables published by the U.S. Bureau of Economic Analysis (BEA): Table 1.14, line 4 provides the total labor income adjusted for inflation, which I divide by the population in NIPA Table 7.1, line 18.

4. The conditional size premium

This section provides the first piece of empirical evidence supporting the description of the size premium in Eq. (1). The returns on the SMB portfolio are only significantly different from zero when the state variables are above certain thresholds, conditioned on the MBM, the VBM, the DJBM, the EP, the TMS, the DFY, the TBL or, marginally, on the EQIS (in the first part of the sample). On the other hand, the SMB^*, the DY, and the IK state variables do not seem to describe the conditional structure of the size premium. The MBM state variable seems to be the most strongly related to the conditional structure of the size premium. So I report the results for the MBM in the body of the text and the results for the other state variables in Appendix A.1.[10]

I sort the years of each sample into one (All), two, three, five, seven or ten percentile groups of high or low MBM in historical terms, using the backward looking percentile rankings described in Eq. (17). For example, the 50% breakpoint results in two percentile groups, the multiples of 20% breakpoints result in five groups, and so on.

A simple way to read the results in this section (Table 4, for example) is to look at each top percentile group for an estimation of the conditional size premium, $E[R_{t+1}^{SMB}|z_t \geq z^*]$ in Eq. (1), increasing z^* as the number of groups increase. The respective estimate of $E[R_{t+1}^{SMB}|z_t < z^*]$ can be found at the "Ex top" column.[11] The tables also report the average

[10] I also report limited evidence about the conditional structure of other premiums in the online Appendix C.3.

[11] For variables that forecast negative market conditions, like the TBL and the EQIS, the results are

return on the SMB portfolio in **each** individual group because this helps to alleviate concerns that the state variables are simply capturing the years in which the size premium was the largest, still leaving a lot of variation unexplained.[12]

4.1. The returns on the SMB portfolio for different states of the economy

[Place Table 4 about here]

Table 4 shows that the existence of the size premium is restricted to the high MBM states in the 1926(9)-2015 period and individual subperiods, before and after 1960.[13] The significance of the returns on the SMB portfolio is almost always restricted to the highest MBM state(s). For example, regardless of the period and number of percentile groups, the average return on the SMB portfolio is never above the two standard error bound if we exclude the years in the top MBM percentile from the sample (Table 4, "Ex top" column). In fact, the significance of the size premium tends to be restricted exclusively to the top percentile group(s), and the point estimation of the size premium also tends to increase substantially in the highest MBM states only.

4.1.1. The other state variables (in Appendix A.1)

The estimations of the size premium based on the scaled-price state variables have similar properties. For example, the interpretation of the results based on the other state variables related to the MBM (the VBM and the DJBM in Tables 12 and 13, respectively) is very similar to the interpretation of the results in Table 4 for the MBM. The estimation based on the EP (Table 14) is also similar, but the EP series is more constant over time, as we see in Fig. 1. So the "extreme" values of the EP only appear at higher percentiles, such as

inverted.

[12]The years with percentile rankings exactly at the limit between two groups (for example, 50% in case of two groups) are included in both individual groups, but not in the "Ex top" calculation for the cases in which it happens.

[13]The results in fact start in 1929 because I lose the first three years to construct the classification variable.

when we consider seven percentile groups. Still, the size premium is never significant if we exclude the years in the top EP percentile from the sample (Table 14, "Ex Top" column). The premium also tends to be insignificant in the remaining individual percentile groups based on the EP. Another difference is that the conditional structure of the size premium based on the EP is not very clear before 1960.

The size premium is also never significant if we exclude the years in the top percentile considering any of the interest rate related variables: The TMS, the DFY, or (excluding the lowest percentile) the TBL in Tables 15, 16, and 17, respectively.[14] Considering the TMS and the DFY, the size premium also tends to be insignificant in each individual percentile group, except the top percentile group(s). But the estimate of the size premium in the individual TBL percentile groups is less robust. The conditional relation with the TBL tends to be weaker because the number of significant premiums outside the bottom (good investment opportunities) group(s) is larger in this case, especially after 1960.

The conditional structure of the size premium based on the EQIS is only marginally informative and only before 1960, as we see in Table 18. For example, in the full sample the size premium is already significant when we exclude the years in the lowest of seven percentile groups (the EQIS also forecasts negative market conditions).

Finally, the DY, the IK, and the SMB^* in Tables 19, 20 and 21, respectively, are not very informative about the conditional structure of the size premium. The size premium tends to be insignificant in every individual percentile group, including the top one based on the DY. Based on seven or ten percentile groups, the IK is weakly related to the size premium after 1960 only. But in general, the size premium is also insignificant in every individual IK percentile group, including the top one. In addition, the size premiums in the top IK percentile groups before 1960 are negative. The relation between the size premium and the SMB^* also seems to change before and after 1960.

[14]TBL forecasts negative market conditions, so the lowest percentile corresponds to good market conditions.

4.1.2. *The size premium and innovations on the state variables in Table 1*

The results above imply the sign of the covariances between the returns on the SMB portfolio and the innovations on the state variables summarized in column $cov(R_{t+1}^{SMB}, \Delta z_{t+1})$ in Table 1. The size premium is significant when the MBM, the VBM, the DJBM, the EP, the DFY, or the TMS state variables are above their respective thresholds. So the returns on the SMB portfolio have negative covariance with innovations on these state variables as explained in Appendix B. The opposite sign holds for the TBL and for the EQIS before 1960 (being zero afterwards).[15] Finally, I assume positive covariance between the innovations on the SMB^* and the returns on the SMB portfolio by construction, following Maio and Santa-Clara (2012).

4.2. *Controlling for market risk: Double sorts on size and market betas*

The increase in the size premium in states of good stock market opportunities is not simply due to the increase in the market premium in those states. This needs to be clarified because the SMB portfolio has positive market exposure. The returns on the SMB portfolio should be higher when the market premium is higher, according to the CAPM.[16]

Analyzing a portfolio with a positive exposure to small stocks, a negative exposure to big stocks, and close to no exposure to market risk proves this point. First, I obtain the returns on 25 portfolios double sorted into five groups of CAPM betas and size on Kenneth French's library. Next, I construct a portfolio with positive equal weights on the small stocks (the ten portfolios with the smallest stocks) and negative equal weights on the big stocks (the ten portfolios with the biggest stocks). The returns on this portfolio, $R_{Size,t}$, are then given by

[15] The estimation confirming the zero covariance between the returns on the SMB portfolio and the innovations on the EQIS after 1960, suggested by the results in Table 18, are available upon request.

[16] The SMB portfolio is created as a long position on three portfolios containing small stocks and an offsetting short position on three portfolios of big stocks. Small stocks tend to have larger CAPM betas than big stocks, so the SMB portfolio should carry positive market risk. In this case, the CAPM predicts exactly a larger size premium when the market returns are larger.

$$R_{Size,t} = \frac{\sum_{s=1}^{2}\sum_{b=1}^{5} R_{Size_s \beta_b,t} - \sum_{s=4}^{5}\sum_{b=1}^{5} R_{Size_s \beta_b,t}}{20}, \tag{18}$$

where $R_{Size_s \beta_b,t}$ is the return on the portfolio formed by the stocks in the size quantile, s, and in the beta quantile, b, at time t. These returns are available from 1963 to 2014.

The results in Table 5 are qualitatively the same as the ones considering the returns on the SMB portfolio in Table 4. Table 5 reports exactly the same variables as Table 4 for the period 1963-2014, also considering the MBM state variable but based on $R_{Size_s \beta_b,t}$. The point estimates of the size premium also tend to be similar in the two tables. One difference is that there are fewer years in the top MBM percentile in the period 1963-2015 and the unconditional premium in this formulation is significant. So the significance of the size premium excluding only the years in the top MBM percentile group tends to get close to the two standard errors bound as the number of percentile groups increases (Table 5, "Ex top" column). This is equivalent to an increase in z^* in Eq. (1), as explained earlier.

[Place Table 5 about here]

4.2.1. Other state variables (in Appendix A.2)

Just as above, the estimations of the size premium controlling for market risk between 1963 and 2015 have the same general properties when based on scaled-price state variables. I still obtain the same overall results considering variations of the MBM (the VBM and the DJBM, in Tables 22 and 23, respectively). And the results based on the EP (Table 24) are even closer to the ones based on the MBM, the VBM, and the DJBM in this formulation.

Also similarly to the results based on the SMB portfolio, the average size premium is never above the two standard errors bound if we exclude the years in the top percentile considering the interest rate related variables TMS and DFY, and is significant above those thresholds. The DFY gives very robust results because the size premium is insignificant in every individual percentile group, except in the top one (Table 25). On the contrary, the

TMS is less robust as a conditioning variable because the premium is large in a few percentile groups outside the top as well. The size premium still largely follows the conditional structure described in Eq. (1) based on the TMS. But the evidence becomes less clear as the number of TMS percentile groups increases (Table 26, “Ex top” column).

Finally, the conditional structure of the size premium in this case is only marginally defined by the TBL state variable when we consider two percentile groups (Table 27). The relation disappears completely with further splits in the data. In fact, the “Ex bottom” group of years yields an average premium approximately at the two (1.99) standard error bound if we split the data into ten groups (Table 27, “Ex bottom” column).

In line with the results based on the SMB portfolio, the estimation of the size premium considering the EQIS is not informative after 1960, as we see in Table 28. The SMB^* and the IK in Tables 29 and 30, respectively, also remain uninformative about the existence of the size premium. On the other hand, the DY in Table 31 seems to work (weakly) as a conditioning variable for the size premium. But the average premiums in the top DY percentile groups are still never above the two standard errors bound.

4.3. Do the state variables predict a size premium on the same years?

It is possible that all the state variables are simply very high in historical terms at the same time (or very low considering the TBL and the EQIS). Even though the correlations between the state variables are not all very strong, as shown in Tables 2 and 3, it is still possible that the variables identify the same years. One way to address this point is to compare the years for which each variable identifies a positive expected size premium. Table 6 displays the years for which at least one state variable predicts a positive size premium. In fact, we notice that the group of scaled-price state variables tend to predict a size premium on the same years. But comparing state variables from different groups, such as the interest rate and the scaled-price state variables, this tendency is not very strong.

[**Place Table 6 about here**]

The years in Table 6 constitute the top percentile group (among either the two, three, five, seven, or ten listed earlier) in which we find the most significant returns on the SMB portfolio in the full sample. For the MBM in Table 4, this corresponds to the 15 years in the top out of **three** groups, with a t-mean of 4.17 (and a mean of 15.05%). Next I assign "1" to all the (15) years in that top group and display the results in Table 6, mentioning the number of percentile groups considered in brackets, such as $MBM(3)$ in this case.

I repeat this for each state variable that forecasts the returns on the SMB portfolio, except the other scaled-price ratios (the VBM, the DJBM, and the EP). To keep the year selection comparable with the MBM, I consider the split into **three** groups for all scaled-price variables. For the TMS in Table 15 and for the DFY in Table 16, the group of years with the largest t-mean is the top out of **five** groups. For the TBL in Table 17 and the EQIS in Table 18, the largest t-mean appears at the (lowest) of **two** percentile groups. So these are the groups of years that I list in Table 6 for each of the state variables. The state variable must be able to predict the size premium, and therefore I exclude the SMB^*, the IK, and the DY from this analysis.

4.4. The size premium is the most significant (also) in recent years compared to the other premiums

Finally, the statistical significance of the (unconditional) size premium has eroded over time. This has either been taken as evidence that since its documentation the premium is being arbitraged away, or that it was simply a spurious, sample-specific finding. The dismissal of the size premium would be difficult to reconcile with the fact that recent factor models, such as Fama and French (2015) or Hou et al. (2015), still rely on exposures to the risks of small stocks to explain the cross section of expected returns. Indeed, the new evidence suggests that the value, and not the size, could be the redundant factor conditioned on the other factors (Fama and French, 2015). Nevertheless, the low statistical significance of the size premium in recent years contributes to diminishing the profession's interest in it. In this section, I reaffirm the relevance of the size effect: I show not only that the (conditional) size premium has never lost its significance, but that in fact the size premium is the most significant and usually the largest in recent years compared to several other premiums, including the momentum and market premiums.

The results in Table 6 already shed light on what has happened to the unconditional estimation of the size premium: Out of the 30 years since 1985, the state variables that consistently forecast the size premium (the MBM, the VBM, the DJBM, the EP, and the DFY) only indicate a size premium in five years (based on the DFY). So the best forecast for the size premium according to these variables in recent years has in fact often been zero.

Table 7 reports the realized (conditional) size premium in recent years according to each scaled-price or interest rate related state variable (the MBM, the VBM, the DJBM, the EP, the DFY, the TMS, the TBL).[17] The same breakpoints found in the previous section identify the high risk years in samples starting in 1975, 1980, and every five years until 2010. This period is also important because Welch and Goyal (2008) suggest a structural break in the predictive relations between the market premium and the ICAPM state variables after the Oil Shock. Table 7 also displays the realized (unconditional) market premium (MP), the value premium (HML), the profitability premium (RMW), and the investment premium (CMA) of Fama and French (2015) as well as the momentum premium (MOM) of Carhart (1997) in each sample.

[**Place Table 7 about here**]

The results in Table 7 support the description of the size premium in Eq. (1) in every sample: The size premium is significant when the state variables that forecasts positive market conditions are above their respective thresholds, and insignificant otherwise. The only difference is the TBL, which also forecasts negative (instead of insignificant) premiums in states of bad market conditions in most of the samples after 1985.[18]

[17] I do not report the state variables that fail to forecast the size premium after 1960, as observed earlier.
[18] The TBL, which forecasts negative market conditions, must instead be **below** a threshold, but the

The realized premium conditioned on the scaled-price state variables since 1975 or since 1980 is large (and highly significant considering the MBM). In fact, the size premium conditioned on the MBM is the largest and most significant compared to all the other premiums. This includes both the market premium and the momentum premium (the second most significant) in these two samples. After 1985, the MBM only predicts a premium in 2009 (9%), and the other scaled-price variables predict no premium at all. This helps to explain the lack of evidence about the unconditional size premium in these samples.

However, the size premium conditioned on the interest rate related variables is still positive in many recent years: In the sample starting in 1985, the DFY forecasts a premium in six years (Table 7). The only premium more significant than the conditional size premium in that sample is the market premium. The TBL, which forecasts a premium in 17 of the years starting in 1985, has the next most significant result. For the samples starting in 1990 or starting in other dates until 2005 the results are even stronger, and the size premium conditioned on the DFY becomes the most significant of all premiums. The size premium conditioned on the TBL is usually the second most significant one.

Hence, the idea that the existence of the size premium has been specific to the period before 1980, does not find support in the data unless we ignore the conditional structure of the premium.

5. The state variables and the future market conditions

The next step towards confirming the description of the conditional size premium in Eq. (1) is to investigate the relation between the state variables and the future investment opportunities. Estimating the conditional and unconditional covariance risk prices associated with each state variable also reveals the inconsistency between the size premium and the ICAPM restrictions summarized in Table 1. In this section, I consider the stock market as a proxy for the wealth portfolio. In Section 6, I show that the positive size premium remains

conclusion is the same.

inconsistent with the ICAPM restrictions based on other parts of the wealth portfolio as well.

5.1. Measuring the relation with the future market conditions

When a state variable, z, covaries positively with the expected returns on the market, or negatively with the expected market volatility, its risk price, γ_z, in Eq. (10) is positive (and vice versa). Hence, the first quantities that I calculate are the covariances between the state variables, z, and the future market returns and variance. In particular, I obtain the covariance between the future one- or five-year market premiums (MP defined earlier) and the state variable, z, respectively $cov(MP_{1y}, z_t)$ and $cov(MP_{5y}, z_t)$. I also obtain the covariance between the future one- or five-year realized variance of the market returns (SVAR defined earlier) and the state variable, z, respectively $cov(SVAR_{1y}, z_t)$ and $cov(SVAR_{5y}, z_t)$. The state variables are the MBM, the VBM, the DJBM, the EP, the DFY, the TMS, the TBL, the EQIS, and the SMB^*.

However, a given state variable can be positively related to both the expected returns and the expected volatility, for example. In this case, I use a pseudo-conditional Sharpe ratio as a proxy to calculate the net change in the investment set associated with that variable.[19] The calculations follow the approach of Whitelaw (1994) and Maio and Santa-Clara (2012), who also provide more details about the method.

The three-step procedure starts with the fitted expected returns, $\widehat{R}_{m,t\to t+q}$, from Eq. (19). I run the standard predictive regressions for one and five years ($q = 1$ and $q = 5$) for the excess returns on the market:

$$R_{m,t\to t+q} = \alpha_{R,q} + \beta_{R,q} z_t + \epsilon_{R,t\to t+q}, \tag{19}$$

where $R_{m,t\to t+q}$ is the annual compound excess returns on the market (MP described earlier)

[19] Brennan and Xia (2006) and Nielsen and Vassalou (2006) explain the restrictions for this result to hold.

for q periods, from t until $t+q$, and $\epsilon_{R,t\to t+q}$ is the error term.

Next, I obtain the fitted expected volatility, $\widehat{SVAR}_{m,t\to t+q}$, using Eq. (20). Again, I run the standard predictive regressions for one and five years ($q=1$ and $q=5$), with the market variance ($SVAR$) used in Welch and Goyal (2008) and Maio and Santa-Clara (2012), for example, as the dependent variable

$$SVAR_{m,t\to t+q} = \alpha_{SVAR,q} + \beta_{SVAR,q} z_t + \epsilon_{SVAR,t\to t+q}, \tag{20}$$

where $SVAR_{m,t\to t+q}$ is the cumulative sum of the realized variances over q periods, from t until $t+q$, and $\epsilon_{SVAR,t\to t+q}$ is the error term.

These two quantities result in a pseudo-conditional Sharpe ratio

$$SR_{t\to t+q} = \frac{\widehat{R}_{m,t\to t+q}}{\sqrt{\widehat{SVAR}_{m,t\to t+q}}} = \frac{\hat{\alpha}_{R,q} + \hat{\beta}_{R,q} z_t}{\sqrt{\hat{\alpha}_{SVAR,q} + \hat{\beta}_{SVAR,q} z_t}}, \tag{21}$$

where $\hat{\alpha}_{R,q}$ and $\hat{\beta}_{R,q}$ are the estimated coefficients from the excess returns predictive regression in Eq. (19), and $\hat{\alpha}_{SVAR,q}$ and $\hat{\beta}_{SVAR,q}$ are the estimated coefficients from the volatility forecast in Eq. (20).

Finally, I calculate the average over time of the partial derivatives of the Sharpe ratio with respect to z_t,

$$\frac{\partial S\hat{R}_{t\to t+q}}{\partial z_t} = \hat{\beta}_{R,q} \widehat{SVAR}_{m,t\to t+q}^{-1/2} - \frac{1}{2} \widehat{SVAR}_{m,t\to t+q}^{-3/2} \hat{\beta}_{SVAR,q} \widehat{R}_{m,t\to t+q}, \tag{22}$$

which gives the relation between the state variable z and the future investment opportunities.

5.2. The unconditional risk prices, γ_z

The usual approach in the empirical ICAPM literature to obtain the price of covariance risk with the state variables is to consider the unconditional relation between the state variables and the aggregate stock market opportunities. This is the approach in Maio and

Santa-Clara (2012), for example, and the one that I adopt in this section.

Table 1 shows that the only state variable that unambiguously implies a positive ICAPM unconditional premium is the SMB^* of Maio and Santa-Clara (2012): It implies a positive size premium in the full sample and also individually before and after 1960. The DFY also implies a positive premium before 1960, with mixed results in the full sample. The term spread before 1960 and the TBL in the full sample also have mixed unconditional results. All other variables, or these variables in other periods, predict a negative premium that is the opposite of the positive size premium observed in the data.

Table 8 shows that all the state variables tend to be at least marginally positively associated with the future market returns in the full 1926-2015 sample (the association is negative for the TBL and the EQIS). Usually, the association is stronger for the five-year returns, being sometimes insignificant at the shorter horizon. The EQIS is the only one that is more significantly associated with the short term returns. The MBM and the VBM also forecast positive short term volatility, but the pseudo-conditional Sharpe ratio still indicates a positive relation with the market conditions even in the short term.

[**Place Table 8 about here**]

The variables with mixed unconditional results in the full sample are the TBL and the DFY. The TBL has a negative relation with future short term volatility that is not matched by a significant relation with future returns. But the TBL is also negatively related to long term future returns. So its risk price, γ_{TBL}, seems to be positive in the short term and negative in the long term.[20] The DFY is positively associated with short term volatility with no significant relation with short term returns. This indicates a negative risk price, γ_{DFY}, in the short term. However, the DFY is positively associated with both long term volatility and market returns, where the pseudo-conditional Sharpe ratio suggests a positive risk price in the long term.

[20]The negative impact on the pseudo-conditional Sharpe ratio in the short term that would result in a negative risk price is not robust because the return forecasting equation used to calculate the Sharpe ratio is not significant.

The results are similar before and after 1960. The biggest difference is that the scaled-price ratios (the MBM, the VBM, the DJBM, and the EP) are usually associated with increases in returns before 1960 and decreases in the variance after 1960. The same happens with the EQIS (but with opposite signs). In addition, the risk price of the TBL is negative (in the long term) before 1960, but insignificant after 1960. Finally, the DFY has a negative risk price before 1960 because it is positively associated with the market volatility both in the short and in the long term. But after 1960 the variable has a positive risk price because it is associated with increases in the market returns.

5.3. The conditional risk prices

In this section, I estimate the covariance risk prices exclusively for the years in which the size premium arises, as described in Eq. (1). Following the discussion in Section 2.2, the risks that generate the size premium should be observed when the state variables are above their thresholds (below the thresholds considering the TBL and the EQIS). Assuming constant risk premiums for the years in which the size premium arises, the ICAPM pricing Eq. (12) conditions down within this subsample of years. This is how I obtain the conditional risk prices associated with each state variable, $\gamma_{z,cond}$.

The results summarized in Table 1 (and based on Table 9) show the lack of empirical support for the ICAPM explanation of the size premium: The (conditional) size premium predicted by the ICAPM is never positive considering any of the state variables, including the SMB^*. The only (nonrobust) exception is the MBM in the full sample. The contradiction between the conditional and unconditional conclusions considering the SMB^* illustrates the pitfalls of the unconditional tests involving the size premium.

Table 9 is otherwise equivalent to Table 8 but shows the relation between the state variables and the market conditions exclusively for the states in which the size premium arises according to each state variable. I select the relevant subsamples to estimate the risk prices for each state variable based on their own breakpoints, z^*, in Eq. (1).[21] Given that the SMB^* does not forecast the size premium, I condition the analysis of the SMB^* on the values of other state variables: The scaled-price MBM and the interest rate related DFY.

[**Place Table 9 about here**]

Table 9 shows four important differences with respect to the unconditional risk prices in Table 8. The first, and most important, is that the SMB^* has a zero risk price conditioned on both state variables in every sample. The SMB^* is not related to the future market conditions for the years in which the size premium in fact arises. This explains the contradiction between the unconditional results in Maio and Santa-Clara (2012) and all the other state variables.

The second difference is the negative risk price for the MBM in the full sample due to its positive relation with short term volatility. This result is not robust given that the MBM shows no significant relation with the market conditions before 1960, implying a zero risk price in this period. And after 1960, there is a negative relation between the MBM and long term volatility, implying a positive risk price.

The third difference is the positive covariance risk price with the DFY: The DFY is positively related to both short and long term increases in volatility and returns in the full sample, with a net positive impact on the pseudo-conditional Sharpe ratios. Before 1960, the DFY is positively related to short and long term returns, confirming its positive risk price. After 1960, there is no clear relation with the market conditions, implying a zero risk price. The final difference is the zero risk price for covariance with the EP: The EP state variable is not related to the market conditions in any sample considered, neither before nor after 1960.

The risk prices of the remaining variables are similar to the unconditional case, but the evidence is less robust. For example, the VBM is positively related to the expected returns

[21]As before, the high risk years correspond to the top third backward looking percentiles in Eq. (17) for the MBM, the VBM, the DJBM, and the EP; the top fifth for the DFY and the TMS; and the **bottom** half for the TBL and the EQIS.

in the full sample, but not in the individual subsamples. The DJBM is positively related to the future returns in every sample, but only to long term returns after 1960. The TMS is 1) positively related to long term returns and negatively related to long term volatility in the full sample, 2) not related to the market conditions before 1960, and 3) only positively related to future returns after 1960. The TBL is not related to the market conditions in the full sample, but it has negative risk prices in both individual subsamples: The TBL is positively related to long term volatility before 1960 and positively related to short term volatility and negatively related to the market returns after 1960. Finally, the EQIS has a negative risk price in the full sample and before 1960: It is negatively related to short term returns in the full sample and positively related to long term volatility before 1960. After 1960, the EQIS has a positive risk price implied by its negative relation with short term volatility.

6. Other parts of the wealth portfolio and consumption

The main conclusion from the results in the previous sections, which are summarized in Table 1, is that the ICAPM predicts either negative or zero excess returns on small stocks for the years in which we actually observe positive excess returns on small stocks. The result is similar considering the unconditional ICAPM predictions. Therefore, the empirical tests based on the aggregate stock market renders the presence of a positive size premium inconsistent with the ICAPM.

The covariance risk prices estimated in the previous section are fundamental for this conclusion. But if the state variables that forecast positive returns on stocks also forecast negative returns on bonds or real estate, for example, then the size premium could still be consistent with the ICAPM restrictions. It is possible that the risk prices estimated in other parts of the wealth portfolio have opposite signs. More generally, the empirical proxy for the wealth portfolio (the stock market) can be misspecified, as pointed out by Roll (1977).

In this section, I look into the relation between the state variables and the other parts of the wealth portfolio and consumption. More specifically, I run predictive regressions similar to the ones in Eq. (19), but I also consider the changes in other parts of the wealth portfolio,

$$\Delta W_{t+q} = \alpha_q + \beta_{z,q} z_t + \epsilon_{t+q}, \tag{23}$$

where ΔW_{t+q} measures changes in different parts of the the agent's wealth over q periods, z is a given state variable, and ϵ_{t+q} is an error term. The values are compounded annually, and I consider $q = 1$ or $q = 5$ years. Section 3.2 describes the data that I use to construct the series with the different ΔW_{t+q} (over one and five years, respectively): The returns on long term Treasury bonds, R_{LT} and $R_{LT,5y}$; the returns on long term corporate bonds, R_{corp} and $R_{corp,5y}$; the returns on real estate, R_{RE} and $R_{RE,5y}$; the returns on human capital, HK_g and $HK_{g,5y}$; and consumption growth, C_g and $C_{g,5y}$.

The short term (one year) results in Table 10 and the long term (five years) results in Table 11 show that considering other parts of the wealth portfolio does not solve the contradiction between the ICAPM restrictions and the positive size premium in general. For example, only two variables forecast opposite changes in other parts of the wealth portfolio compared to the aggregate stock returns in high risk years, namely the DFY and the EQIS (Tables 10 and 11). The DFY conditionally forecasts short term decreases in human capital and consumption, and the EQIS conditionally forecasts positive long term returns on real estate (but also a short term decrease in consumption). The conditional relations between the other state variables and the investment opportunities are usually absent, or otherwise in line with the ones based on the stock market.

[Place Table 10 about here]

[Place Table 11 about here]

6.1. The returns on long term Treasury bonds

The only variable that conditionally forecasts the (short term) returns on Treasury bonds is the TMS in Table 10. The relation is positive and implies the same positive covariance risk price, $\gamma_{TMS,cond} > 0$, obtained considering the stock market in Table 1. Unconditionally, the TMS also forecasts positive returns on Treasury bonds. In fact, this positive relation is only significant in the high risk years in which we observe the size premium.

Unconditionally, the TBL and the DFY also forecast positive returns on Treasury bonds. The positive unconditional risk price associated with the DFY still renders the size premium inconsistent with the ICAPM restrictions, as in Table 1. On the other hand, the ICAPM would imply a positive unconditional risk premium for the SMB portfolio based on the positive risk price of the TBL, $\gamma_{TBL} > 0$. But the significance of this relation is restricted to the low risk years both at the one- and five-year horizons (Tables 10 and 11).

Finally, exclusively in low risk years in which the size premium is absent, the MBM, the VBM, and the DJBM forecast negative market conditions, given by negative long term returns on Treasury bonds. The EQIS forecasts positive market conditions in the same years (Table 10).

6.2. The returns on long term corporate bonds

The results considering the returns on corporate bonds are very similar to the ones considering the returns on Treasury bonds. Again, the only state variable conditionally related to the investment set in the high risk years is the TMS. The positive relation arises both conditionally and unconditionally in the high risk years, but not in the low risk years (Table 10).

Unconditionally, the DFY and the TBL forecast positive returns on corporate bonds at both the one- and five-year horizons. But the relation is again restricted to the low risk years in which the size premium is zero.

Finally, exclusively in the low risk years, the MBM, the VBM, the DJBM and the EP (also for the short term) forecast negative long term returns on corporate bonds, while the EQIS forecasts positive returns (Tables 10 and 11).

6.3. The returns on real estate

The MBM (short and long term), the VMB (short term) and the EQIS (long term) are all positively associated with returns on real estate in high risk years (Tables 10 and 11). This suggests a positive covariance risk price associated with these variables. These results are in line with the ones based on the stock market in Table 1 for the MBM and for the VBM, but not for the EQIS. Hence, in this particular part of the wealth portfolio the size premium is consistent with the conditional ICAPM restrictions based on the EQIS, but still inconsistent based on the MBM, on the VBM or on the other state variables analyzed (with zero covariance risk prices).

Unconditionally, the MBM (long term) and the TMS (short term) forecast positive returns on real estate, while the TBL (short term) marginally forecasts negative returns (Tables 10 and 11). The unconditional size premium predicted by the ICAPM based on these results is negative in line with Table 1 (but inconsistent with the positive premium observed). In the low risk years, the EQIS (short and long term), the DJBM (long term) and the EP (long term) predict negative returns on real estate, while the TMS (short term) predicts positive returns.

6.4. The returns on human capital

There are two variables that conditionally forecast the returns on human capital in high risk years: The DFY in the long term and the TBL in the short term (Tables 10 and 11). Both forecast decreases in human capital, suggesting negative covariance risk prices. The negative risk price for the TBL is consistent with the estimations considering the stock market (Table 1). So the conclusions regarding the inconsistency between the ICAPM restrictions and the size premium are similar. All the remaining state variables with zero risk prices provide no support for the ICAPM explanation of the size premium either. On the other hand, the negative covariance risk price with the DFY in this part of the wealth portfolio is consistent with the ICAPM explanation of the size premium.

Unconditionally, the MBM, the VBM, the DJBM (all in the long term) and the EP (in the short and long term) forecast positive returns on human capital. This suggests the same positive risk prices as those obtained from their relation to the stock market conditions. As before, the ICAPM is inconsistent with the unconditional size premium considering these variables or the ones that have no relation to the returns on human capital. The DFY unconditionally forecasts negative returns on human capital. So, again based exclusively on the DFY and on this part of the wealth portfolio, there is support for the unconditional ICAPM explanation of the size premium.

In the low risk years, the MBM, the VBM, the DJBM, the DFY (all both in the short and long term) and the EP (in the short term) forecast positive returns on human capital. These variables have positive risk prices, and the size premium should be negative according to the ICAPM in this part of the sample.

6.5. Consumption growth

There is strong evidence that the state variables tend to be conditionally related to consumption growth exclusively in the high risk years in which the size premium arises. Table 11 shows the positive conditional relation between long term consumption growth and the MBM, the VBM, the DJBM and the TMS (negative for the TBL and the EQIS) in high risk years. The respective covariance risk prices are all in line with the ones obtained based on the returns on stocks summarized in Table 1, which leads to similar conclusions. In the short term, the TMS predicts positive consumption growth, and the DFY predicts negative consumption growth in high risk years (Table 10). The covariance risk price of the TMS still leads to the same conclusions regarding the inconsistency between the ICAPM and the size premium. On the contrary, the negative risk price associated with the DFY again provides limited support for the ICAPM explanation of the size premium.

Unconditionally, the DJBM and the TMS forecast positive long term consumption growth (negative for the EQIS), while the MBM and the DFY forecast negative short term consumption growth (Tables 11 and 10, respectively). The risk prices associated with the DJBM, the TMS and the EQIS are in line with the ones obtained in Table 1. Hence, the conclusions about the inconsistency between the unconditional size premium and the ICAPM are similar in this case. On the other hand, the results based on the MBM and the DFY support the ICAPM explanation of the unconditional size premium. Finally, in the low risk years, the MBM (short term), the VBM (short term), and the TMS (short and long term) forecast positive consumption growth (negative considering the EQIS in the long term).

7. Summary

We learn two broad new facts from this paper: First, the existence of the size premium is restricted to the states with good investment opportunities considering several different state variables. Second, the intertemporal risk exposures of small stocks do not in general explain the existence of the size premium within an ICAPM framework.

The first contribution is crucial because it implies that all the unconditional tests involving the size premium in the literature are likely to be either inconclusive or misleading. This includes, for example, the inference that models explain the size premium anomaly based on their ability to unconditionally price the 25 double-sorted Fama/French portfolios. Uncovering the conditional structure of the size premium also reaffirms its importance: The size premium is around five times larger than previously estimated at approximately 15% per year conditioned on the MBM, and it tends to be the most significant anomaly with respect to the CAPM even in the years following Banz (1981) and therefore after the Oil Shock, mentioned by Welch and Goyal (2008) as critical.

The second contribution illustrates the pitfalls of the unconditional tests involving the size premium. The ICAPM explanation for the size premium has very little empirical support both in its unconditional and, especially, in its conditional forms. This is opposite to the conclusions in Maio and Santa-Clara (2012) based on unconditional tests, for example.

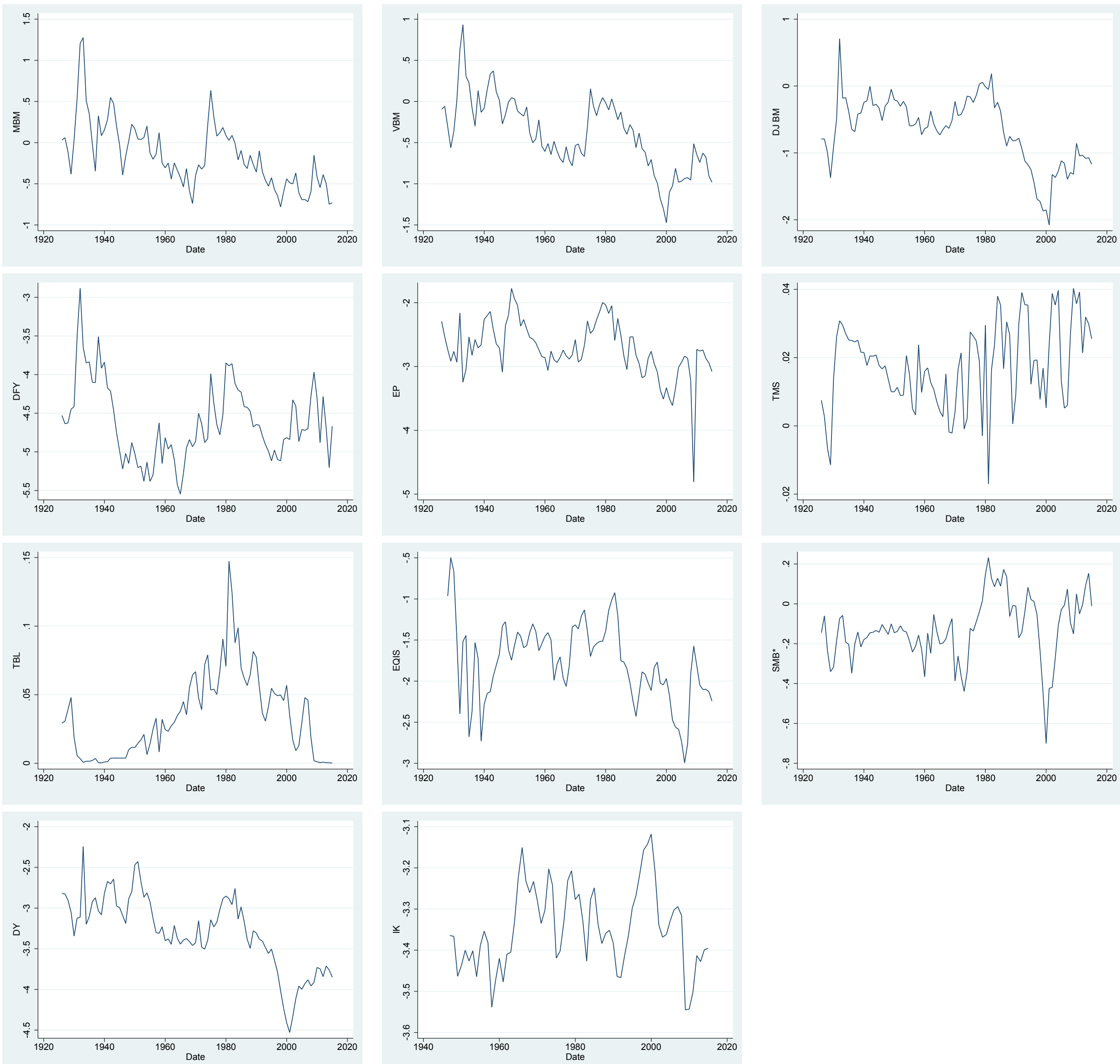

Fig. 1. **The state variables in time series from 1926 until 2015.** The panel plots the time series of the median BM (MBM), the value weighted average BM of all CRSP stocks (VBM), the BM of the Dow Jones stocks (DJBM), the default spread (DFY), the earnings-price ratio (EP), the term spread (TMS), the T-bill rate (TBL), the percent equity issuing (EQIS), the SMB^{*}, the dividend yield (DY), and the investment to capital ratio (IK). The data are from 1926 to 2015, except for the IK (1947-2015).

Table 1: **Summary of the conditional and unconditional ICAPM sign restrictions on the SMB portfolio premium considering each state variable between 1926 and 2015 and individual subsamples before and after 1960**. I report the signs of each quantity, with "+/−" if there is evidence of both a positive and negative relation (depending on the horizon). The $cov(R^{SMB}_{t+1}, \Delta z_{t+1})$ is the covariance between the returns on the SMB portfolio with innovations on the respective state variable. γ_z is the unconditional covariance risk price associated with the state variable considering all the years in each sample, $\gamma_{z,cond}$ is the conditional covariance risk price associated with each state variable exclusively in the years in which the size premium appears according to that state variable. $E[SMB_{ICAPM}]$ and $E[SMB_{ICAPM}|z]$ are the SMB portfolio premiums predicted by the ICAPM considering the $cov(R^{SMB}_{t+1}, \Delta z_{t+1})$ and the risk price of each variable estimated unconditionally and conditionally, respectively. The state variables are the median BM (MBM), the value weighted average BM (VBM), the BM of the Dow Jones stocks (DJBM), the default spread (DFY), the earnings-price ratio (EP), the term spread (TMS), the T-bill rate (TBL), the percent equity issuing (EQIS), and the SMB^*, which is conditioned on the MBM or on the DFY. The number in brackets gives the number of groups used as a breakpoint to select the subsample used in the conditional estimation. For example, MBM(3) means that I estimate the covariance risk price with the MBM state variable only in the subsample of years in which the MBM backward looking percentile is above two-thirds.

		$cov(R^{SMB}_{t+1}, \Delta z_{t+1})$	γ_z	$\gamma_{z,cond}$	$E[SMB_{ICAPM}]$	$E[SMB_{ICAPM}\|z]$
MBM(3)						
	1926–2015	−	+	−	−	+
	1926–1960	−	+	0	−	0
	1960–2015	−	+	+	−	−
VBM(3)						
	1926–2015	−	+	+	−	−
	1926–1960	−	+	0	−	0
	1960–2015	−	+	0	−	0
DJBM(3)						
	1926–2015	−	+	+	−	−
	1926–1960	−	+	+	−	−
	1960–2015	−	+	+	−	−
EP(3)						
	1926–2015	−	+	0	−	0
	1926–1960	−	+	0	−	0
	1960–2015	−	+	0	−	0
DFY(5)						
	1926–2015	−	+/−	+	+/−	−
	1926–1960	−	−	+	+	−
	1960–2015	−	+	0	−	0
TMS(5)						
	1926–2015	−	+	+	−	−
	1926–1960	−	+/−	0	+/−	0
	1960–2015	−	+	+	−	−
TBL(2)						
	1926–2015	+	+/−	0	+/−	0
	1926–1960	+	−	−	−	−
	1960–2015	+	0	−	0	−
EQIS(2)						
	1926–2015	+	−	−	−	−
	1926–1960	+	−	−	−	−
	1960–2015	0	+	+	0	0
$SMB^*\|MBM(3)$						
	1926–2015	+	+	0	+	0
	1926–1960	+	+	0	+	0
	1960–2015	+	+	0	+	0
$SMB^*\|DFY(5)$						
	1926–2015	(as above)	(as above)	0	(as above)	0
	1926–1960			0		0
	1960–2015			0		0

Table 2: **Descriptive statistics for the state variables used in the predictive regressions.** The state variables are the median BM (MBM), the value weighted average BM of all CRSP stocks (VBM), the BM of the Dow Jones stocks (DJBM), the default spread (DFY), the earnings-price ratio (EP), the term spread (TMS), the T-bill rate (TBL), the dividend yield (DY), the percent equity issuing (EQIS), the investment to capital ratio (IK), and the SMB^* of Maio and Santa Clara. The yearly data are from 1928 to 2015, except for the IK (1947-2015). The table reports the mean, standard deviation, first order autocorrelation, and correlations. The lower diagonal corresponds to the levels of the state variables, and the upper diagonal corresponds to the respective AR(1) innovations.

				Correlation matrix: Levels (below diagonal) and innovations (above diagonal)										
State variable	Mean	Standard deviation	AC(1)	MBM	VBM	DJBM	DFY	EP	TMS	TBL	EQIS	DY	SMB^*	IK
MBM	-0.151	0.399	0.820		0.91	0.45	0.56	0.06	0.19	-0.22	-0.21	0.33	0.06	-0.45
VBM	-0.388	0.435	0.889	0.92		0.41	0.49	0.05	0.25	-0.25	-0.22	0.46	0.26	-0.51
DJBM	-0.661	0.511	0.876	0.73	0.84		0.43	0.54	0.12	-0.01	-0.31	-0.07	0.07	-0.08
DFY	-4.619	0.500	0.801	0.57	0.51	0.31		-0.01	0.23	-0.25	-0.19	-0.01	0.08	-0.37
EP	-2.724	0.441	0.618	0.45	0.57	0.74	0.05		-0.16	0.27	-0.23	0.05	0.18	0.31
TMS	0.018	0.012	0.481	0.12	0.09	-0.10	0.36	-0.28		-0.80	-0.14	0.01	0.14	-0.47
TBL	0.034	0.030	0.874	-0.16	-0.13	0.07	-0.01	0.20	-0.40		0.09	-0.05	0.01	0.54
EQIS	-1.770	0.478	0.759	0.20	0.26	0.34	-0.07	0.22	-0.31	0.28		0.00	-0.19	0.00
DY	-3.297	0.457	0.901	0.70	0.86	0.80	0.19	0.68	-0.18	-0.03	0.43		0.30	-0.30
SMB^*	-0.128	0.159	0.758	0.00	0.22	0.21	0.15	0.28	0.19	0.25	-0.08	0.23		-0.22
IK	-3.345	0.099	0.745	-0.28	-0.35	-0.19	-0.10	0.00	-0.44	0.51	-0.04	-0.26	-0.24	

Table 3: **Descriptive statistics for the backward looking percentile rankings of the state variables.** The state variables are the median BM (MBM), the value weighted average BM of all CRSP stocks (VBM), the BM of the Dow Jones stocks (DJBM), the default spread (DFY), the earnings-price ratio (EP), the term spread (TMS), the T-bill rate (TBL), the dividend yield (DY), the percent equity issuing (EQIS), the investment to capital ratio (IK), and the SMB^* of Maio and Santa Clara. The yearly data are from 1930 to 2015, except for the IK (1949-2015). The table reports the mean, standard deviation, first order autocorrelation, and correlations of the percentile ranking given in Eq. (17). The lower diagonal corresponds to the levels of the state variables, and the upper diagonal corresponds to the respective AR(1) innovations.

				Correlation matrix: Levels of the percentiles (below diagonal) and innovations (above diagonal)										
State variable	Mean	Standard deviation	AC(1)	MBM	VBM	DJBM	DFY	EP	TMS	TBL	EQIS	DY	SMB^*	IK
MBM	0.377	0.283	0.667		0.90	0.51	0.47	0.19	0.31	-0.44	-0.21	0.16	0.20	-0.37
VBM	0.363	0.303	0.756	0.92		0.56	0.38	0.26	0.33	-0.44	-0.25	0.30	0.25	-0.43
DJBM	0.410	0.326	0.848	0.68	0.74		0.26	0.46	0.12	-0.26	-0.15	-0.08	0.14	0.15
DFY	0.494	0.292	0.786	0.50	0.48	0.22		-0.04	0.26	-0.33	-0.09	0.04	0.09	-0.30
EP	0.405	0.328	0.679	0.50	0.55	0.69	-0.02		-0.13	0.28	-0.10	0.04	0.08	0.27
TMS	0.473	0.339	0.507	0.34	0.37	-0.01	0.54	-0.21		-0.71	-0.17	-0.05	0.14	-0.47
TBL	0.652	0.333	0.897	-0.02	-0.06	0.17	-0.26	0.36	-0.60		0.23	0.11	-0.14	0.53
EQIS	0.480	0.310	0.813	0.07	0.07	0.41	-0.22	0.39	-0.34	0.51		0.11	-0.17	0.13
DY	0.313	0.328	0.794	0.44	0.55	0.63	-0.08	0.69	-0.11	0.23	0.43		0.10	-0.23
SMB^*	0.591	0.329	0.607	0.32	0.51	0.29	0.19	0.34	0.17	-0.08	-0.10	0.33		-0.30
IK	0.525	0.339	0.593	-0.28	-0.34	0.12	-0.33	0.07	-0.60	0.51	0.21	-0.01	-0.28	

Table 4: **Returns on the SMB portfolio in years with similar MBM states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1926(9)-2015 and subsamples 1926(9)-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the MBM backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio at each (MBM) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926-2015											
All	2.91										
	(2.23)										
	87										
2	0.53	7.45									0.65
	(0.38)	(3.08)									(0.44)
	61	29									58
3	1.50	-1.47	15.05								0.39
	(0.93)	(-0.86)	(4.17)								(0.32)
	45	27	15								72
5	-0.42	3.71	-1.66	9.82	12.00						1.87
	(-0.21)	(1.65)	(-0.7)	(2.44)	(2.2)						(1.46)
	29	21	17	11	9						78
7	-1.08	4.40	-0.81	1.18	-1.94	15.44	14.46				2.06
	(-0.51)	(1.76)	(-0.22)	(0.77)	(-0.78)	(4.89)	(1.76)				(1.67)
	26	14	14	13	5	9	6				81
10	-3.27	3.62	4.40	2.78	-3.05	-0.01	-1.94	19.63	7.08	14.46	2.06
	(-1.16)	(1.51)	(1.68)	(0.68)	(-0.85)	(-0.01)	(-0.78)	(5.48)	(4.14)	(1.76)	(1.67)
	17	12	12	9	11	9	5	6	3	6	81
1926-1960											
All	3.84										
	(1.67)										
	32										
2	0.53	8.13									0.89
	(0.26)	(1.88)									(0.38)
	22	13									19
3	0.89	0.71	16.94								0.81
	(0.3)	(0.4)	(2.1)								(0.46)
	14	12	6								26
5	-1.16	4.79	-0.47	8.91	17.12						1.94
	(-0.33)	(1.3)	(-0.29)	(1.52)	(1.38)						(1.05)
	10	7	7	4	4						28
7	-3.23	9.19	0.89	-0.98	1.24	13.33	20.55				2.11
	(-0.91)	(2.33)	(0.22)	(-0.54)	(0.21)	(2.49)	(1.22)				(1.18)
	8	5	5	6	2	3	3				29
10	-7.24	4.93	10.55	0.46	-2.06	0.33	1.24	16.58	6.84	20.55	2.11
	(-1.61)	(1.23)	(2.88)	(0.09)	(-1.13)	(0.21)	(0.21)	(2.25)	-	(1.22)	(1.18)
	5	5	3	4	5	5	2	2	1	3	29
1960-2015											
All	2.35										
	(1.51)										
	56										
2	0.54	6.89									0.54
	(0.3)	(2.51)									(0.3)
	40	16									40
3	1.75	-3.22	13.79								0.16
	(0.92)	(-1.2)	(4.26)								(0.1)
	32	15	9								47
5	0.03	3.17	-2.50	10.35	7.90						1.81
	(0.01)	(1.09)	(-0.63)	(1.82)	(3.27)						(1.08)
	20	14	10	7	5						51
7	-0.06	1.74	-1.76	3.04	-4.06	16.50	8.37				2.01
	(-0.03)	(0.58)	(-0.32)	(1.34)	(-2.05)	(3.94)	(2.07)				(1.24)
	19	9	9	7	3	6	3				53
10	-1.41	2.69	2.35	4.64	-3.87	-0.44	-4.06	21.15	7.19	8.37	2.01
	(-0.44)	(0.84)	(0.77)	(0.71)	(-0.58)	(-0.3)	(-2.05)	(4.65)	(2.43)	(2.07)	(1.24)
	13	7	9	5	6	4	3	4	2	3	53

Table 5: **The excess returns on small stocks for 25 portfolios double-sorted by size and CAPM betas in years with similar MBM states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double-sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the MBM backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the Size portfolios double sorted by size and betas in each (MBM) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.13										
	(2.18)										
	52										
2	1.40	7.01									1.40
	(0.8)	(3.1)									(0.8)
	36	16									36
3	2.64	-1.05	11.61								1.35
	(1.27)	(-0.62)	(3.74)								(0.91)
	28	15	9								43
5	-0.40	5.33	-1.00	9.18	9.19						2.49
	(-0.18)	(1.52)	(-0.43)	(2.45)	(2.29)						(1.64)
	17	13	10	7	5						47
7	-0.61	3.18	2.49	2.06	1.91	11.73	11.37				2.63
	(-0.26)	(1.05)	(0.49)	(0.9)	(1.74)	(3.11)	(1.71)				(1.8)
	16	8	9	7	3	6	3				49
10	-1.84	2.25	3.25	8.66	-1.99	0.49	1.91	14.64	5.91	11.37	2.63
	(-0.57)	(1.48)	(1.07)	(1.07)	(-0.56)	(0.18)	(1.74)	(2.9)	(1.85)	(1.71)	(1.8)
	11	6	8	5	6	4	3	4	2	3	49

Table 6: **Years with positive expected size premium since 1929 according to each state variable**. The state variables are the median BM (MBM), the value weighted average BM (VBM), the BM of the Dow Jones stocks (DJBM), the default spread (DFY), the earnings-price ratio (EP), the term spread (TMS), the T-bill rate (TBL), and the percent equity issuing (EQIS). The number in brackets gives the number of percentile groups used as a breakpoint: MBM(3) displays 1 if the MBM percentile rank given in Eq. (17) is above $\frac{2}{3}$, and a dot otherwise. I choose the breakpoints by inspection of the previous results: They maximize the significance of the size premium in the top percentile group. All the scaled-price ratios consider a breakpoint of three groups to be comparable with the MBM regardless.

Year	MBM(3)	VBM(3)	DJBM(3)	EP(3)	DFY(5)	TMS(5)	TBL(2)	EQIS(2)
1930	1	1	1	.	.	1	1	1
1931	1	1	1	.	1	1	1	1
1932	1	1	1	1	1	1	1	1
1933	1	1	1	.	1	1	1	1
1934	.	.	1	.	.	.	1	.
1935	.	.	1	.	.	.	1	1
1936	.	.	.	.	.	.	1	1
1937	.	.	.	.	.	.	1	.
1938	.	.	1	.	1	.	1	.
1939	.	.	1	.	.	.	1	1
1940	.	.	1	1	.	.	.	1
1941	.	.	1	1	.	.	.	1
1942	1	1	1	1	.	.	.	.
1943	1	1	.	1	.	.	.	.
1944	.	.	1	.	.	.	.	.
1947	.	.	.	1	.	.	.	.
1948	.	.	1	1	.	.	.	.
1949	.	.	1	1	.	.	.	.
1950	.	.	1	1	.	.	.	.
1951	.	.	.	1	.	.	.	.
1952	.	.	.	1	.	.	.	.
1953	.	.	.	1	.	.	.	.
1958	.	.	.	.	.	.	.	1
1963	.	.	.	.	.	.	.	1
1964	.	.	.	.	.	.	.	1
1965	.	.	.	.	.	.	.	1
1966	.	.	.	.	.	.	.	1
1967	.	.	.	.	.	.	.	1
1968	.	.	.	.	.	.	.	1
1970	.	.	1	.	.	.	.	.
1971	.	.	.	.	1	.	.	.
1974	1	1	1	1	.	.	.	.
1975	1	1	1	1	1	1	.	1
1976	1	1	1	1	1	1	.	1
1977	1	1	1	1	.	1	.	.
1978	1	1	1	1	.	.	.	.
1979	1	1	1	1	.	.	.	.
1980	1	1	1	1	1	1	.	.
1981	.	1	1	1	1	.	.	.
1982	1	1	1	1	1	.	.	.
1983	.	1	.	.	1	.	.	.
1984	.	.	.	1	1	1	.	.
1985	.	1	.	.	1	1	.	1
1986	.	.	.	.	.	.	.	1
1987	.	.	.	.	.	1	.	1
1988	.	.	.	.	.	1	.	1
1989	.	.	.	.	.	.	.	1
1990	.	.	.	.	.	.	.	1
1991	.	.	.	.	.	1	.	1
1992	.	.	.	.	.	1	1	1
1993	.	.	.	.	.	1	1	1
1994	.	.	.	.	.	1	1	1
1995	.	.	.	.	.	.	.	1
1996	.	.	.	.	.	.	.	1
1997	.	.	.	.	.	.	.	1
1998	.	.	.	.	.	.	.	1
1999	.	.	.	.	.	.	1	1
2000	.	.	.	.	.	.	.	1
2001	.	.	.	.	.	.	1	1
2002	.	.	.	.	1	1	1	1
2003	.	.	.	.	.	1	1	1
2004	.	.	.	.	.	1	1	1
2005	.	.	.	.	.	.	1	1
2006	.	.	.	.	.	.	.	1
2007	.	.	.	.	.	.	.	1
2008	.	.	.	.	1	.	1	1
2009	1	.	.	.	1	1	1	.
2010	.	.	.	.	1	1	1	.
2011	.	.	.	.	.	1	1	1
2012	.	.	.	.	1	.	1	1
2013	.	.	.	.	.	1	1	1
2014	.	.	.	.	.	.	1	1
2015	.	.	.	.	.	.	1	1

Table 7: **The conditional size premium according to several state variables compared to other (unconditional) premiums in recent years.** I report the **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio, and the **number of years** in each sample. Each full sample starts in the year displayed in the first column, "From year", and I subdivide this sample into high or low risk based on the state variable listed in the first row. The number in brackets next to the state variable gives the respective number of percentile ranking groups used to identify the high risk years. The state variables are the median BM (MBM), the value weighted average BM of all CRSP stocks (VBM), the value weighted average BM of the Dow Jones stocks (DJBM), the earnings-price ratio (EP), the default spread (DFY), the term spread (TMS), and the T-bill rate (TBL). The high risk years correspond to the top third backward looking percentiles in Eq. (17) for the MBM, the VBM, the DJBM, and the EP; the top fifth for the DFY and the TMS; and the **bottom** half for the TBL. The benchmark premiums are the market premium (MP), the value premium (HML), the momentum premium (MOM), the profitability premium (RMW), and the investment premium (CMA).

	The size premium in high or low risk years														The other unconditional premiums				
From year	MBM(3)		VBM(3)		DJBM(3)		EP(3)		DFY(5)		TMS(5)		TBL(2)		MP	HML	MOM	RMW	CMA
	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	All	All	All	All	All
1975	14.3	-0.4	9.4	0.3	12.7	0.0	10.9	0.1	5.7	1.0	5.1	0.2	4.4	1.1	7.4	4.3	8.3	4.1	3.8
	(3.95)	(-0.28)	(2.31)	(0.19)	(2.98)	(0.02)	(2.62)	(0.09)	(2.12)	(0.54)	(2.35)	(0.11)	(2.51)	(0.47)	(2.94)	(1.86)	(3.17)	(2.45)	(2.89)
	8	33	10	31	8	33	9	32	13	28	19	22	17	24	41	41	41	41	41
1980	17.9	-0.4	6.6	0.3	13.6	0.0	9.4	0.1	5.3	-0.7	3.2	-0.4	4.4	-1.8	8.0	3.9	7.7	4.7	3.9
	(3.94)	(-0.28)	(1)	(0.19)	(1.55)	(0.02)	(1.24)	(0.09)	(1.75)	(-0.39)	(1.75)	(-0.19)	(2.51)	(-0.79)	(2.78)	(1.55)	(2.61)	(2.51)	(2.61)
	3	33	5	31	3	33	4	32	11	25	16	20	17	19	36	36	36	36	36
1985	9.0	0.1	-0.4	0.4	.	0.4	.	0.4	4.7	-0.7	2.3	-1.2	4.4	-4.6	7.8	2.9	7.1	4.5	3.6
	.	(0.06)	.	(0.27)	.	(0.26)	.	(0.26)	(2.81)	(-0.39)	(1.57)	(-0.55)	(2.51)	(-3.04)	(2.97)	(1.09)	(2.17)	(2.1)	(2.21)
	1	30	1	30	0	31	0	31	6	25	14	17	17	14	31	31	31	31	31
1990	9.0	1.1	.	1.4	.	1.4	.	1.4	5.7	0.4	3.2	0.0	4.4	-4.4	7.6	3.4	7.0	4.4	3.4
	.	(0.68)	.	(0.89)	.	(0.89)	.	(0.89)	(3.51)	(0.2)	(1.82)	(0.02)	(2.51)	(-2.28)	(2.58)	(1.1)	(1.85)	(1.74)	(1.8)
	1	25	0	26	0	26	0	26	5	21	11	15	17	9	26	26	26	26	26
1995	9.0	1.2	.	1.6	.	1.6	.	1.6	5.7	0.3	4.1	0.3	4.9	-5.1	7.5	3.0	6.0	4.5	3.8
	.	(0.61)	.	(0.83)	.	(0.83)	.	(0.83)	(3.51)	(0.12)	(1.65)	(0.12)	(2.35)	(-2.08)	(2.11)	(0.8)	(1.32)	(1.46)	(1.65)
	1	20	0	21	0	21	0	21	5	16	7	14	14	7	21	21	21	21	21
2000	9.0	2.4	.	2.8	.	2.8	.	2.8	5.7	1.6	4.1	1.9	3.8	-1.2	4.5	5.0	2.0	6.7	5.0
	.	(1.41)	.	(1.71)	.	(1.71)	.	(1.71)	(3.51)	(0.7)	(1.65)	(0.81)	(1.99)	(-0.45)	(1.04)	(1.15)	(0.41)	(1.88)	(1.71)
	1	15	0	16	0	16	0	16	5	11	7	9	13	3	16	16	16	16	16
2005	9.0	0.0	.	0.8	.	0.8	.	0.8	6.2	-2.2	2.8	-0.3	1.8	-3.8	7.8	-1.2	1.4	2.8	1.2
	.	(0)	.	(0.47)	.	(0.47)	.	(0.47)	(3.13)	(-1.43)	(0.84)	(-0.14)	(0.94)	(-5.17)	(1.51)	(-0.42)	(0.23)	(1.65)	(0.7)
	1	10	0	11	0	11	0	11	4	7	4	7	9	2	11	11	11	11	11
2010	.	-0.8	.	-0.8	.	-0.8	.	-0.8	3.7	-3.1	0.7	-2.3	-0.8	.	15.2	-2.0	4.9	1.1	1.5
	.	(-0.38)	.	(-0.38)	.	(-0.38)	.	(-0.38)	(1.11)	(-1.45)	(0.19)	(-0.83)	(-0.38)	.	(2.94)	(-0.56)	(2.62)	(0.5)	(0.7)
	0	6	0	6	0	6	0	6	2	4	3	3	6	0	6	6	6	6	6

Table 8: **The unconditional relation between the state variables and the stock market opportunities in 1926-2015 and subsamples 1926-1960 and 1960-2015.** $cov(MP_{1y}, z)$ and $cov(MP_{5y}, z)$ are, respectively, the covariance between the future one- or five-year market premiums and the state variable z given n the heading of the table; $cov(svar_{1y}, z)$ and $cov(svar_{5y}, z)$ are, respectively, the covariance between the future one- or five-year realized variance of the market returns and the state variable given; and dSR_{1y} and dSR_{5y} are the average of the derivatives of the future one- or five-year pseudo-conditional Sharpe ratios of the stock market with respect to the state variables given. Each column in the table corresponds to a different state variable: The median BM (MBM), the value weighted average BM of all CRSP stocks (VBM), the BM of the Dow Jones stocks (DJBM), the earnings-price ratio (EP), the default spread (DFY), the term spread (TMS), the T-bill rate (TBL), the percent equity issuing (EQIS), and the SMB^*. The t-statistics are in brackets and the number of years in each sample is listed next to "Years". Italics indicates significance at 10%; bold and italics at 5%; and bold, italics and underline at 1%.

	MBM	VBM	DJBM	EP	DFY	TMS	TBL	EQIS	SMB^*
1926-2015									
$cov(MP_{1y}, z)$	3.18	3.29	4.08	3.13	1.84	0.06	-0.10	-2.38	0.68
	(2.96)	***(2.81)***	***(3.10)***	***(2.72)***	(1.37)	*(1.67)*	(1.23)	*(1.92)*	(1.54)
$cov(MP_{5y}, z)$	10.83	11.64	12.87	7.98	5.96	0.26	-0.49	-1.48	2.59
	(4.50)	***(4.41)***	***(4.10)***	***(2.77)***	*(1.79)*	***(3.31)***	***(2.48)***	(0.49)	***(2.53)***
$cov(svar_{1y}, z)$	0.66	0.43	0.09	-0.28	1.39	0.01	-0.03	-0.10	-0.07
	(3.15)	*(1.81)*	(0.34)	(1.18)	***(6.25)***	(1.55)	*(1.96)*	(0.41)	(0.75)
$cov(svar_{5y}, z)$	1.03	0.49	-1.83	-1.08	3.80	-0.02	-0.08	-0.53	-0.26
	(1.39)	(0.60)	*(1.81)*	(1.21)	***(4.11)***	(0.73)	(1.31)	(0.71)	(0.87)
dSR_{1y}	97	84	82	99	-98	1562	-416	-59	159
	(18.06)	***(25.67)***	***(179.35)***	***(50.45)***	***(-2.53)***	***(33.74)***	***(-10.38)***	***(-147.95)***	***(74.76)***
dSR_{5y}	148	141	142	112	6	4368	-1018	-8	296
	(68.82)	***(142.29)***	***(41.35)***	***(69.70)***	***(3.92)***	***(109.74)***	***(-52.93)***	***(-357.98)***	***(87.28)***
Years	87	87	90	90	90	90	90	86	87
1926-1960									
$cov(MP_{1y}, z)$	6.26	5.12	7.40	5.06	3.49	0.06	-0.06	-6.86	0.99
	(2.70)	***(2.47)***	***(4.40)***	***(2.72)***	(0.92)	(1.05)	(0.75)	***(2.55)***	***(2.12)***
$cov(MP_{5y}, z)$	14.14	10.40	25.94	18.12	4.32	0.27	-0.42	-10.16	3.46
	(2.67)	***(2.34)***	***(10.19)***	***(4.55)***	(0.44)	*(1.92)*	***(2.48)***	(1.54)	***(4.16)***
$cov(svar_{1y}, z)$	1.29	0.77	0.43	-0.55	3.01	0.02	-0.01	-0.32	0.03
	(2.94)	*(1.87)*	(1.07)	(1.44)	***(5.72)***	***(2.11)***	(0.95)	(0.56)	(0.33)
$cov(svar_{5y}, z)$	2.17	0.82	-3.64	-3.44	7.93	-0.04	0.10	0.62	-0.64
	(1.32)	(0.55)	***(2.61)***	***(2.53)***	***(3.28)***	(1.02)	*(1.89)*	(0.37)	***(2.08)***
dSR_{1y}	253	198	282	292	-506471	2144	-1129	-150	738
	(4.84)	***(10.25)***	***(13.05)***	***(7.90)***	(-1.00)	***(4.41)***	***(-21.28)***	***(-39.20)***	***(62.40)***
dSR_{5y}	150	192	635	1530	-66	7149	-8064	-122	2280
	(28.87)	***(55.85)***	***(5.71)***	(1.48)	***(-6.08)***	***(31.39)***	***(-20.13)***	***(-66.29)***	***(11.44)***
Years	32	32	35	35	35	35	35	31	32
1960-2015									
$cov(MP_{1y}, z)$	0.43	1.10	0.99	1.11	0.42	0.06	-0.03	-0.24	0.64
	(0.64)	(1.36)	(0.81)	(1.07)	(0.48)	***(2.02)***	(0.50)	(0.23)	(1.51)
$cov(MP_{5y}, z)$	2.38	4.34	1.50	-1.27	5.05	0.30	-0.08	1.67	3.14
	(1.27)	*(1.91)*	(0.43)	(0.42)	***(2.11)***	***(3.75)***	(0.42)	(0.57)	***(2.77)***
$cov(svar_{1y}, z)$	-0.15	-0.27	-0.47	-0.36	0.25	0.01	-0.01	-0.10	-0.04
	(1.20)	*(1.83)*	***(2.10)***	*(1.89)*	(1.53)	(0.87)	(0.67)	(0.53)	(0.52)
$cov(svar_{5y}, z)$	-1.08	-1.32	-2.19	-0.76	0.37	0.01	-0.02	-1.55	0.23
	(3.46)	***(3.39)***	***(3.84)***	(1.39)	(0.83)	(0.53)	(0.58)	***(3.12)***	(1.04)
dSR_{1y}	47	79	40	52	4.36	1852	-157	-3	121
	(18.92)	***(16.89)***	***(15.61)***	***(18.18)***	***(32.35)***	***(50.18)***	***(-73.87)***	***(-195.93)***	***(86.49)***
dSR_{5y}	146	132	42	-4	83.40	4013	-170	50	217
	(6.08)	***(20.65)***	***(18.01)***	***(-175.57)***	***(111.24)***	***(162.71)***	***(-167.53)***	***(21.80)***	***(79.85)***
Years	56	56	56	56	56	56	56	56	56

Table 9: **The conditional relation between the state variables and the stock market opportunities exclusively in high risk years in 1926-2015 and subsamples 1926-1960 and 1960-2015.** $cov(MP_{1y}, z)$ and $cov(MP_{5y}, z)$ are, respectively, the covariance between the future one- or five-year returns on the market and the state variable z given in the heading of the table; $cov(svar_{1y}, z)$ and $cov(svar_{5y}, z)$ are, respectively, the covariance between the future one- or five-year realized variance of the market returns and the state variable given; and dSR_{1y} and dSR_{5y} are the average of the derivatives of the future one- or five-year pseudo-conditional Sharpe ratios of the stock market with respect to the state variables given. Each column in the table corresponds to a different state variable: The median BM (MBM), the value weighted average BM of all CRSP stocks (VBM), the BM of the Dow Jones stocks (DJBM), the earnings-price ratio (EP), the default spread (DFY), the term spread (TMS), the T-bill rate (TBL), the percent equity issuing (EQIS), and the SMB^*. The high risk years correspond to the top third backward looking percentiles in Eq. (17) for the MBM, the VBM, the DJBM, and the EP; the top fifth for the DFY and the TMS; and the **bottom** half for the TBL and the EQIS. The results for the SMB^* are conditioned on the MBM, $SMB^*(MBM)$, or on the DFY, $SMB^*(DFY)$, using the respective subsamples of risky years. The t-statistics are in brackets and the number of years in each sample is listed next to "Years". Italics indicates significance at 10%; bold and italics at 5%; and bold, italics and underline at 1%.

	MBM(3)	VBM(3)	DJBM(3)	EP(3)	DFY(5)	TMS(5)	TBL(2)	EQIS(2)	SMB^*(MBM)	SMB^*(DFY)
1926 – 2015										
$cov(MP_{1y}, z)$	7.60	6.94	8.30	1.34	7.29	0.06	-0.09	-3.15	1.79	0.94
	(1.47)	*(1.93)*	***(5.18)***	(1.05)	*(1.77)*	(1.44)	(1.34)	*(1.88)*	(1.03)	(0.52)
$cov(MP_{5y}, z)$	15.52	14.67	14.34	4.35	19.70	0.19	-0.22	-3.93	2.32	1.25
	(1.66)	***(2.51)***	***(4.28)***	(1.67)	***(3.02)***	***(2.4)***	(1.27)	(0.93)	(0.71)	(0.36)
$cov(svar_{1y}, z)$	2.34	1.23	0.37	0.07	2.46	-0.01	0.01	0.37	-0.18	-0.44
	(2.93)	*(1.87)*	(0.88)	(0.32)	***(3.79)***	(0.88)	(0.76)	(0.93)	(0.54)	(1.24)
$cov(svar_{5y}, z)$	3.43	0.84	-1.85	-0.05	5.08	-0.05	0.01	1.50	-1.31	-0.63
	(1.22)	(0.41)	(1.54)	(0.14)	***(3.11)***	***(2.13)***	(0.2)	(1.25)	(1.46)	(0.71)
dSR_{1y}	205	335	463	230	284	7234	-8293	-106	451	230
	(3.24)	***(4.38)***	***(12.48)***	***(40.26)***	***(3.48)***	***(22.31)***	***(-23.45)***	***(-28.56)***	***(15.63)***	***(7.38)***
dSR_{5y}	138	262	10741	462	186	16268	-7548	-70	701	166
	(16.36)	***(43.35)***	(1.05)	***(173.17)***	***(9.91)***	***(10.62)***	***(-120.63)***	***(-32.83)***	***(3.87)***	***(22.63)***
Years	15	17	25	23	18	31	18	47	15	18
1926-1960										
$cov(MP_{1y}, z)$	19.28	17.06	13.99	1.61	29.29	0.18	-0.14	-17.67	3.88	3.64
	(1.22)	(1.09)	***(5.59)***	(0.7)	*(2.97)*	(1.16)	(0.73)	(1.47)	(1.25)	(1.18)
$cov(MP_{5y}, z)$	35.49	28.07	26.25	5.37	49.33	0.48	-0.21	-30.15	7.25	3.96
	(1.43)	(1.1)	***(6.82)***	(1.43)	***(8.17)***	(1.53)	(0.61)	(1.17)	(1.51)	(0.72)
$cov(svar_{1y}, z)$	2.76	0.76	0.96	0.07	2.43	0.03	0.00	1.08	0.28	0.01
	(1.14)	(0.29)	(1.26)	(0.18)	(1.47)	(1.03)	(0.06)	(0.48)	(0.54)	(0.03)
$cov(svar_{5y}, z)$	-2.80	-7.29	-2.01	-0.24	1.76	-0.05	0.11	10.38	-1.46	-0.47
	(0.39)	(1.22)	(0.86)	(0.32)	(0.32)	(0.87)	***(3.16)***	*(1.99)*	(1.17)	(0.5)
dSR_{1y}	260	223	537	218	607	21516	-9645	-146	1230	2355
	(4.33)	***(18.66)***	***(4.65)***	***(38.34)***	***(7.02)***	***(2.64)***	***(-115.49)***	***(-19.32)***	***(7.94)***	***(196.24)***
dSR_{5y}	257	298	545	573	592	21539	-9857	-191	1661	1872
	(17.51)	***(5.33)***	***(8.32)***	***(27.46)***	***(20.97)***	***(14.92)***	***(-11.42)***	***(-6.46)***	***(7.24)***	***(11.77)***
Years	6	6	15	13	4	7	7	10	6	4
1960-2015										
$cov(MP_{1y}, z)$	-0.86	0.50	0.89	0.88	0.51	0.05	-0.07	0.23	1.08	0.66
	(0.66)	(0.6)	(0.89)	(0.81)	(0.39)	***(3.37)***	***(2.47)***	(0.32)	(1.27)	(0.58)
$cov(MP_{5y}, z)$	-6.04	0.85	3.56	2.20	3.49	0.17	-0.28	1.58	1.45	1.91
	(1.77)	(0.65)	***(3.03)***	(1.14)	(1.26)	***(3.2)***	*(1.99)*	(0.6)	(0.51)	(0.75)
$cov(svar_{1y}, z)$	-0.08	-0.05	0.06	0.05	-0.13	0.00	0.03	0.05	-0.06	-0.24
	(0.79)	(1.06)	(1.05)	(0.67)	(0.44)	(0.37)	*(2.21)*	(0.23)	(0.88)	(0.95)
$cov(svar_{5y}, z)$	-0.33	-0.10	0.10	0.16	-0.43	0.00	0.04	-1.51	0.03	0.04
	(3.84)	(0.73)	(1.61)	(1.06)	(0.94)	(0.25)	(1.04)	***(2.84)***	(0.31)	(0.1)
dSR_{1y}	-95	281	276	205	86.33	8805	-22904	10	368	188
	(-17.74)	***(15.26)***	***(17.43)***	***(23.84)***	***(17.37)***	***(44.43)***	***(-4.91)***	***(132.2)***	***(15.28)***	***(8.32)***
dSR_{5y}	-370	205	573	223	253.18	12319	-22389	76	191	138
	(-16.72)	***(42.21)***	***(46.94)***	***(35.61)***	***(24.73)***	***(160.44)***	***(-9.07)***	***(19.46)***	***(139.71)***	***(268.43)***
Years	9	11	10	10	14	24	11	37	9	14

Table 10: β_z **coefficients from the predictive regressions of the type $\Delta W_{t+1} = \alpha + \beta_z z_t + \epsilon_{t+1}$ in which the different ΔW_{t+1} measure changes on the agent's wealth over one year, and z is a given state variable.** ΔW_{t+1} is the return on long term Treasury bonds (R_{LT}), the return on long term corporate bonds (R_{corp}), the growth rate in labor income (HK_g), consumption growth (C_g), or the return on real estate (R_{RE}). The values correspond to annual changes. The state variables related to the size premium are: The median BM (MBM), the value weighted average BM of all CRSP stocks (VBM), the BM of the Dow Jones stocks (DJBM), the earnings-price ratio (EP), the default spread (DFY), the term spread (TMS), the T-bill rate (TBL), and the percent equity issuing (EQIS). The rows display the coefficient of each state variable (β_z), followed by the t-statistics in brackets, the number of observations, and the adjusted R^2 in percent terms. The columns display the values for each regression in the full sample ("All"), or in the subset of low or high risk years, respectively "Low" and "High". The high risk years correspond to the top third backward looking percentiles in Eq. (17) for the MBM, the VBM, the DJBM, and the EP; the top fifth for the DFY and the TMS; and the **bottom** half for the TBL and the EQIS. Italics indicates significance at 10%; bold and italics at 5%; and bold, italics and underline at 1%.

	R_{LT}			R_{corp}			HK_g			C_g			R_{RE}		
	All	Low	High	All	Low	High	All	Low	High	All	Low	High	All	Low	High
MBM(3)	-0.01	-0.03	0.01	0.01	-0.01	0.03	-0.01	0.04	-0.07	-0.01	0.01	-0.03	0.02	0.01	0.05
	(-0.45)	(-0.77)	(0.15)	(0.56)	(-0.30)	(0.36)	(-0.44)	***(2.33)***	(-0.79)	***(-2.05)***	*(1.71)*	(-1.38)	(1.61)	(0.46)	***(2.21)***
	89	71	18	89	71	18	85	70	15	83	66	17	89	71	18
	-1	-1	-6	-1	-1	-5	-1	6	-3	4	3	5	2	-1	19
VBM(3)	-0.01	-0.03	-0.01	0.01	-0.02	0.04	0.01	0.04	-0.01	-0.01	0.01	-0.02	0.01	0.00	0.05
	(-0.52)	(-1.02)	(-0.11)	(0.25)	(-0.58)	(0.48)	(0.88)	***(2.62)***	(-0.13)	(-0.85)	*(1.73)*	(-0.69)	(1.05)	(-0.11)	*(1.96)*
	89	69	20	89	69	20	85	68	17	83	63	20	89	69	20
	-1	0	-5	-1	-1	-4	0	8	-7	0	3	-3	0	-1	13
DJBM(3)	-0.01	-0.03	0.06	0.00	-0.03	0.11	0.02	0.03	0.04	0.00	0.01	-0.01	0.00	-0.01	0.01
	(-0.69)	(-1.22)	(1.03)	(-0.08)	(-1.19)	(1.48)	(1.65)	***(3.55)***	(0.47)	(-0.71)	(1.12)	(-0.45)	(0.02)	(-0.56)	(0.23)
	89	64	25	89	64	25	85	60	25	83	58	25	89	64	25
	-1	1	0	-1	1	5	2	16	-3	-1	0	-3	-1	-1	-4
DFY(5)	0.03	0.01	-0.05	0.04	0.02	-0.02	-0.03	0.03	-0.15	-0.01	0.00	-0.06	0.00	0.00	0.01
	(1.33)	(0.25)	(-0.54)	***(2.20)***	(0.97)	(-0.25)	*(-1.98)*	***(2.17)***	***(-3.47)***	***(-2.52)***	(0.27)	***(-3.85)***	(-0.23)	(-0.32)	(0.31)
	89	71	18	89	71	18	85	67	18	83	68	15	89	71	18
	1	-1	-4	4	0	-6	3	5	39	6	-1	50	-1	-1	-6
EP(3)	-0.01	-0.03	-0.09	-0.02	-0.05	-0.08	0.04	0.03	-0.05	-0.01	0.00	-0.03	0.00	-0.01	-0.05
	(-0.46)	(-1.07)	(-0.64)	(-0.74)	*(-1.92)*	(-0.51)	***(2.65)***	(1.35)	(-0.48)	(-1.25)	(0.14)	(-0.89)	(-0.17)	(-0.39)	(-0.90)
	89	66	23	89	66	23	85	63	22	83	60	23	89	66	23
	-1	0	-3	-1	4	-3	7	1	-4	1	-2	-1	-1	-1	-1
TMS(5)	2.40	0.10	8.78	2.52	0.37	7.38	-0.86	0.11	3.85	0.15	0.65	2.48	0.91	1.20	-0.01
	(3.11)	(0.11)	***(2.14)***	***(3.30)***	(0.39)	*(1.94)*	(-1.44)	(0.17)	(1.28)	(0.68)	***(2.71)***	***(2.21)***	***(2.45)***	***(2.20)***	(0.00)
	89	66	23	89	66	23	85	62	23	83	64	19	89	66	23
	9	-2	14	10	-1	11	1	-2	3	-1	9	18	5	6	-5
TBL(2)	0.90	1.29	1.01	0.81	1.33	-0.12	0.29	-0.16	0.04	0.00	-0.07	0.08	-0.27	-0.27	0.10
	(2.82)	***(3.53)***	(0.82)	***(2.53)***	***(3.66)***	(-0.10)	(1.26)	(-0.89)	(0.04)	(-0.01)	(-1.06)	(0.13)	*(-1.76)*	(-1.51)	(0.16)
	89	64	26	89	64	26	85	60	26	83	64	20	89	64	26
	7	15	-1	6	16	-4	1	0	-4	-1	0	-5	2	2	-4
EQIS(2)	-0.01	0.05	0.00	0.00	0.05	0.01	0.00	-0.03	-0.05	-0.01	0.00	-0.02	-0.01	-0.06	0.02
	(-0.29)	(1.00)	(0.03)	(0.16)	(1.03)	(0.30)	(-0.22)	(-1.04)	(-1.67)	(-1.28)	(0.04)	(-1.68)	(-0.76)	***(-2.95)***	(0.93)
	87	43	46	87	43	46	85	41	46	81	41	42	87	43	46
	-1	0	-2	-1	0	-2	-1	0	4	1	-3	4	0	15	0

Table 11: β_z **coefficients from the predictive regressions of the type $\Delta W_{t+5} = \alpha + \beta_z z_t + \epsilon_{t+1}$ in which different ΔW_{t+5} measure changes on the agent's wealth over five years, and z is a given state variable.** ΔW_{t+5} is the 5 year return on long term Treasury bonds (R_{LT}), the return on long term corporate bonds (R_{corp}), the growth rate in labor income (HK_g), consumption growth (C_g), or the return on real estate (R_{RE}). The values correspond to 5 year changes compounded annually. The state variables related to the size premium are: The median BM (MBM), the value weighted average BM of all CRSP stocks (VBM), the BM of the Dow Jones stocks (DJBM), the earnings-price ratio (EP), the default spread (DFY), the term spread (TMS), the T-bill rate (TBL), and the percent equity issuing (EQIS). The rows display the coefficient of each state variable (β_z), followed by the t-statistics in brackets, the number of observations, and the adjusted R^2 in percent terms. The columns display the values for each regression in the full sample ("All"), or in the subset of low or high risk years, respectively "Low" and "High". The high risk years correspond to the top third backward looking percentiles in Eq. (17) for the MBM, the VBM, the DJBM, and the EP; the top fifth for the DFY and the TMS; and the **bottom** half for the TBL and the EQIS. Italics indicates significance at 10%; bold and italics at 5%; and bold, italics and underline at 1%

	$R_{LT,5y}$			$R_{corp,5y}$			$HK_g, 5y$			$C_g, 5y$			$R_{RE,5y}$		
	All	Low	High	All	Low	High	All	Low	High	All	Low	High	All	Low	High
MBM(3)	-0.12	-0.19	-0.14	-0.04	-0.16	-0.05	0.16	0.27	0.08	0.01	0.01	0.17	0.09	0.07	0.14
	(-1.40)	(-1.42)	(-0.73)	(-0.47)	(-1.30)	(-0.24)	***(2.70)***	***(3.76)***	(0.38)	(0.43)	(0.41)	***(2.97)***	***(2.12)***	(1.09)	(1.72)
	85	67	18	85	67	18	81	66	15	79	62	17	85	67	18
	1	2	-3	-1	1	-6	7	17	-6	-1	-1	33	4	0	10
VBM(3)	-0.09	-0.21	-0.24	-0.04	-0.21	-0.14	0.19	0.24	0.13	0.01	0.00	0.20	0.02	-0.04	0.13
	(-1.10)	***(-2.62)***	(-0.74)	(-0.55)	***(-2.67)***	(-0.42)	***(3.75)***	***(4.34)***	(0.60)	(0.57)	(0.25)	***(3.03)***	(0.58)	(-0.71)	(1.30)
	85	65	20	85	65	20	81	64	17	79	59	20	85	65	20
	0	8	-2	-1	9	-5	14	22	-4	-1	-2	30	-1	-1	3
DJBM(3)	-0.07	-0.17	0.37	-0.04	-0.17	0.45	0.20	0.18	0.17	0.03	0.02	0.11	-0.02	-0.10	-0.01
	(-0.98)	***(-2.22)***	(1.32)	(-0.52)	***(-2.23)***	(1.56)	***(5.01)***	***(5.44)***	(0.76)	*(1.74)*	(1.09)	***(2.43)***	(-0.59)	***(-2.54)***	(-0.10)
	85	60	25	85	60	25	81	56	25	79	54	25	85	60	25
	0	6	3	-1	6	6	23	34	-2	3	0	17	-1	8	-4
DFY(5)	0.21	0.14	-0.09	0.27	0.15	0.07	0.07	0.14	-0.05	0.00	-0.02	0.00	0.03	0.03	0.01
	(3.32)	***(2.10)***	(-0.30)	***(4.42)***	***(2.28)***	(0.23)	(1.53)	***(2.22)***	(-0.32)	(0.25)	(-0.80)	(-0.10)	(0.98)	(0.50)	(0.18)
	85	68	17	85	68	17	81	64	17	79	65	14	85	68	17
	11	5	-6	18	6	-6	2	6	-6	-1	-1	-8	0	-1	-6
EP(3)	0.00	-0.08	0.38	-0.02	-0.14	0.46	0.17	0.15	-0.33	-0.01	-0.05	0.00	0.00	-0.12	-0.09
	(-0.05)	(-0.99)	(0.62)	(-0.30)	*(-1.80)*	(0.74)	***(3.35)***	*(1.97)*	(-1.57)	(-0.68)	(-1.10)	(0.01)	(0.01)	***(-2.49)***	(-0.45)
	85	62	23	85	62	23	81	59	22	79	56	23	85	62	23
	-1	0	-3	-1	4	-2	11	5	7	-1	0	-5	-1	8	-4
TMS(5)	2.60	-5.98	15.68	2.19	-6.69	8.75	-0.72	3.23	5.54	1.64	3.57	6.61	1.42	3.10	-1.16
	(0.93)	(-1.52)	(1.45)	(0.78)	*(-1.70)*	(0.82)	(-0.35)	(1.13)	(0.64)	***(2.43)***	***(3.90)***	***(3.19)***	(1.05)	(1.44)	(-0.32)
	85	64	21	85	64	21	81	60	21	79	60	19	85	64	21
	0	2	5	0	3	-2	-1	0	-3	6	19	34	0	2	-5
TBL(2)	7.63	9.50	6.32	7.32	9.54	3.67	0.15	0.00	-7.64	0.00	0.11	-0.94	-0.31	-0.70	3.19
	(9.61)	***(10.57)***	***(5.93)***	***(8.90)***	***(11.14)***	*(1.79)*	(0.19)	(0.00)	*(-1.83)*	(0.00)	(0.37)	(-0.78)	(-0.56)	(-1.09)	(1.42)
	85	64	22	85	64	22	81	60	22	79	62	18	85	64	22
	52	64	62	48	66	10	-1	-2	10	-1	-1	-2	-1	0	5
EQIS(2)	0.03	0.52	-0.08	0.09	0.58	0.02	0.04	-0.03	-0.07	-0.05	-0.12	-0.05	0.03	-0.18	0.15
	(0.38)	***(2.93)***	(-0.92)	(1.20)	***(3.32)***	(0.21)	(0.69)	(-0.35)	(-0.79)	***(-2.96)***	***(-3.09)***	*(-1.88)*	(0.97)	***(-2.84)***	***(2.32)***
	83	43	42	83	43	42	81	41	42	77	41	38	83	43	42
	-1	15	0	1	19	-2	-1	-2	-1	9	18	6	0	14	10

Appendix A. The size premium conditioned on other ICAPM state variables

A.1. The size premium as the return on the SMB portfolio

This appendix shows the evidence supporting the description of the conditional size premium in Eq. (1) considering the returns on the SMB portfolio, but conditioned on other state variables, apart from the MBM. The state variables are the value weighted BM of all CRSP stocks (VBM), the Dow Jones' BM of Pontiff and Schall (1998) (DJBM), the earnings-price ratio (EP), the term spread (TMS), the default spread (DFY), the T-bill rate (TBL), the percent equity issuing of Baker and Wurgler (2000) (EQIS), the investment to capital ratio of Cochrane (1991) (IK), the **lagged** dividend yield of Ball (1978) (DY), and the SMB^* of Maio and Santa-Clara (2012).

Table 12: **Returns on the SMB portfolio in years with similar VBM states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1926(9)-2015 and subsamples 1926(9)-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the VBM backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio at each (VBM) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926(9)-2015											
All	2.91										
	(2.23)										
	87										
2	0.62	6.83									1.06
	(0.47)	(2.61)									(0.74)
	65	28									59
3	0.25	1.54	12.06								0.69
	(0.15)	(0.96)	(3.29)								(0.56)
	46	24	17								70
5	-0.62	2.12	1.41	4.11	14.71						1.03
	(-0.32)	(0.74)	(0.75)	(0.83)	(3.43)						(0.84)
	30	19	19	7	12						75
7	-0.57	1.21	6.35	-1.15	3.68	14.12	11.83				2.13
	(-0.28)	(0.39)	(2.18)	(-0.63)	(1.45)	(2.9)	(1.66)				(1.7)
	28	17	8	14	5	8	7				80
10	0.11	-2.09	1.56	4.21	1.19	-1.56	3.27	4.74	15.30	13.87	2.25
	(0.04)	(-0.94)	(0.45)	(1.08)	(0.55)	(-0.75)	(0.88)	(0.54)	(5.18)	(1.37)	(1.82)
	20	10	15	4	16	9	3	4	7	5	82
1926(9)-1960											
All	3.84										
	(1.67)										
	32										
2	0.59	7.56									1.29
	(0.31)	(1.71)									(0.55)
	24	13									19
3	-1.19	3.54	16.94								0.81
	(-0.51)	(1.37)	(2.1)								(0.46)
	15	11	6								26
5	-4.28	2.35	3.52	3.72	16.94						0.81
	(-1.37)	(0.75)	(1.23)	.	(2.1)						(0.46)
	8	7	10	1	6						26
7	-4.28	1.57	13.29	0.29	3.72	23.96	15.54				1.67
	(-1.37)	(0.44)	(4.15)	(0.12)	.	.	(1.6)				(0.88)
	8	6	3	8	1	1	5				27
10	-1.98	-11.18	1.57	7.03	3.54	-1.18	3.72	.	16.58	17.12	1.94
	(-0.54)	(-3.94)	(0.44)	.	(1.11)	(-0.68)	.	.	(2.25)	(1.38)	(1.05)
	6	2	6	1	9	6	1	0	2	4	28
1960-2015											
All	2.35										
	(1.51)										
	56										
2	0.65	6.19									0.95
	(0.37)	(1.94)									(0.54)
	42	15									41
3	0.95	-0.15	9.39								0.63
	(0.44)	(-0.08)	(2.55)								(0.39)
	32	13	11								45
5	0.72	1.98	-0.93	4.18	12.47						1.14
	(0.32)	(0.47)	(-0.4)	(0.72)	(3.36)						(0.71)
	23	12	9	6	6						50
7	0.92	1.02	2.18	-3.07	3.68	12.72	2.56				2.35
	(0.38)	(0.23)	(0.72)	(-1.06)	(1.12)	(2.36)	(1.52)				(1.45)
	21	11	5	6	4	7	2				54
10	1.00	0.19	1.55	3.27	-1.85	-2.34	3.05	4.74	14.79	0.88	2.38
	(0.3)	(0.1)	(0.28)	(0.61)	(-0.73)	(-0.39)	(0.47)	(0.54)	(4.16)	.	(1.5)
	15	8	9	3	7	3	2	4	5	1	55

Table 13: **Returns on the SMB portfolio in years with similar DJBM states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1926-2015 and subsamples 1926-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the *DJBM* backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio at each (DJBM) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926-2015											
All	2.60										
	(2.02)										
	90										
2	0.26	6.25									0.17
	(0.19)	(2.67)									(0.12)
	56	36									54
3	0.24	-1.31	10.22								-0.33
	(0.16)	(-0.54)	(3.84)								(-0.26)
	41	24	25								65
5	0.13	1.49	-4.14	4.00	12.31						0.34
	(0.07)	(0.54)	(-1.22)	(1.73)	(3.47)						(0.28)
	32	15	13	13	17						73
7	0.19	0.53	1.83	-5.02	3.04	2.56	17.34				0.55
	(0.09)	(0.29)	(0.46)	(-1.03)	(1.31)	(1.03)	(3.67)				(0.48)
	26	14	9	9	12	9	11				79
10	-0.39	1.47	1.02	2.02	-1.34	-6.05	4.35	3.42	7.60	19.03	1.21
	(-0.16)	(0.78)	(0.36)	(0.39)	(-0.38)	(-1.02)	(1.56)	(0.77)	(2.13)	(2.97)	(1.03)
	23	9	8	7	9	6	8	5	10	7	83
1926-1960											
All	2.95										
	(1.34)										
	35										
2	-1.58	6.01									-2.24
	(-0.59)	(2.08)									(-0.77)
	15	22									13
3	-4.22	0.10	8.76								-1.41
	(-1.1)	(0.04)	(2.26)								(-0.67)
	7	13	15								20
5	-6.96	-1.26	1.64	3.14	12.46						0.13
	(-1.42)	(-0.34)	(0.38)	(1.24)	(1.91)						(0.07)
	5	5	6	11	8						27
7	-10.84	0.74	-2.21	3.68	3.73	-0.93	23.77				0.26
	(-1.4)	(0.52)	(-0.48)	(0.59)	(1.37)	(-0.48)	(2.27)				(0.16)
	3	4	4	4	10	6	4				31
10	-10.84	-1.14	2.62	-3.85	3.48	-0.69	4.60	0.60	1.16	23.77	0.26
	(-1.4)	(-0.53)	(3.67)	(-0.63)	(0.72)	(-0.12)	(1.44)	(0.14)	(0.56)	(2.27)	(0.16)
	3	2	2	3	5	3	7	4	4	4	31
1960-2015											
All	2.35										
	(1.51)										
	56										
2	0.93	6.62									0.93
	(0.6)	(1.62)									(0.6)
	42	14									42
3	1.15	-2.97	12.42								0.17
	(0.74)	(-0.66)	(3.68)								(0.1)
	35	11	10								46
5	1.43	2.86	-9.10	8.68	12.17						0.48
	(0.8)	(0.77)	(-2)	(1.43)	(3.23)						(0.3)
	28	10	7	2	9						47
7	1.63	0.50	5.07	-11.98	-0.39	9.54	13.66				0.74
	(0.78)	(0.22)	(0.81)	(-2)	(-0.13)	(2.19)	(2.99)				(0.48)
	23	11	5	5	2	3	7				49
10	1.17	2.07	0.49	6.42	-7.36	-11.41	2.63	14.74	11.89	12.71	1.77
	(0.49)	(1.01)	(0.13)	(0.82)	(-2.08)	(-1.07)	.	.	(2.27)	(2.2)	(1.11)
	20	8	6	4	4	3	1	1	6	3	53

Table 14: **Returns on the SMB portfolio in years with similar EP states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1926-2015 and subsamples 1926-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the EP backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio at each (EP) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926-2015											
All	2.60										
	(2.02)										
	90										
2	0.99	5.52									0.99
	(0.68)	(2.28)									(0.68)
	58	32									58
3	0.29	2.03	7.67								0.86
	(0.16)	(1.17)	(2.49)								(0.65)
	45	22	23								67
5	-0.22	2.74	0.11	6.37	7.84						1.20
	(-0.1)	(1.05)	(0.06)	(1.95)	(2.12)						(0.95)
	32	19	14	6	19						71
7	0.70	-1.38	5.20	1.10	0.49	1.21	11.14				0.89
	(0.38)	(-0.34)	(1.8)	(0.46)	(0.17)	(0.39)	(2.6)				(0.74)
	27	15	9	8	9	7	15				75
10	1.94	-3.80	0.52	5.20	1.72	-1.50	3.86	8.88	2.60	10.90	1.32
	(0.82)	(-0.99)	(0.12)	(1.8)	(0.65)	(-0.51)	(0.65)	(2.55)	(0.51)	(2.19)	(1.08)
	20	12	10	9	7	7	3	3	7	12	78
1926-1960											
All	2.95										
	(1.34)										
	35										
2	1.90	3.94									1.90
	(0.72)	(1.12)									(0.72)
	17	18									17
3	-1.60	4.74	5.28								1.57
	(-0.48)	(1.77)	(1.14)								(0.71)
	11	11	13								22
5	-2.13	4.02	1.29	5.65	5.16						1.93
	(-0.5)	(1.02)	(0.36)	(1.33)	(0.94)						(0.94)
	7	8	5	4	11						24
7	-2.13	-0.68	8.73	3.89	1.38	-0.58	8.94				1.17
	(-0.5)	(-0.11)	(2.09)	(0.81)	(0.26)	(-0.19)	(1.24)				(0.63)
	7	4	4	3	4	5	8				27
10	-4.11	2.81	-0.68	8.73	7.48	-2.83	5.36	5.95	-4.93	8.94	1.17
	(-0.7)	(1.56)	(-0.11)	(2.09)	(1.34)	(-0.85)	(0.54)	(1.83)	(-3.17)	(1.24)	(0.63)
	5	2	4	4	2	3	2	2	3	8	27
1960-2015											
All	2.35										
	(1.51)										
	56										
2	0.62	7.56									0.62
	(0.36)	(2.33)									(0.36)
	42	14									42
3	0.90	-0.68	10.78								0.52
	(0.44)	(-0.34)	(2.89)								(0.32)
	35	11	10								46
5	0.35	1.81	-0.54	7.81	11.52						0.83
	(0.15)	(0.5)	(-0.22)	(1.13)	(2.56)						(0.52)
	26	11	9	2	8						48
7	1.66	-1.63	2.38	-0.58	-0.22	5.67	13.66				0.74
	(0.85)	(-0.32)	(0.61)	(-0.22)	(-0.06)	(0.62)	(2.99)				(0.48)
	21	11	5	5	5	2	7				49
10	3.95	-4.56	1.32	2.38	-0.58	-0.50	0.88	14.74	8.24	14.80	1.40
	(1.67)	(-1.11)	(0.22)	(0.61)	(-0.22)	(-0.1)	.	.	(1.01)	(3.23)	(0.89)
	15	11	6	5	5	4	1	1	4	4	52

Table 15: **Returns on the SMB portfolio in years with similar TMS states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1926-2015 and subsamples 1926-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the TMS backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio at each (TMS) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926-2015											
All	2.60										
	(2.02)										
	90										
2	1.59	3.70									1.59
	(0.99)	(1.81)									(0.99)
	47	43									47
3	-0.68	4.44	5.37								1.14
	(-0.44)	(1.61)	(2.12)								(0.8)
	38	21	31								59
5	-1.33	4.95	2.88	0.20	7.19						1.02
	(-0.68)	(2.14)	(0.59)	(0.06)	(2.58)						(0.73)
	28	15	10	14	23						67
7	-0.55	-1.66	6.88	0.57	5.57	0.45	6.94				1.44
	(-0.25)	(-0.56)	(2.64)	(0.09)	(1.61)	(0.09)	(2.27)				(1.04)
	23	11	10	7	10	10	19				71
10	-0.84	-2.22	0.26	9.05	9.47	-1.52	2.38	-1.99	7.36	7.08	1.77
	(-0.31)	(-0.79)	(0.08)	(3.34)	(1.09)	(-0.27)	(0.66)	(-0.34)	(1.97)	(1.77)	(1.34)
	18	10	7	8	4	6	7	7	9	14	76
1926-1960											
All	2.95										
	(1.34)										
	35										
2	0.81	7.60									0.81
	(0.38)	(1.48)									(0.38)
	24	11									24
3	-2.46	6.15	12.26								0.62
	(-1.16)	(1.99)	(1.67)								(0.33)
	18	10	7								28
5	-4.97	8.32	0.53	2.50	17.12						1.12
	(-2.2)	(2.99)	(1.1)	(0.63)	(1.38)						(0.62)
	13	10	2	6	4						31
7	-3.95	-0.75	9.64	.	2.60	2.97	20.55				1.30
	(-1.56)	(-0.17)	(3.14)	.	(0.58)	(0.75)	(1.22)				(0.74)
	11	6	7	0	5	3	3				32
10	-3.93	-7.31	4.19	11.07	1.01	0.05	-0.77	5.78	2.10	32.15	1.18
	(-1.28)	(-2.64)	(0.87)	(3.46)	.	.	(-0.13)	(0.98)	(0.44)	(1.52)	(0.69)
	9	4	4	6	1	1	3	3	2	2	33
1960-2015											
All	2.35										
	(1.51)										
	56										
2	2.35	2.36									2.35
	(1)	(1.11)									(1)
	24	32									24
3	0.92	2.73	3.36								1.60
	(0.41)	(0.66)	(1.39)								(0.78)
	20	12	24								32
5	1.83	-1.80	3.19	-1.53	5.10						0.94
	(0.63)	(-0.88)	(0.59)	(-0.29)	(2.35)						(0.46)
	15	5	9	8	19						37
7	2.56	-2.75	0.60	0.57	8.54	-0.64	4.38				1.54
	(0.78)	(-0.66)	(0.32)	(0.09)	(1.57)	(-0.09)	(2.36)				(0.75)
	12	5	4	7	5	7	16				40
10	2.26	1.18	-4.97	2.96	9.47	-1.83	4.75	-7.81	8.87	2.90	2.20
	(0.53)	(0.31)	(-4.93)	(2.49)	(1.09)	(-0.27)	(0.95)	(-0.88)	(1.93)	(1.4)	(1.15)
	9	6	3	2	4	5	4	4	7	12	44

Table 16: **Returns on the SMB portfolio in years with similar DFY states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1926-2015 and subsamples 1926-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the DFY backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio at each (DFY) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926-2015											
All	2.60										
	(2.02)										
	90										
2	0.66	4.30									0.74
	(0.42)	(2.2)									(0.46)
	44	47									43
3	1.10	1.30	6.41								1.21
	(0.56)	(0.78)	(1.96)								(0.96)
	29	37	24								66
5	1.94	-0.88	1.78	1.72	8.14						1.21
	(0.85)	(-0.31)	(0.73)	(0.49)	(2.46)						(0.9)
	18	16	22	16	18						72
7	1.95	0.79	-2.41	1.24	4.90	-0.47	9.82				1.38
	(0.71)	(0.22)	(-1.01)	(0.38)	(1.93)	(-0.11)	(2.18)				(1.1)
	15	11	10	15	16	10	13				77
10	1.13	3.22	0.37	-2.13	0.82	2.17	2.03	1.21	2.86	16.43	1.43
	(0.3)	(2.63)	(0.07)	(-0.78)	(0.23)	(0.68)	(0.83)	(0.14)	(1.54)	(2.29)	(1.21)
	11	7	8	8	10	13	10	6	11	7	83
1926-1960											
All	2.95										
	(1.34)										
	35										
2	-0.04	10.15									0.06
	(-0.02)	(1.94)									(0.03)
	26	10									25
3	0.72	1.59	17.80								1.03
	(0.32)	(0.52)	(1.48)								(0.57)
	20	11	4								31
5	0.29	1.76	0.39	4.30	17.80						1.03
	(0.13)	(0.34)	(0.09)	(0.73)	(1.48)						(0.57)
	15	7	6	3	4						31
7	-0.06	1.77	2.55	-7.04	6.59	6.84	21.45				1.21
	(-0.02)	(0.32)	(0.64)	(-1.12)	(1.81)	.	(1.32)				(0.69)
	13	6	4	3	5	1	3				32
10	-1.22	3.32	1.36	2.28	-4.44	5.81	4.30	.	3.45	32.15	1.18
	(-0.39)	(2.08)	(0.16)	(0.41)	(-0.86)	(1.27)	(0.73)	.	(1.01)	(1.52)	(0.69)
	10	5	4	3	4	3	3	0	2	2	33
1960-2015											
All	2.35										
	(1.51)										
	56										
2	1.64	2.72									1.64
	(0.66)	(1.36)									(0.66)
	19	37									19
3	1.94	1.18	4.13								1.37
	(0.47)	(0.61)	(1.35)								(0.78)
	9	27	20								36
5	10.18	-2.94	2.22	1.13	5.38						1.35
	(1.38)	(-0.93)	(0.8)	(0.27)	(2.17)						(0.71)
	3	9	17	13	14						42
7	14.99	-0.39	-5.71	3.14	4.14	-1.28	6.33				1.49
	(1.55)	(-0.08)	(-2.46)	(0.93)	(1.22)	(-0.28)	(1.84)				(0.86)
	2	5	6	13	11	9	10				46
10	24.65	2.95	-0.63	-4.78	3.86	1.08	1.05	1.21	2.73	10.15	1.59
	.	(1.24)	(-0.09)	(-1.84)	(0.97)	(0.27)	(0.39)	(0.14)	(1.23)	(1.87)	(0.99)
	1	2	4	5	7	10	7	6	9	5	51

Table 17: **Returns on the SMB portfolio in years with similar TBL states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1926-2015 and subsamples 1926-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the TBL backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). Column "Ex bottom" displays the results for all the years except the ones in the lowest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio in each (TBL) state											
	Bottom	2	3	4	5	6	7	8	9	Top	Ex bottom
1926-2015											
All	2.60										
	(2.02)										
	90										
2	6.29	1.30									1.02
	(2.72)	(0.86)									(0.67)
	27	64									63
3	6.63	1.73	1.53								1.59
	(2.08)	(0.84)	(0.86)								(1.15)
	18	22	50								72
5	7.22	6.05	-2.44	3.02	1.37						1.75
	(1.85)	(2.36)	(-0.79)	(1.13)	(0.68)						(1.31)
	14	9	10	15	42						76
7	7.13	4.00	7.80	-1.87	4.54	-4.57	1.97				1.83
	(1.69)	(0.84)	(3.24)	(-0.52)	(1.8)	(-0.83)	(1.01)				(1.39)
	13	4	6	8	14	9	36				77
10	7.43	5.98	2.55	7.80	3.54	-2.79	5.32	-1.60	-3.34	2.84	1.86
	(1.62)	(2.51)	(0.4)	(3.24)	(0.58)	(-0.67)	(1.91)	(-0.28)	(-0.68)	(1.34)	(1.43)
	12	2	3	6	4	7	10	5	10	32	78
1926-1960											
All	2.95										
	(1.34)										
	35										
2	9.41	0.36									0.36
	(1.71)	(0.18)									(0.18)
	10	25									25
3	12.77	3.60	-0.98								0.49
	(1.75)	(1.07)	(-0.44)								(0.26)
	7	9	19								28
5	23.71	5.22	-2.88	4.96	-3.09						1.00
	(1.6)	(1.46)	(-0.53)	(1.34)	(-1.47)						(0.57)
	3	6	2	10	14						32
7	23.71	2.55	7.89	-8.34	7.59	-6.48	-3.07				1.00
	(1.6)	(0.4)	(1.98)	.	(2.34)	(-1.72)	(-1.36)				(0.57)
	3	3	3	1	9	3	13				32
10	23.71	.	2.55	7.89	-8.34	2.58	6.88	0.47	-0.91	-3.68	1.00
	(1.6)	.	(0.4)	(1.98)	.	.	(1.78)	(0.05)	(-0.72)	(-1.39)	(0.57)
	3	0	3	3	1	1	7	3	3	11	32
1960-2015											
All	2.35										
	(1.51)										
	56										
2	4.45	1.88									1.44
	(2.51)	(0.9)									(0.69)
	17	40									39
3	2.72	0.43	3.01								2.26
	(1.38)	(0.16)	(1.23)								(1.2)
	11	13	32								45
5	2.72	7.71	-2.32	-0.87	3.51						2.26
	(1.38)	(2.13)	(-0.62)	(-0.31)	(1.32)						(1.2)
	11	3	8	5	29						45
7	2.16	8.37	7.71	-0.94	-0.96	-3.61	4.66				2.40
	(1.04)	.	(2.13)	(-0.23)	(-0.33)	(-0.43)	(1.85)				(1.29)
	10	1	3	7	5	6	24				46
10	2.00	5.98	.	7.71	7.51	-3.69	1.69	-4.71	-3.70	6.25	2.42
	(0.86)	(2.51)	.	(2.13)	(1.15)	(-0.77)	(1.25)	(-0.69)	(-0.6)	(2.35)	(1.34)
	9	2	0	3	3	6	3	2	8	21	47

Table 18: **Returns on the SMB portfolio in years with similar EQIS states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1926(30)-2015 and subsamples 1926(30)-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the $EQIS$ backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). Column "Ex bottom" displays the results for all the years except the ones in the lowest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio in each (EQIS) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex bottom
1926(30)-2015											
All	3.17										
	(2.45)										
	86										
2	4.21	2.09									1.92
	(2.42)	(1.13)									(0.99)
	47	41									39
3	4.52	4.65	0.28								2.30
	(2.07)	(2.13)	(0.12)								(1.44)
	34	24	28								52
5	5.56	2.80	9.14	0.83	-0.80						2.50
	(1.6)	(1.28)	(3.05)	(0.39)	(-0.26)						(1.86)
	19	21	12	16	18						67
7	4.91	4.65	0.22	10.86	2.69	0.21	-2.14				2.81
	(1.25)	(1.68)	(0.06)	(4.03)	(0.81)	(0.11)	(-0.47)				(2.09)
	15	17	9	11	8	14	12				71
10	5.64	5.44	3.63	1.46	4.80	12.39	0.06	1.43	-1.23	-0.37	2.81
	(1.08)	(1.22)	(1.32)	(0.39)	(1.69)	(3.08)	(0.03)	(0.41)	(-0.44)	(-0.06)	(2.19)
	11	8	13	8	7	7	7	9	9	9	75
1926(30)-1960											
All	4.59										
	(2.05)										
	31										
2	12.07	1.39									1.02
	(2.48)	(0.75)									(0.51)
	10	23									21
3	16.75	3.96	0.14								1.67
	(2.17)	(1.48)	(0.06)								(0.97)
	6	10	15								25
5	19.22	11.81	8.83	-1.04	1.00						2.42
	(1.61)	(9.53)	(2.27)	(-0.59)	(0.31)						(1.45)
	4	2	5	11	9						27
7	20.55	12.96	.	8.83	-0.91	0.60	-0.78				2.88
	(1.22)	(9.58)	.	(2.27)	(-0.39)	(0.27)	(-0.15)				(1.72)
	3	3	0	5	5	10	5				28
10	20.55	15.26	11.81	.	5.04	11.51	-0.91	-1.15	1.26	0.47	2.88
	(1.22)	.	(9.53)	.	(4.51)	(1.83)	(-0.39)	(-0.41)	(0.43)	(0.05)	(1.72)
	3	1	2	0	4	3	5	6	6	3	28
1960-2015											
All	2.35										
	(1.51)										
	56										
2	2.09	2.87									2.87
	(1.27)	(0.85)									(0.85)
	37	19									19
3	1.89	5.14	0.49								2.82
	(1.05)	(1.56)	(0.12)								(1.09)
	28	14	14								28
5	1.91	1.85	9.37	4.28	-2.59						2.52
	(0.73)	(0.8)	(2.04)	(0.93)	(-0.48)						(1.31)
	15	19	7	6	9						41
7	1.01	2.87	0.22	12.55	8.69	-0.40	-3.11				2.72
	(0.47)	(0.9)	(0.06)	(3.2)	(1.17)	(-0.12)	(-0.44)				(1.43)
	12	14	9	6	3	5	7				44
10	0.05	4.04	2.14	1.46	4.47	13.05	2.48	5.18	-6.20	-0.79	2.74
	(0.02)	(0.82)	(0.7)	(0.39)	(0.61)	(2.16)	(0.35)	(0.78)	(-1.11)	(-0.1)	(1.55)
	8	7	11	8	3	4	2	4	3	6	48

Table 19: **Returns on the SMB portfolio in years with similar DY states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1926-2015 and subsamples 1926-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the DY backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio at each (DY) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926-2015											
All	2.60										
	(2.02)										
	90										
2	2.80	2.07									2.80
	(1.75)	(1)									(1.75)
	65	25									65
3	2.52	1.65	3.74								2.31
	(1.47)	(0.52)	(1.55)								(1.55)
	55	17	18								72
5	1.50	6.76	4.29	-0.21	4.40						2.29
	(0.99)	(1.12)	(1.15)	(-0.06)	(1.67)						(1.6)
	48	12	6	11	13						77
7	1.82	5.34	3.82	4.29	1.62	1.38	3.90				2.47
	(1.11)	(0.74)	(0.62)	(1.15)	(0.31)	(0.48)	(1.09)				(1.8)
	44	8	8	6	7	9	8				82
10	1.76	0.73	7.31	6.37	5.81	-3.29	1.62	-3.42	4.80	4.07	2.47
	(0.89)	(0.48)	(0.6)	(0.97)	(1.39)	.	(0.31)	(-1.43)	(1.36)	(0.99)	(1.83)
	36	12	5	7	5	1	7	4	6	7	83
1926-1960											
All	2.95										
	(1.34)										
	35										
2	5.81	0.24									5.81
	(1.52)	(0.11)									(1.52)
	17	18									17
3	6.14	-0.03	2.29								3.33
	(1.28)	(-0.01)	(0.98)								(1.03)
	12	10	13								22
5	1.02	9.85	7.07	-4.56	3.95						2.54
	(0.71)	(0.93)	(1.38)	(-1.33)	(1.45)						(0.88)
	8	6	4	7	10						25
7	1.40	16.01	-1.29	7.07	-5.54	-1.50	5.53				2.30
	(0.75)	(1.26)	(-0.14)	(1.38)	(-0.94)	(-0.72)	(1.51)				(0.88)
	6	4	4	4	4	6	7				28
10	2.67	-1.73	16.76	2.95	10.52	-3.29	-5.54	-3.25	0.86	6.01	2.31
	(1.62)	(-0.87)	(0.85)	(0.26)	(1.97)	.	(-0.94)	(-0.96)	(0.43)	(1.4)	(0.92)
	5	3	3	3	3	1	4	3	4	6	29
1960-2015											
All	2.35										
	(1.51)										
	56										
2	1.72	6.77									1.72
	(1.04)	(1.48)									(1.04)
	49	7									49
3	1.50	4.04	7.52								1.85
	(0.89)	(0.79)	(1.18)								(1.15)
	44	7	5								51
5	1.58	3.67	-1.26	7.40	5.93						2.15
	(0.9)	(0.55)	(-0.59)	(1.19)	(0.71)						(1.35)
	41	6	2	4	3						53
7	1.86	-5.32	8.94	-1.26	11.17	7.14	-7.56				2.53
	(1.01)	(-2.57)	(0.99)	(-0.59)	(1.6)	(0.97)	.				(1.61)
	39	4	4	2	3	3	1				55
10	1.59	1.55	-6.86	8.94	-1.26	.	11.17	-3.93	12.67	-7.56	2.53
	(0.72)	(0.83)	(-2.03)	(0.99)	(-0.59)	.	(1.6)	.	(1.5)	.	(1.61)
	32	9	2	4	2	0	3	1	2	1	55

Table 20: **Returns on the SMB portfolio in years with similar IK states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1947(9)-2015 and subsamples 1947(9)-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the IK backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio at each (IK) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1947-2015											
All	1.96										
	(1.48)										
	67										
2	1.48	2.33									1.51
	(1.08)	(1.11)									(1.03)
	32	37									30
3	0.49	5.09	1.64								2.17
	(0.35)	(1.77)	(0.62)								(1.56)
	26	15	26								41
5	1.83	-1.28	6.97	0.66	2.85						1.64
	(1.34)	(-0.54)	(1.71)	(0.18)	(0.94)						(1.13)
	14	13	9	13	18						49
7	2.13	0.48	0.99	1.89	1.34	0.68	4.83				1.21
	(1.44)	(0.2)	(0.19)	(0.77)	(0.23)	(0.22)	(1.4)				(0.86)
	12	11	6	4	9	11	14				53
10	2.31	0.97	-0.50	-3.89	7.69	4.42	3.47	-1.09	0.91	4.08	1.55
	(1.17)	(0.59)	(-0.18)	(-0.89)	(1.81)	(0.82)	(0.76)	(-0.2)	(0.16)	(1.14)	(1.08)
	9	5	10	3	5	6	5	8	7	11	56
1947-1960											
All	0.07										
	(0.05)										
	12										
2	2.10	-1.19									2.59
	(1.26)	(-0.78)									(1.03)
	6	8									4
3	2.59	1.08	-2.56								1.94
	(1.03)	(1.19)	(-1.13)								(1.37)
	4	3	5								7
5	2.59	.	1.08	3.34	-4.03						2.12
	(1.03)	.	(1.19)	.	(-1.83)						(1.71)
	4	0	3	1	4						8
7	5.15	0.03	.	1.12	1.01	3.34	-4.03				2.12
	(2.75)	(0.01)	.	(0.71)	.	.	(-1.83)				(1.71)
	2	2	0	2	1	1	4				8
10	5.15	0.03	.	.	1.12	1.08	.	3.34	.	-4.03	2.12
	(2.75)	(0.01)	.	.	(0.71)	(1.19)	.	.	.	(-1.83)	(1.71)
	2	2	0	0	2	3	0	1	0	4	8
1960-2015											
All	2.35										
	(1.51)										
	56										
2	1.34	3.23									1.34
	(0.81)	(1.27)									(0.81)
	26	30									26
3	0.11	5.70	2.63								2.19
	(0.07)	(1.73)	(0.82)								(1.35)
	22	13	21								35
5	1.53	-1.28	8.65	0.44	4.81						1.53
	(0.9)	(-0.54)	(1.68)	(0.11)	(1.3)						(0.91)
	10	13	7	12	14						42
7	1.53	0.58	0.99	2.66	1.34	0.42	8.38				1.04
	(0.9)	(0.2)	(0.19)	(0.47)	(0.23)	(0.12)	(1.95)				(0.65)
	10	9	6	2	9	10	10				46
10	1.50	1.60	-0.50	-3.89	12.08	6.07	3.47	-1.72	0.91	8.71	1.45
	(0.61)	(1.32)	(-0.18)	(-0.89)	(2.03)	(0.73)	(0.76)	(-0.27)	(0.16)	(1.85)	(0.89)
	7	3	10	3	3	4	5	7	7	7	49

Table 21: **Returns on the SMB portfolio in years with similar SMB^* states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the SMB portfolio; and the **number of years** at each state in 1926(9)-2015 and subsamples 1926(9)-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the SMB^* backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the SMB portfolio in each (SMB^*) state											
	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926(9)-2015											
All	2.91										
	(2.23)										
	87										
2	3.89	2.14									4.31
	(1.82)	(1.33)									(1.92)
	33	56									31
3	3.74	2.03	2.83								3.01
	(1.47)	(0.78)	(1.49)								(1.66)
	24	18	45								42
5	1.98	8.74	1.83	2.61	2.74						3.02
	(0.66)	(2.38)	(0.54)	(1.13)	(1.13)						(1.99)
	18	7	12	17	33						54
7	1.28	5.48	11.35	-0.83	-1.38	2.48	3.90				2.56
	(0.34)	(1.38)	(2.93)	(-0.3)	(-0.44)	(1.24)	(1.18)				(1.92)
	14	7	7	8	9	19	23				64
10	0.67	3.28	6.89	10.13	3.94	-2.49	0.83	3.85	-0.91	5.78	2.17
	(0.12)	(1.23)	(0.77)	(4.18)	(0.84)	(-0.93)	(0.23)	(1.25)	(-0.47)	(1.43)	(1.71)
	9	9	3	4	8	6	7	10	15	18	69
1926(9)-1960											
All	3.84										
	(1.67)										
	32										
2	0.60	5.70									1.11
	(0.26)	(1.68)									(0.42)
	15	19									13
3	-0.19	1.24	8.40								0.71
	(-0.05)	(0.44)	(1.86)								(0.33)
	7	12	13								19
5	0.33	1.87	-0.49	6.65	8.27						2.10
	(0.08)	(0.36)	(-0.15)	(1.57)	(1.32)						(1.02)
	6	2	8	7	9						23
7	-1.49	1.55	5.91	-2.44	3.88	7.23	11.90				2.68
	(-0.23)	(0.63)	(1.03)	(-0.74)	(0.73)	(2.41)	(0.81)				(1.53)
	4	3	3	6	4	8	4				28
10	-9.23	5.11	-3.29	7.03	0.47	-4.21	3.88	10.34	2.13	20.55	2.11
	(-0.9)	(2.68)	.	.	(0.13)	(-2.12)	(0.73)	(1.37)	(0.56)	(1.22)	(1.18)
	2	4	1	1	7	3	4	3	6	3	29
1960-2015											
All	2.35										
	(1.51)										
	56										
2	6.33	0.31									6.33
	(2.01)	(0.19)									(2.01)
	19	37									19
3	5.12	3.60	0.57								4.74
	(1.67)	(0.62)	(0.31)								(1.78)
	18	6	32								24
5	2.67	11.49	6.49	-0.22	0.66						3.62
	(0.71)	(2.64)	(0.79)	(-0.09)	(0.29)						(1.72)
	13	5	4	10	24						32
7	2.27	8.42	15.43	4.03	-5.59	-0.98	2.22				2.42
	(0.53)	(1.25)	(3.22)	(0.93)	(-1.95)	(-0.44)	(0.8)				(1.27)
	11	4	4	2	5	11	19				37
10	3.19	1.83	11.98	11.17	28.24	-0.76	-3.23	1.07	-2.94	2.83	2.18
	(0.57)	(0.39)	(0.95)	(3.6)	.	(-0.14)	(-0.72)	(0.38)	(-1.51)	(0.82)	(1.25)
	8	5	2	3	1	3	3	7	9	15	41

A.2. *The size premium controlling for the CAPM betas*

This section replicates the results from the previous section, but changing the portfolio proxy for the size premium. I use a double sort by size and CAPM betas to obtain a portfolio with a positive weight on small stocks, a negative weight on big stocks, and close to no exposure to market risk, as described in Eq. (18).

Table 22: **The excess returns on small stocks for 25 portfolios double sorted by size and CAPM betas in years with similar VBM states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the VBM backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the Size portfolios double sorted by size and betas in each (VBM) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.13										
	(2.18)										
	52										
2	1.64	6.00									1.97
	(0.99)	(2.21)									(1.17)
	38	15									37
3	3.09	-2.52	9.91								1.31
	(1.44)	(-1.95)	(3.58)								(0.84)
	28	13	11								41
5	2.22	3.71	-3.20	5.00	12.49						1.91
	(0.88)	(1.18)	(-1.78)	(1.18)	(3.86)						(1.29)
	19	12	9	6	6						46
7	2.80	3.53	0.05	-5.05	0.31	13.63	4.87				3.06
	(1.02)	(0.99)	(0.16)	(-2.14)	(0.2)	(3.74)	(2.27)				(2.05)
	17	11	5	6	4	7	2				50
10	2.76	1.30	4.92	0.08	-3.47	-4.97	-0.72	7.86	13.58	7.02	3.05
	(0.72)	(0.56)	(1.18)	(0.29)	(-1.58)	(-1.44)	(-0.21)	(1.33)	(3.64)	.	(2.09)
	12	7	9	3	7	3	2	4	5	1	51

Table 23: **The excess returns on small stocks for 25 portfolios double sorted by size and CAPM betas in years with similar DJBM states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the DJBM backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the Size portfolios double sorted by size and betas in each (DJBM) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.13										
	(2.18)										
	52										
2	1.61	7.27									1.61
	(0.97)	(2.72)									(0.97)
	38	14									38
3	1.23	1.68	10.67								1.33
	(0.75)	(0.43)	(3.62)								(0.88)
	32	10	10								42
5	0.94	5.20	-3.75	15.78	9.15						1.87
	(0.49)	(1.33)	(-1.76)	(1.82)	(3.25)						(1.18)
	26	9	6	2	9						43
7	0.69	2.73	6.96	-4.89	1.51	10.36	10.81				1.94
	(0.32)	(1.19)	(1.05)	(-1.65)	(0.27)	(1.41)	(3.28)				(1.28)
	23	8	5	4	2	3	7				45
10	0.36	2.89	2.65	8.39	-3.45	-4.04	7.13	24.43	8.71	10.02	2.71
	(0.15)	(1.49)	(0.87)	(1)	(-0.78)	(-2.27)	.	.	(2.26)	(2.22)	(1.82)
	20	6	5	4	3	3	1	1	6	3	49

Table 24: **The excess returns on small stocks for 25 portfolios double sorted by size and CAPM betas in years with similar EP states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the EP backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the Size portfolios double sorted by size and betas in each (EP) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.13										
	(2.18)										
	52										
2	2.06	6.04									2.06
	(1.27)	(2.01)									(1.27)
	38	14									38
3	2.44	-1.45	10.30								1.42
	(1.25)	(-0.92)	(3.3)								(0.94)
	31	11	10								42
5	2.11	2.09	-1.07	15.73	8.94						2.07
	(1.05)	(0.49)	(-0.57)	(1.81)	(2.62)						(1.34)
	23	10	9	2	8						44
7	2.91	1.41	0.60	1.75	-2.28	10.16	10.81				1.94
	(1.31)	(0.32)	(0.15)	(1.29)	(-0.66)	(0.71)	(3.28)				(1.28)
	18	10	5	5	5	2	7				45
10	4.49	-1.61	3.59	0.60	1.75	-4.60	7.02	24.43	7.02	10.87	2.49
	(1.71)	(-0.58)	(0.45)	(0.15)	(1.29)	(-1.41)	.!	.	(1.1)	(3.29)	(1.66)
	14	9	5	5	5	4	1	1	4	4	48

Table 25: **The excess returns on small stocks for 25 portfolios double sorted by size and CAPM betas in years with similar DFY states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the DFY backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the Size portfolios double sorted by size and betas in each (DFY) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.13										
	(2.18)										
	52										
2	2.27	3.51									2.27
	(0.94)	(1.96)									(0.94)
	16	36									16
3	1.15	2.30	4.98								1.98
	(0.33)	(0.99)	(2.31)								(1.04)
	9	23	20								32
5	6.81	-1.75	4.13	2.02	5.43						2.28
	(1.33)	(-0.57)	(1.17)	(0.69)	(2.48)						(1.28)
	3	9	14	12	14						38
7	10.53	-0.84	-2.43	5.63	2.21	-0.01	7.42				2.11
	(1.72)	(-0.16)	(-0.97)	(1.28)	(0.72)	(-0.01)	(2.6)				(1.3)
	2	5	5	11	10	9	10				42
10	16.65	1.88	-0.89	-2.43	7.91	2.62	0.12	3.91	3.54	8.85	2.52
	.	(0.75)	(-0.13)	(-0.97)	(1.79)	(0.56)	(0.05)	(0.72)	(1.23)	(2.87)	(1.64)
	1	2	4	5	4	10	6	6	9	5	47

Table 26: **The excess returns on small stocks for 25 portfolios double sorted by size and CAPM betas in years with similar TMS states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the TMS backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the Size portfolios double sorted by size and betas in each (TMS) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.13										
	(2.18)										
	52										
2	2.58	3.50									2.58
	(0.99)	(2.09)									(0.99)
	21	31									21
3	0.88	4.32	4.47								1.99
	(0.38)	(0.91)	(2.43)								(0.92)
	19	9	24								28
5	1.22	-0.40	4.39	4.52	4.41						2.40
	(0.42)	(-0.15)	(0.72)	(1.28)	(2.19)						(1.22)
	15	4	7	7	19						33
7	3.71	-7.06	3.72	2.08	11.90	2.95	4.09				2.71
	(1.21)	(-2.35)	(4.87)	(0.31)	(2.39)	(0.69)	(2.23)				(1.41)
	12	5	2	6	4	7	16				36
10	2.86	-1.24	-4.53	3.72	18.75	-1.35	9.77	0.58	8.16	2.22	3.40
	(0.84)	(-0.23)	(-1.8)	(4.87)	(1.28)	(-0.26)	(1.53)	(0.17)	(1.69)	(1.61)	(1.86)
	9	6	2	2	2	5	3	4	7	12	40

Table 27: **The excess returns on small stocks for 25 portfolios double sorted by size and CAPM betas in years with similar TBL states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the TBL backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). Column "Ex bottom" displays the results for all the years except the ones in the lowest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the Size portfolios double sorted by size and betas in each (TBL) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex bottom
1963-2015											
All	3.13										
	(2.18)										
	52										
2	3.72	2.90									2.87
	(2.4)	(1.51)									(1.46)
	16	37									36
3	2.64	-0.65	4.99								3.25
	(1.81)	(-0.25)	(2.27)								(1.85)
	10	13	29								42
5	2.64	9.99	-5.28	2.99	5.14						3.25
	(1.81)	(1.79)	(-2.1)	(0.58)	(2.25)						(1.85)
	10	3	8	5	26						42
7	1.90	9.34	9.99	-4.54	2.95	-0.64	6.06				3.39
	(1.35)	.	(1.79)	(-1.64)	(0.57)	(-0.12)	(2.47)				(1.97)
	9	1	3	7	5	6	21				43
10	2.03	5.09	.	9.99	1.03	-6.87	8.41	-5.16	-1.12	7.02	3.33
	(1.28)	(1.2)	.	(1.79)	(0.37)	(-2.33)	(1.3)	(-0.99)	(-0.2)	(2.96)	(1.99)
	8	2	0	3	3	6	3	2	6	20	44

Table 28: **The excess returns on small stocks for 25 portfolios double sorted by size and CAPM betas in years with similar EQIS states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the EQIS backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). Column "Ex bottom" displays the results for all the years except the ones in the lowest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the Size portfolios double sorted by size and betas in each (EQIS) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex bottom
1963-2015											
All	3.13										
	(2.18)										
	52										
2	2.83	3.81									3.81
	(1.56)	(1.63)									(1.63)
	36	16									16
3	1.93	6.74	1.91								4.42
	(0.91)	(2.33)	(0.79)								(2.3)
	27	13	12								25
5	2.49	1.95	9.71	5.84	0.60						3.37
	(0.74)	(0.92)	(2.26)	(1.54)	(0.21)						(2.16)
	14	19	7	3	9						38
7	0.50	3.67	1.60	11.96	8.03	-1.19	1.49				3.92
	(0.18)	(1)	(0.64)	(2.76)	(1.5)	(-0.73)	(0.4)				(2.34)
	12	13	9	6	2	3	7				40
10	-1.63	7.98	1.71	2.27	9.99	9.50	2.67	7.43	-5.76	3.78	3.99
	(-0.55)	(1.24)	(0.54)	(0.83)	(1.23)	(1.69)	.	(1.25)	(-1.71)	(1.08)	(2.52)
	8	6	11	8	3	4	1	2	3	6	44

Table 29: **The excess returns on small stocks for 25 portfolios double sorted by size and CAPM betas in years with similar SMB^* states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the SMB^* backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t + 1$.

Returns on the Size portfolios double sorted by size and betas in each (SMB^*) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.13										
	(2.18)										
	52										
2	6.75	1.37									6.75
	(2.3)	(0.89)									(2.3)
	17	35									17
3	5.09	9.24	1.13								6.08
	(1.98)	(1.45)	(0.67)								(2.5)
	16	5	31								21
5	4.01	7.47	15.19	2.34	0.62						5.29
	(1.16)	(2.2)	(1.64)	(0.75)	(0.32)						(2.57)
	11	5	3	9	24						28
7	3.14	10.09	13.28	6.10	0.40	-0.43	2.07				3.74
	(0.85)	(2.14)	(1.82)	(1.88)	(0.17)	(-0.14)	(0.95)				(1.96)
	10	3	4	2	3	11	19				33
10	6.73	-0.76	8.80	6.58	33.38	6.10	0.40	3.30	-3.30	2.96	3.20
	(1.64)	(-0.12)	(1.12)	(1.59)	.	(1.88)	(0.17)	(0.71)	(-1.46)	(1.14)	(1.83)
	7	4	2	3	1	2	3	6	9	15	37

Table 30: **The excess returns on small stocks for 25 portfolios double sorted by size and CAPM betas in years with similar IK states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the IK backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t + 1$.

Returns on the Size portfolios double sorted by size and betas in each (IK) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.13										
	(2.18)										
	52										
2	2.04	4.07									2.04
	(1.2)	(1.8)									(1.2)
	24	28									24
3	1.07	4.57	4.33								2.38
	(0.6)	(1.53)	(1.55)								(1.51)
	20	12	20								32
5	1.78	-0.09	7.32	2.04	5.68						2.19
	(2.29)	(-0.03)	(1.36)	(0.76)	(1.61)						(1.48)
	10	11	6	11	14						38
7	1.78	3.76	-0.76	2.08	3.17	1.16	8.32				1.89
	(2.29)	(0.89)	(-0.16)	(0.29)	(0.79)	(0.35)	(1.87)				(1.36)
	10	7	6	2	8	9	10				42
10	2.14	0.96	1.63	-4.69	10.70	3.95	3.08	1.18	4.09	7.27	2.49
	(2.37)	(0.57)	(0.39)	(-1.45)	(2.65)	(0.37)	(1.04)	(0.26)	(0.75)	(1.51)	(1.67)
	7	3	8	3	3	3	5	6	7	7	45

Table 31: **The excess returns on small stocks for 25 portfolios double sorted by size and CAPM betas in years with similar DY states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean to its standard error) of the difference between the returns on the 10 portfolios of small stocks and the 10 portfolios of big stocks among a total of 25 double sorted portfolios by size and CAPM betas; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the DY backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, given in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the Size portfolios double sorted by size and betas in each (DY) state											
	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.13										
	(2.18)										
	52										
2	2.52	7.06									2.52
	(1.57)	(2.77)									(1.57)
	45	7									45
3	2.41	3.91	7.83								2.63
	(1.45)	(0.9)	(2.3)								(1.71)
	40	7	5								47
5	2.49	3.06	1.45	8.16	5.60						2.98
	(1.54)	(0.43)	(0.26)	(2.18)	(1.42)						(1.97)
	37	6	2	4	3						49
7	2.66	-5.33	9.65	1.45	9.52	6.73	0.68				3.18
	(1.56)	(-1.72)	(1.07)	(0.26)	(1.93)	(2.01)	.				(2.17)
	35	4	4	2	3	3	1				51
10	3.12	0.53	-10.14	9.65	1.45	.	9.52	4.09	8.06	0.68	3.18
	(1.47)	(0.91)	(-3.28)	(1.07)	(0.26)	.	(1.93)	.	(1.51)	.	(2.17)
	28	9	2	4	2	0	3	1	2	1	51

Appendix B. The (negative) covariance between the returns on the SMB portfolio and the innovations on the state variables

Here is how to obtain the covariance between the returns on the SMB portfolio, R_{t+1}^{SMB}, and the innovations in the state variable, $\Delta z_{t+1} = z_{t+1} - z_t$, if the state variable z_t is mean reverting considering that the size premium only appears above a certain threshold of that state variable. A symmetric (opposite) derivation holds in case the premium only appears below a certain threshold, for state variables that forecast negative market conditions.

First, remembering the assumptions in Eq. (1):

$$\begin{aligned} E[R_{t+1}^{SMB}|z_t \geq z^*] &= \mu_{SMB,z} > 0, \\ E[R_{t+1}^{SMB}|z_t < z^*] &= 0, \\ P(z_t \geq z^*) &= p. \end{aligned} \tag{24}$$

with the addition of Eq. (24) that simply assigns probability p to the state variable z_t being above z^*.

So, now we can write:

$$
\begin{aligned}
&Cov\left(R_{t+1}^{SMB},\Delta z_{t+1}\right)=\\
&=E\left[R_{t+1}^{SMB}\Delta z_{t+1}\right]-E\left[R_{t+1}^{SMB}\right]E_t\left[\Delta z_{t+1}\right]\\
&=E\left[R_{t+1}^{SMB}\Delta z_{t+1}\right]-\left\{pE\left[R_{t+1}^{SMB}|z_t\geq z^*\right]+(1-p)\,E\left[R_{t+1}^{SMB}|z_t<z^*\right]\right\}E\left[\Delta z_{t+1}\right]\\
&=E\left[R_{t+1}^{SMB}\Delta z_{t+1}\right]-p\mu_{SMB,z}E\left[\Delta z_{t+1}\right]\\
&=pE\left[R_{t+1}^{SMB}\Delta z_{t+1}|z_t\geq z^*\right]+(1-p)\,E\left[R_{t+1}^{SMB}\Delta z_{t+1}|z_t<z^*\right]\\
&-p\mu_{SMB,z}\left\{pE\left[\Delta z_{t+1}|z_t\geq z^*\right]+(1-p)\,E\left[\Delta z_{t+1}|z_t<z^*\right]\right\}\\
&=pE\left[\mu_{SMB,z}\Delta z_{t+1}|z_t\geq z^*\right]+(1-p)\,E\left[0\Delta z_{t+1}|z_t<z^*\right]\\
&-p\mu_{SMB,z}\left\{pE\left[\Delta z_{t+1}|z_t\geq z^*\right]+(1-p)\,E\left[\Delta z_{t+1}|z_t<z^*\right]\right\}\\
&=p\mu_{SMB,z}E\left[\Delta z_{t+1}|z_t\geq z^*\right]-p\mu_{SMB,z}\left\{pE\left[\Delta z_{t+1}|z_t\geq z^*\right]+(1-p)\,E\left[\Delta z_{t+1}|z_t<z^*\right]\right\}\\
&=p\mu_{SMB,z}\,(1-p)\left(E\left[\Delta z_{t+1}|z_t\geq z^*\right]-E\left[\Delta z_{t+1}|z_t<z^*\right]\right)\\
&=p\mu_{SMB,z}\,(1-p)\left\{\left(E\left[z_{t+1}|z_t\geq z^*\right]-E\left[z_t|z_t\geq z^*\right]\right)-\left(E\left[z_{t+1}|z_t<z^*\right]-E\left[z_t|z_t<z^*\right]\right)\right\}.
\end{aligned}
$$

If z_{t+1} is independent from z_t, then

$$E\left[z_{t+1}|z_t<z^*\right]=E\left[z_{t+1}|z_t\geq z^*\right]=E\left[z_t\right],$$

so

$$
\begin{aligned}
Cov\left(R_{t+1}^{SMB},\Delta z_{t+1}\right)&=p\mu_{SMB,z}\,(1-p)\left\{E\left[z_t\right]-E\left[z_t|z_t\geq z^*\right]-E\left[z_t\right]+E\left[z_t|z_t<z^*\right]\right\}\\
&=p\mu_{SMB,z}\,(1-p)\left\{-E\left[z_t|z_t\geq z^*\right]+E\left[z_t|z_t<z^*\right]\right\}<0.
\end{aligned}
$$

If $z_{t+1}=\alpha+\delta z_t+\epsilon_{t+1}$:

$$
\begin{aligned}
Cov\left(R_{t+1}^{SMB}, \Delta z_{t+1}\right) &= p\mu_{SMB,z}\left(1-p\right)\left\{\left(E\left[\alpha+\delta z_t+\epsilon_{t+1}|z_t \geq z^*\right] - E\left[z_t|z_t \geq z^*\right]\right)\right. \\
&\left. - \left(E\left[\alpha+\delta z_t+\epsilon_{t+1}|z_t < z^*\right] - E\left[z_t|z_t < z^*\right]\right)\right\} \\
&= p\mu_{SMB,z}\left(1-p\right)\left\{\left(\alpha+\delta E\left[z_t|z_t \geq z^*\right] - E\left[z_t|z_t \geq z^*\right]\right)\right. \\
&\left. - \left(\alpha+\delta E\left[z_t|z_t < z^*\right] - E\left[z_t|z_t < z^*\right]\right)\right\} \\
&= p\mu_{SMB,z}\left(1-p\right)\left\{\left(\delta-1\right)E\left[z_t|z_t \geq z^*\right] - \left(\delta-1\right)E\left[z_t|z_t < z^*\right]\right\} \\
&= p\mu_{SMB,z}\left(1-p\right)\left\{\left(\delta-1\right)\left(E\left[z_t|z_t \geq z^*\right] - E\left[z_t|z_t < z^*\right]\right)\right\} < 0,
\end{aligned}
$$

considering that $\delta < 1$ (i.e., the process is stationary).

Appendix C. On-line Appendix

C.1. *The size premium conditioned on a forward looking classification*

The backward looking classification variable used in the paper, given by Eq. (17), assumes that the eventual shifts in the state variables are unexpected. This assumption is particularly important for variables that show a time trend in the period that I study such as the MBM, as Fig. 1 shows. This trend could reflect the long term technological changes that result in less use of physical capital by the firms. But it could also reflect long term time varying risk premiums that are important to capture.

Here I include forward looking information in the classification variable by simply splitting each sample in groups of equal sizes based on the state variable. For example, considering a sample with 40 years in two quantiles: One group has the 20 years with the highest MBM, and the other has the 20 years with the smallest MBM. Even if the information about what is a relatively high or low value of the MBM will only be completely available at the end of the sample period. In the case of variables with negative time trends, as the MBM, this means that the years at the beginning of the sample will usually belong to higher quantiles.

I also create a demeaned version of the MBM state variable, MBM_d, to allow comparing the sample and subsamples, before and after 1960, in terms of their MBM values:

$$MBM_{d,t} \equiv \ln(MBM_t) - \overline{\ln(MBM)}, \tag{25}$$

where $\ln(MBM_t)$ is the natural logarithm of the median BM in year t, and $\overline{\ln(MBM)}$ is the sample average of all values of $\ln(MBM_t)$, including future realizations.

C.1.1. *Summary statistics*

Table 32 presents the preliminary evidence that the size premium only exists in states of good investment opportunities, considering the forward looking MBM. The table displays the summary statistics for the market premium, the returns on the SMB portfolio, and the demeaned MBM, MBM_d, from Eq. (25). I report the mean, standard deviation and the t-Mean (the ratio of mean to standard deviation) of these variables in each of the sample periods. The first column reports the unconditional results (considering all the years in each sample). The next columns display the corresponding values of the variables in a breakdown of these years according to their states (low, medium, or high MBM states).

[**Place Table 32 about here**]

The unconditional mean return on the SMB portfolio is two standard errors above zero in the full 1926-2014 period, but it is insignificant in both individual subperiods split in 1960 (Table 32). The average MBM is significantly higher before 1960, and both the market premium and volatility are higher in that period, too.

The breakdown of the periods into states shows that the mean return on the SMB portfolio is never above the two standard error bound in the states with low or medium MBM. On the contrary, the returns on the SMB portfolio are largest and most significant in states of high MBM. But even in the (relatively) high MBM states, the returns on the SMB portfolio are insignificant after 1960. This can be explained by the significantly low average MBM in this period: The years with the largest MBM in this period have an average MBM of only 0.17, which would correspond to a medium MBM state before 1960, for example. The market premium also tends to be largest and most significant in high MBM states. This happens despite the market volatility tendency to increase in these states.

C.1.2. The size premium in the forward looking MBM states

The results in Table 33 provide more detailed confirmation that the existence of the size premium is restricted to the high risk states also considering the forward looking ranking. This also clarifies the results in Table 32 about the period after 1960: The size premium arises exclusively in high MBM years after 1960, just as it does before 1960. The difference is that after 1960 the premium only arises one fifth of the time, instead of one third of the time. One possible reason is the low average MBM (and market premium) in this part of the sample.

[**Place Table 33 about here**]

Table 33 is the equivalent of Table 4 but based on forward looking information. The main difference is that the percentile groups have approximately the same size given the full sample sorting of the years. The significance of the mean return on the SMB portfolio is almost always restricted to the highest MBM state(s) in Table 33, similar to the results considering the backward MBM classification (Table 4). For example, the mean return on the SMB portfolio is never above the two standard error bound if we exclude the top MBM quantile years from the sample. This happens in all the samples and for all numbers of quantiles considered (Table 33, "Ex top" column). In fact, the significance of the size premium tends to be restricted exclusively to the top quantile after 1960. But before 1960 the top two or three quantiles exhibit a significant size premium depending on the number of quantiles used to split the data.

Increasing the number of MBM quantiles and looking at smaller groups of years highlights the non-linear relation between the size premium and the aggregate BM. The non-top individual groups of years tend to have insignificant size premiums. Both the significance and the point estimation of the size premium tend to increase substantially in the highest MBM states only.

C.1.3. Controlling for market risk

Table 34 shows that controlling for market risk does not change the qualitative results either, again in line with the results from the backward looking classification variable.

[**Place Table 34 about here**]

C.2. The covariance risk price with the SMB^* conditioned on the forward looking MBM states

This section investigates whether the results in Maio and Santa-Clara (2012) still hold conditioned on a forward looking state variable instead of the backward looking used in the original analysis. The short answer is no, the forward looking results are in line with the backward looking ones that generate Table 9.

Just as it happens based on a backward looking ranking of the state variables, the positive unconditional relation between the SMB^* and the market conditions reported in Table 8 tends to be restricted to the low and medium MBM states in case we consider the forward looking classification as well. In the high MBM states, the relation between the SMB^* and the investment set is usually undefined. It is mostly insignificant (pre 1960), marginally mixed (post 1960), or marginally positive (in the full sample).

[Place Table 35 about here]

The SMB^* unconditionally forecasts positive market returns in every sample. But conditioning on the MBM state of the economy, this relation is only significant in the low BM states in the full 1926-2014 sample. Considering the sample split in 1960, the SMB^* significantly forecasts the long (5 years) and short term (1 year) market returns in the low or the medium BM states, but never in the high BM states. In fact, after 1960 the SMB^* seems to forecast **negative** market returns in the short and the long term in high BM years, even if the coefficients are not significant.

The SMB^* also unconditionally forecasts negative market volatility in the full sample and before 1960. It marginally forecasts lower volatility in high BM states in the full sample, with mostly insignificant and mixed results after 1960, and insignificant results before 1960. Before 1960, the SMB^* forecasts lower short and long term volatility in both low and medium BM states, but not in high BM states. After 1960, the SMB^* marginally forecasts **higher** long term volatility exclusively in high BM states.

So the net effect of the SMB^* on the investment opportunities tends to be positive if taken unconditionally, or in the low and medium BM states. But in the high BM states, an increase in the SMB^* tends to be weakly associated with worse investment opportunities (after 1960), no significant relation (before 1960), or positive opportunities (in the full sample). So there is some evidence that the SMB^* is positively related to the investment opportunities with a positive risk price, but the relation changes in particular in the high BM states, exactly when the size premium arises. The estimated risk prices are largely in line with the ones in Table 1 that consider a backward looking classification.

Table 32: **Summary statistics for selected variables in the full sample and in different states of the economy (MBM terciles).** The table describes the 1926-2014 sample and two subsamples 1926-1960, and 1960-2014. The panel splits horizontally into four parts: All states, Low MBM states, Medium MBM states, and High MBM states. "All states" contains the results for the entire sample period. Low, Medium, and High MBM states correspond to the three states of the economy (MBM_d terciles): In a given sample, the years in which MBM_d is in the lowest tercile across all the years are "Low", the ones in the highest tercile are "High", and the remaining ones are "Medium". The Market (premium) is the value weighted return on the market minus the risk free rate. The return on the SMB portfolio is the average return on the three small Fama/French portfolios minus the average return on the three big Fama/French portfolios. I report the mean, standard deviation (Std dev) and the $t-Mean$, which is the ratio of mean to its standard error of each variable. The variable MBM_d is determined in July of year t, and all the returns are from July of year t to the end of June in $t+1$.

	The size premium according to the state of the economy (median BM)											
	All states			Low MBM states			Medium MBM states			High MBM states		
	Market	SMB	MBM	Market	SMB	MBM	Market	SMB	MBM	Market	SMB	MBM
1926-2014												
Mean	9.06	2.78	0.00	5.16	1.18	-0.39	4.62	-1.29	-0.05	17.27	8.39	0.44
Std dev	2.72	1.29	0.04	3.55	2.01	0.02	2.91	1.98	0.02	6.54	2.35	0.06
t-Mean	3.34	2.15	0.00	1.46	0.59	-16.87	1.59	-0.65	-2.13	2.64	3.56	7.75
1926-1960												
Mean	13.34	2.95	0.28	4.58	-2.16	-0.05	11.53	0.99	0.24	24.87	10.65	0.69
Std dev	5.90	2.19	0.06	5.86	3.23	0.04	5.27	2.18	0.02	16.75	4.97	0.11
t-Mean	2.26	1.34	4.40	0.78	-0.67	-1.43	2.19	0.46	13.65	1.48	2.14	6.23
1960-2014												
Mean	6.46	2.64	-0.18	3.24	0.01	-0.47	7.75	3.68	-0.21	8.33	4.17	0.17
Std dev	2.27	1.57	0.04	3.94	2.31	0.02	3.87	2.93	0.01	4.11	2.89	0.05
t-Mean	2.84	1.68	-4.43	0.82	0.00	-21.63	2.00	1.26	-14.79	2.03	1.44	3.04

Table 33: **Returns on the SMB portfolio when I vary the number of MBM quantiles to group the years with similar states**: Mean and $(t - Mean)$, the ratio of the mean return to its standard error, of the returns on the SMB portfolio in 1926-2014 and subsamples 1926-1960 and 1960-2014.

I split each sample into (1), 2, 3, 5, 7, or 10 quantiles based on the MBM_d state variable and report the results for all of these groups of years. Each row corresponds to a given number of quantiles. The number of quantiles is in the first column: All years (i.e., the whole sample), 2, 3, 5, 7, or 10; with the number of years in each quantile in brackets. The next 10 columns contain the results for each respective group of years, from 1 to 10, depending on the number of quantiles considered. The last column, "Ex top", displays the results considering all the years except the ones in the highest MBM quantile. The variable MBM_d is determined in July of year t, and all the returns are from July of year t to the end of June in $t + 1$.

	Returns on the SMB portfolio in each state (MBM quantile)										
	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926-2014											
All (89 obs.)	2.78										
	(2.15)										
2 (44)	0.09	5.41									0.09
	(0.05)	(2.96)									(0.05)
3 (29)	1.18	-1.29	8.39								-0.08
	(0.59)	(-0.65)	(3.56)								(-0.05)
5 (18)	-0.76	2.42	-2.72	5.45	9.03						1.19
	(-0.33)	(0.73)	(-1.63)	(1.92)	(2.87)						(0.88)
7 (13)	-2.17	5.98	-1.16	-2.43	-1.44	9.51	11.44				1.43
	(-0.77)	(2.42)	(-0.27)	(-1.37)	(-0.59)	(3.07)	(2.58)				(1.13)
10 (9)	-5.20	3.18	5.63	-0.48	-3.63	-1.91	0.41	10.48	5.22	12.83	1.65
	(-2.1)	(0.95)	(1.53)	(-0.09)	(-1.51)	(-0.79)	(0.14)	(2.36)	(2.45)	(2.2)	(1.34)
1926-1960											
All (35 obs.)	2.95										
	(1.34)										
2 (17)	-2.37	8.57									-2.37
	(-1.07)	(2.5)									(-1.07)
3 (12)	-2.16	0.99	10.65								-0.58
	(-0.67)	(0.46)	(2.14)								(-0.3)
5 (7)	-5.21	-0.30	1.21	2.65	16.37						-0.41
	(-1.53)	(-0.07)	(0.43)	(1.22)	(2.35)						(-0.25)
7 (5)	-7.24	-3.57	2.57	0.82	3.71	6.30	18.03				0.43
	(-1.61)	(-0.96)	(0.53)	(0.22)	(1.17)	(2.35)	(1.81)				(0.26)
10 (4)	-10.20	1.46	-0.01	-0.70	-1.01	4.18	2.88	2.35	7.64	28.01	0.60
	(-2.33)	(0.74)	(0)	(-0.12)	(-0.41)	(0.68)	(0.73)	(2.03)	(1.74)	(2.07)	(0.37)
1960-2014											
All	2.64										
	(1.68)										
2	2.51	2.76									2.51
	(1.31)	(1.1)									(1.31)
3	0.01	3.68	4.17								1.89
	(0)	(1.26)	(1.44)								(1.01)
5	-1.45	2.06	6.18	-3.00	9.39						0.95
	(-0.49)	(0.85)	(1.28)	(-1.53)	(2.55)						(0.57)
7	-5.93	3.03	6.08	1.62	0.46	-2.26	14.39				0.64
	(-2.17)	(0.79)	(1.91)	(0.3)	(0.1)	(-1.21)	(3.98)				(0.41)
10	-5.92	2.27	0.53	3.35	12.22	1.16	-4.46	-1.25	10.65	7.89	2.11
	(-1.53)	(0.55)	(0.11)	(1.4)	(3.15)	(0.14)	(-1.58)	(-0.45)	(1.59)	(3.25)	(1.25)

Table 34: **Returns on the size portfolio based on a double sort by betas and size when I vary the number of MBM quantiles to group the years with similar states:** Mean and $(t - Mean)$, the ratio of the mean return to its standard error, of the returns on the SMB portfolio in 1963-2014.

I split each sample into (1), 2, 3, 5, 7, or 10 quantiles based on the MBM_d state variable and report the results for all of these groups of years. Each row corresponds to a given number of quantiles. The number of quantiles is in the first column: All years (i.e., the whole sample), 2, 3, 5, 7, or 10. The number of years in each group is in brackets. The next 10 columns contain the results for each respective group of years, from 1 to 10, depending on the number of quantiles considered. The last column, "Ex top", displays the results considering all the years except the ones in the highest MBM quantile. The variable MBM_d is determined in July of year t, and all the returns are from July of year t to the end of June in $t+1$.

Returns on the Size portfolio double sorted by size and betas in each state (MBM quantile)											
	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2014											
All (51 obs.)	3.23										
	(2.21)										
2 (26)	1.64	4.76									1.64
	(0.86)	(2.17)									(0.86)
3 (17)	-1.50	6.62	4.57								2.56
	(-0.78)	(2.49)	(1.73)								(1.45)
5 (10)	-2.69	4.83	4.96	-2.65	10.78						1.39
	(-1.02)	(1.42)	(1.52)	(-1.24)	(3.71)						(0.89)
7 (7)	-6.18	3.23	7.70	1.94	0.61	3.98	11.08				1.98
	(-2.24)	(1.09)	(2.1)	(0.85)	(0.12)	(1.06)	(3.61)				(1.28)
10 (5)	-6.85	1.46	0.35	9.31	3.92	5.70	-4.34	-1.30	12.37	9.19	2.58
	(-1.74)	(0.55)	(0.08)	(1.88)	(1.21)	(1.08)	(-0.94)	(-0.83)	(2.73)	(2.29)	(1.67)

Table 35: **Predictive regressions for 1 or 5 years for the excess returns on the market, the market variance, and the derivative of the pseudo-conditional Sharpe ratio with respect to the SMB_t^*.** I show the results in the full sample and in different states of the economy (BM terciles) in the periods 1926-2014, 1926-1960, and 1960-2014.
The row Rm displays the SMB_t^* coefficients, β_q, from Eq. (19): $R_{m,t\to t+q} = \alpha_q + \beta_q SMB_t^* + \epsilon_{t\to t+q}$ followed by the respective adjusted coefficient of determination (in %). The row $SVAR_m$ displays the SMB_t^* coefficients, β_q, from Eq. (20): $SVAR_{m,t\to t+q} = \alpha_q + \beta_q SMB_t^* + \epsilon_{t\to t+q}$ followed by the respective adjusted coefficient of determination (in %). The row $\frac{\partial SR}{\partial SMB_t^*}$ displays the average of the partial derivatives of the pseudo-conditional Sharpe ratios in Eq. (22) with respect to the SMB_t^*. The t-statistics of the results are in brackets. The left panel reports the results for the future $q = 1$ (year) values, and the right panel reports the results for the future $q = 5$ (years) in the equations above. Each panel splits horizontally into four parts: All, Low BM, Med BM, and High BM states. "All" contains the results for the entire sample period. Low, Med, and High BM states correspond to the three states of the economy (BM_t terciles): In a given sample, the years in which BM_t is in the lowest tercile across all the years are "Low", the ones in the highest tercile are "High", and the remaining ones are "Med".

	q = 1 year				q = 5 years			
	All	Low BM	Med BM	High BM	All	Low BM	Med BM	High BM
1926-2014								
R_m	17.28	22.26	0.24	32.52	72.45	85.50	40.98	33.68
	(1.52)	(1.95)	(0.02)	(0.68)	(2.67)	(2.61)	(1.39)	(0.33)
$\overline{R}^2$	1.5	9.0	-3.6	-1.9	0.1	0.2	0.0	0.0
$SVAR_m$	-0.03	-0.05	-0.01	-0.03	-0.18	-0.16	-0.10	-0.49
	(-1.34)	(-1.82)	(-0.41)	(-0.32)	(-2.2)	(-1.28)	(-0.89)	(-1.84)
$\overline{R}^2$	0.9	7.9	-3.0	-3.2	0.0	0.0	0.0	0.1
$\frac{\partial SR}{\partial SMB_t^*}$	1.20	1.74	0.07	1.81	2.48	2.39	1.55	3.46
	(40.3)	(12.28)	(40.24)	(55.63)	(30.28)	(23.3)	(23.07)	(7.77)
1926-1960								
R_m	71.41	42.72	103.71	63.77	251.94	172.43	201.69	251.74
	(1.88)	(1.34)	(2.77)	(0.32)	(3.05)	(2.51)	(1.01)	(0.79)
$\overline{R}^2$	6.9	6.8	37.8	-9.9	21.6	39.8	0.1	-3.9
$SVAR_m$	-0.02	-0.14	-0.15	0.30	-0.76	-1.16	-1.15	0.03
	(-0.29)	(-1.95)	(-2.9)	(0.86)	(-2.95)	(-3.3)	(-2.15)	(0.04)
$\overline{R}^2$	-2.8	20.3	40.2	-2.7	18.5	47.3	24.8	-11.1
$\frac{\partial SR}{\partial SMB_t^*}$	3.40	4.05	28.24	0.44	9.52	15.57	23.61	4.67
	(92.08)	(3.91)	(2.24)	(2.16)	(9.83)	(1.9)	(2.62)	(308.06)
1960-2014								
R_m	10.68	16.85	21.82	-35.79	53.95	45.99	75.60	-24.89
	(1.29)	(1.19)	(1.6)	(-1.44)	(2.48)	(1.07)	(1.98)	(-0.45)
$\overline{R}^2$	1.2	2.4	8.0	5.9	9.3	1.0	14.7	-4.9
$SVAR_m$	-0.02	-0.04	0.00	-0.02	-0.01	0.06	-0.05	0.11
	(-1.29)	(-0.95)	(0.06)	(-1.61)	(-0.27)	(0.58)	(-1.27)	(1.68)
$\overline{R}^2$	1.2	-0.7	-5.9	8.5	-1.9	-5.0	3.6	9.6
$\frac{\partial SR}{\partial SMB_t^*}$	0.87	1.06	1.54	-2.28	1.53	0.98	2.89	-1.51
	(34.02)	(15.83)	(269.23)	(-18.23)	(328.47)	(53.42)	(28.84)	(-19.49)

C.3. The relation between other premiums and the state variables

It is possible that not only the the size premium but also other premiums are related to the ICAPM state variables. This section provides some limited evidence about these relations, that are a lot less informative and robust compared to the size premium.

More specifically, I consider the same state variables that I use in the paper: The median BM of all CRSP stocks (MBM), the value weighted BM of all CRSP stocks (VBM), the Dow Jones' BM of Pontiff and Schall (1998) (DJBM), the earnings-price ratio of all S&P Composite stocks (EP), the term spread (TMS), the default spread (DFY), the Treasury bill rate (TBL), the percent equity issuing of Baker and Wurgler (2000) (EQIS), the investment to capital ratio of Cochrane (1991) (IK), the **lagged** dividend yield of Ball (1978) (DY), and the SMB^* of Maio and Santa-Clara (2012).

I investigate whether these state variables are related to the annual premiums: The market premium (MP), the value premium (HML), the profitability premium (RMW), and the investment premium (CMA) described in Fama and French (2015), and the momentum premium (MOM) in Carhart (1997).

The Kenneth French website provides the series of returns (time frames in brackets): RMW (1963-2015), CMA (1963-2015) and MOM (1927-2015). The other variables and their time frames are described in Section 3. I only report the results that seem at least marginally informative. I do not report anything based on the DY, the SMB^*, or the EQIS, for example. In addition, the results based on the four scaled price state variables (the MBM, the VBM, the DJBM, and the EP) tend to be similar and I only report the ones based on the MBM. The others are available upon request.

Table 36, Table 37 and Table 38 show a relation between the returns on the RMW portfolio and the MBM, the TMS and the DFY state variables. But the connection between the premium and the market conditions is not clear. For example, the mean return on the RMW portfolio is significant in states with bad investment opportunities (low MBM and other scaled-price ratios). But it is also significant when opportunities are good (high TMS and DFY). In addition, the results are not robust because the premiums in non top/bottom percentiles are also often significant. In fact, considering the MBM, the conclusion that the premium is absent in the top percentile is more robust than the conclusion that the premium appears exclusively in the bottom percentiles.

The CMA tends to be more significant in periods of good opportunities considering the MBM and the DFY (Table 39 and Table 40), but it also appears in periods of bad investment opportunities according to the (high) TBL (Table 41). The relations are not robust in this case either. For example, the significance of the unconditional premium is larger than the significance of the premium in each of the individual top quantiles considering the TBL (Table 41). In addition, according to the DFY, it seems that the premium is either negative or zero when the DFY is small (i.e., periods of bad investment opportunities), instead of being positive exclusively when the DFY is large.

The IK and the DFY seem related to MOM (Table 42 and Table 43): The MOM appears to be significant when the IK is large and when the DFY is small. The evidence is stronger considering the DFY, suggesting that the momentum premium is insignificant (and small) when the DFY is large, and big and significant when the DFY is small, especially before 1960. The conclusions based on the IK consider the 1947-2015 sample only, and this could explain why the results based on the DFY seem more robust. Finally, the DFY is also related to the market premium (Table 44). The market premium tends to be insignificant even if the point estimates are large when the DFY is large.

Table 36: **Returns on the RMW portfolio in years with similar MBM states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the RMW portfolio; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the MBM backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the RMW portfolio in each (MBM) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.10										
	(2.27)										
	53										
2	4.28	0.38									4.28
	(2.34)	(0.25)									(2.34)
	37	16									37
3	4.30	2.96	-0.56								3.85
	(1.9)	(1.78)	(-0.31)								(2.43)
	29	15	9								44
5	0.94	8.56	2.85	3.45	-3.36						3.77
	(0.5)	(2.08)	(1.18)	(2.53)	(-1.42)						(2.59)
	18	13	10	7	5						48
7	0.68	8.46	7.63	1.28	4.14	2.12	-5.92				3.64
	(0.34)	(1.91)	(1.58)	(0.45)	(1.48)	(1.89)	(-1.85)				(2.6)
	17	8	9	7	3	6	3				50
10	1.45	0.14	7.73	9.89	4.99	-0.34	4.14	2.94	0.49	-5.92	3.64
	(0.78)	(0.03)	(1.7)	(1.16)	(1.71)	(-0.08)	(1.48)	(1.89)	(0.78)	(-1.85)	(2.6)
	11	7	8	5	6	4	3	4	2	3	50

Table 37: **Returns on the RMW portfolio in years with similar TMS states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the RMW portfolio; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the TMS backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the RMW portfolio in each (TMS) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.10										
	(2.27)										
	53										
2	1.59	4.09									1.59
	(0.59)	(2.91)									(0.59)
	21	32									21
3	3.13	-0.34	4.51								1.93
	(1.18)	(-0.1)	(2.64)								(0.94)
	19	10	24								29
5	3.06	3.36	-2.76	8.76	2.84						3.24
	(0.93)	(1.04)	(-0.65)	(2.11)	(2.33)						(1.6)
	15	4	7	8	19						34
7	2.83	4.52	1.44	-3.05	10.04	3.52	3.02				3.13
	(0.71)	(1.26)	(0.35)	(-0.61)	(1.51)	(2.16)	(2.08)				(1.68)
	12	5	2	6	5	7	16				37
10	-0.02	7.68	5.29	1.44	-12.99	1.33	12.81	4.71	0.46	4.24	2.76
	(-0.01)	(0.95)	(0.85)	(0.35)	(-1.2)	(0.39)	(1.63)	(1.67)	(0.39)	(2.46)	(1.63)
	9	6	2	2	2	5	4	4	7	12	41

Table 38: **Returns on the RMW portfolio in years with similar DFY states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the RMW portfolio; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the DFY backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the RMW portfolio in each (DFY) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.10										
	(2.27)										
	53										
2	3.04	3.12									3.04
	(1.03)	(2.06)									(1.03)
	16	37									16
3	0.53	4.52	2.55								3.43
	(0.48)	(1.65)	(1.79)								(1.69)
	9	24	20								33
5	0.34	3.13	5.71	0.73	3.26						3.04
	(0.39)	(1.71)	(1.28)	(0.48)	(1.66)						(1.76)
	3	9	14	13	14						39
7	0.43	0.62	5.05	6.99	0.92	2.11	2.90				3.14
	(0.28)	(0.31)	(2.07)	(1.25)	(0.49)	(1.02)	(1.28)				(1.96)
	2	5	5	11	11	9	10				43
10	-1.09	1.06	0.73	5.05	4.85	6.05	0.58	0.89	4.26	1.46	3.27
	.	(1.18)	(0.28)	(2.07)	(0.4)	(1.34)	(0.21)	(0.74)	(1.44)	(0.96)	(2.18)
	1	2	4	5	4	10	7	6	9	5	48

Table 39: **Returns on the CMA portfolio in years with similar MBM states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the CMA portfolio; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the BM backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the CMA portfolio in each (MBM) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.85										
	(3.28)										
	53										
2	2.61	6.72									2.61
	(1.76)	(4.02)									(1.76)
	37	16									37
3	2.76	5.72	4.25								3.77
	(1.51)	(2.94)	(2.41)								(2.74)
	29	15	9								44
5	0.14	6.68	4.19	6.62	5.29						3.70
	(0.09)	(1.98)	(1.82)	(2.64)	(2.1)						(2.9)
	18	13	10	7	5						48
7	0.00	3.94	6.59	5.77	11.51	2.21	8.33				3.58
	(0)	(1.09)	(1.65)	(1.87)	(3.9)	(1.25)	(2.73)				(2.92)
	17	8	9	7	3	6	3				50
10	-0.86	1.70	4.20	10.64	1.21	8.66	11.51	2.96	0.72	8.33	3.58
	(-0.36)	(1.17)	(1.17)	(1.56)	(0.71)	(1.88)	(3.9)	(1.11)	(0.77)	(2.73)	(2.92)
	11	7	8	5	6	4	3	4	2	3	50

Table 40: **Returns on the CMA portfolio in years with similar DFY states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the CMA portfolio; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the DFY backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the CMA portfolio in each (DFY) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.85										
	(3.28)										
	53										
2	1.06	5.06									1.06
	(0.5)	(3.65)									(0.5)
	16	37									16
3	-2.69	5.82	4.43								3.50
	(-2.09)	(2.71)	(3.37)								(2.03)
	9	24	20								33
5	-3.63	0.04	8.06	3.37	4.14						3.75
	(-1.73)	(0.02)	(2.38)	(2.07)	(2.39)						(2.53)
	3	9	14	13	14						39
7	-2.29	-3.81	2.61	9.53	2.09	3.10	5.89				3.38
	(-0.82)	(-2.11)	(1.6)	(2.3)	(1.15)	(1.79)	(2.81)				(2.48)
	2	5	5	11	11	9	10				43
10	-5.11	-2.90	-3.18	2.61	6.89	8.53	1.88	5.11	2.56	6.99	3.52
	.	(-0.85)	(-1.45)	(1.6)	(0.94)	(2.14)	(0.73)	(2.72)	(1.26)	(2.3)	(2.8)
	1	2	4	5	4	10	7	6	9	5	48

Table 41: **Returns on the CMA portfolio in years with similar TBL states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the CMA portfolio; and the **number of years** at each state in 1963-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the TBL backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the CMA portfolio in each (TBL) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1963-2015											
All	3.85										
	(3.28)										
	53										
2	3.35	4.00									3.51
	(1.76)	(2.75)									(1.74)
	17	37									16
3	1.99	2.69	5.07								2.37
	(1.24)	(1.12)	(2.88)								(1.61)
	11	13	29								24
5	1.99	11.02	-0.78	12.42	3.59						4.10
	(1.24)	(1.26)	(-0.49)	(2.04)	(2.4)						(2.24)
	11	3	8	5	26						27
7	2.19	0.01	11.02	-1.33	10.43	3.55	4.05				3.72
	(1.25)	.	(1.26)	(-0.78)	(1.64)	(1.31)	(2.29)				(2.35)
	10	1	3	7	5	6	21				32
10	2.13	1.38	.	11.02	0.68	-1.24	14.66	9.05	1.26	4.29	3.59
	(1.08)	(1.01)	.	(1.26)	(0.29)	(-0.67)	(1.38)	(2.28)	(0.63)	(2.32)	(2.33)
	9	2	0	3	3	6	3	2	6	20	33

Table 42: **Returns on the MOM portfolio in years with similar IK states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the MOM portfolio; and the **number of years** at each state in 1947(9)-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the IK backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Returns on the MOM portfolio in each (IK) state

	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1947-2015											
All	9.08										
	(5.12)										
	67										
2	4.64	13.08									4.14
	(1.91)	(5.77)									(1.61)
	32	37									30
3	5.23	10.41	12.17								7.13
	(2.41)	(2.18)	(4.21)								(3.21)
	26	15	26								41
5	5.59	5.26	7.19	13.11	12.59						7.79
	(1.88)	(1.7)	(0.92)	(3.84)	(3.59)						(3.81)
	14	13	9	13	18						49
7	4.05	7.90	5.69	-6.72	19.88	8.45	13.85				7.82
	(1.25)	(3.22)	(0.95)	(-0.5)	(5.66)	(2.41)	(3.12)				(4.12)
	12	11	6	4	9	11	14				53
10	5.33	6.05	8.02	-3.96	0.37	14.51	16.16	11.20	12.52	12.64	8.38
	(1.25)	(1.58)	(2.73)	(-0.5)	(0.03)	(2.24)	(8.06)	(2.06)	(4.18)	(2.28)	(4.57)
	9	5	10	3	5	6	5	8	7	11	56

Table 43: **Returns on the MOM portfolio in years with similar DFY states**. I report three measures: The **mean** and the **(t-Mean)** (the ratio of the mean return to its standard error) of the returns on the MOM portfolio; and the **number of years** at each state in 1926-2015 and subsamples 1926-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the DFY backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

	Returns on the MOM portfolio in each (DFY) state										
	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926-2015											
All	8.69										
	(4.4)										
	89										
2	11.71	6.03									11.67
	(5.99)	(1.85)									(5.83)
	43	47									42
3	11.11	9.46	4.70								10.17
	(5.91)	(3.57)	(0.82)								(5.98)
	28	37	24								65
5	10.85	7.79	10.81	10.39	3.35						10.05
	(4.71)	(2.39)	(3.36)	(2.38)	(0.46)						(6.11)
	17	16	22	16	18						71
7	11.95	9.49	5.60	15.65	7.03	7.54	1.79				9.87
	(4.52)	(2.74)	(1.49)	(4.1)	(1.67)	(1.5)	(0.18)				(6.21)
	14	11	10	15	16	10	13				76
10	14.53	5.60	10.90	4.67	19.45	4.36	11.40	8.73	1.18	6.76	8.86
	(4.69)	(2.29)	(2.37)	(1.01)	(4.06)	(1.43)	(1.93)	(1.27)	(0.2)	(0.39)	(5.37)
	10	7	8	8	10	13	10	6	11	7	82
1926-1960											
All	8.73										
	(2.24)										
	34										
2	9.85	6.37									9.71
	(4.56)	(0.51)									(4.32)
	25	10									24
3	11.06	6.73	3.11								9.47
	(5.4)	(1.19)	(0.1)								(3.92)
	19	11	4								30
5	9.89	8.39	7.99	13.06	3.11						9.47
	(6.22)	(1.16)	(1.81)	(0.76)	(0.1)						(3.92)
	14	7	6	3	4						30
7	10.79	10.53	2.34	14.76	7.60	3.73	2.90				9.29
	(6.87)	(1.77)	(0.25)	(6.01)	(0.71)	.	(0.07)				(3.96)
	12	6	4	3	5	1	3				31
10	11.77	6.50	13.54	1.52	12.27	4.01	13.06	.	3.66	2.56	9.11
	(7.44)	(2.11)	(1.57)	(0.11)	(4.04)	(0.5)	(0.76)	.	(50.85)	(0.03)	(4)
	9	5	4	3	4	3	3	0	2	2	32
1960-2015											
All (55 obs.)	8.72										
	(4.15)										
	56										
2 (28)	14.15	5.94									14.15
	(4.19)	(2.3)									(4.19)
	19	37									19
3 (18)	11.21	10.64	5.01								10.78
	(2.7)	(3.74)	(1.24)								(4.6)
	9	27	20								36
5 (11)	15.35	7.32	11.85	9.78	3.42						10.49
	(1.25)	(3.34)	(3.04)	(2.33)	(0.67)						(4.76)
	3	9	17	13	14						42
7 (8)	18.94	8.25	7.77	15.53	6.77	7.97	1.46				10.30
	(0.93)	(2.37)	(3.58)	(3.52)	(1.59)	(1.42)	(0.23)				(4.87)
	2	5	6	13	11	9	10				46
10 (6)	39.34	3.36	8.26	6.56	22.41	4.46	10.68	8.73	0.63	8.44	8.75
	.	(0.7)	(1.84)	(2.97)	(3.47)	(1.3)	(1.9)	(1.27)	(0.09)	(1.43)	(3.89)
	1	2	4	5	7	10	7	6	9	5	51

Table 44: **Market premiums in years with similar DFY states.** I report three measures: The **mean** and the **(t-Mean)**, the ratio of the mean return to its standard error, of the market premium; and the **number of years** at each state in 1926-2015 and subsamples 1926-1960 and 1960-2015. I split the years into (1), 2, 3, 5, 7, or 10 groups based on the DFY backward looking percentile ranking in that year, given by Eq. (17). Each row corresponds to a given number of groups, named in the first column: All (i.e., the whole sample), 2, 3, 5, 7, or 10. The next 10 columns contain the results for each respective percentile group, from 1 (Bottom) to 10 (Top). The "Ex top" column displays the results for all the years except the ones at the highest state. The state variable is from July of year t, and the returns are from July of year t to the end of June in $t+1$.

Market premium in each (DFY) state											
	Bottom	2	3	4	5	6	7	8	9	Top	Ex top
1926-2015											
All	8.98										
	(3.34)										
	90										
2	10.00	7.25									10.87
	(3.55)	(1.61)									(3.95)
	44	47									43
3	15.68	3.29	9.64								8.74
	(5.06)	(1.08)	(1.21)								(3.8)
	29	37	24								66
5	12.80	14.85	0.13	7.51	12.05						8.21
	(3.79)	(2.96)	(0.03)	(2.01)	(1.14)						(3.81)
	18	16	22	16	18						72
7	12.55	21.28	2.71	-3.81	11.45	7.72	11.95				8.47
	(3.3)	(3.56)	(0.59)	(-0.78)	(2.79)	(1.59)	(0.82)				(4.11)
	15	11	10	15	16	10	13				77
10	13.46	11.75	23.98	5.71	-2.78	0.27	10.57	2.41	5.65	22.11	7.87
	(2.78)	(2.54)	(3.14)	(1.12)	(-0.45)	(0.05)	(2.11)	(0.45)	(1.03)	(0.83)	(3.95)
	11	7	8	8	10	13	10	6	11	7	83
1926-1960											
All	13.34										
	(2.26)										
	35										
2	11.02	15.33									12.55
	(2.53)	(0.83)									(2.96)
	26	10									25
3	17.03	3.64	21.60								12.27
	(3.91)	(0.51)	(0.45)								(3.16)
	20	11	4								31
5	14.53	15.95	-1.73	20.43	21.60						12.27
	(3.72)	(1.4)	(-0.18)	(1.62)	(0.45)						(3.16)
	15	7	6	3	4						31
7	14.09	26.60	-3.88	-13.57	18.80	-4.61	30.34				11.75
	(3.32)	(2.51)	(-0.59)	(-0.92)	(2.17)	.	(0.46)				(3.09)
	13	6	4	3	5	1	3				32
10	14.58	14.43	31.20	-4.37	-10.78	1.85	20.43	.	-2.04	45.25	11.41
	(2.8)	(2.33)	(2.07)	(-0.47)	(-1)	(0.11)	(1.62)	.	(-0.79)	(0.41)	(3.09)
	10	5	4	3	4	3	3	0	2	2	33
1960-2015											
All (55 obs.)	6.37										
	(2.85)										
	56										
2 (28)	8.93	5.06									8.93
	(3.15)	(1.66)									(3.15)
	19	37									19
3 (18)	12.68	3.62	7.25								5.89
	(4.99)	(1.15)	(1.64)								(2.34)
	9	27	20								36
5 (11)	4.15	13.99	1.72	4.53	9.32						5.39
	(2.57)	(4.78)	(0.38)	(1.33)	(1.58)						(2.38)
	3	9	17	13	14						42
7 (8)	2.54	14.89	7.10	-0.04	8.10	9.09	6.44				6.36
	(10.65)	(4.89)	(1.17)	(-0.01)	(1.84)	(1.75)	(0.84)				(2.89)
	2	5	6	13	11	9	10				46
10 (6)	2.30	5.07	16.77	11.76	4.47	-0.21	6.35	2.41	7.36	12.85	5.74
	.	(2.21)	(5.42)	(2.49)	(0.71)	(-0.03)	(1.37)	(0.45)	(1.11)	(1.03)	(2.64)
	1	2	4	5	7	10	7	6	9	5	51

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