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Expected Stock Returns When Interest Rates Are Low

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KEY FINDINGS

- Total stock returns do not appear to increase with the level of the risk-free return, so the equity risk premium tends to be higher when the risk-free return is low.
- This result holds for the US stock market as well as most international stock markets and is robust over time and to the inclusion of various control factors.
- The observed relation appears to stem from the operating performance of firms, while multiple expansion or risk-based explanations do not appear to be plausible.

ABSTRACT

The equity risk premium is generally considered to be a reward that investors earn on top of the prevailing risk-free return, implying that, all else equal, total expected stock returns should increase with the level of the risk-free return. We examine whether this notion is true using long-term historical data. Our statistical tests strongly reject the hypothesis that a higher risk-free return implies higher total average stock returns. Instead, expected stock returns appear to be unrelated (or perhaps even inversely related) to the level of the risk-free return. Thus, the equity risk premium tends to be higher when the risk-free return is low and vice versa. This result appears to stem from the operating performance of firms. Our findings challenge the conventional wisdom about expected stock returns and have important implications for asset allocation decisions, in particular when risk-free rates are at extreme levels.

Expected stock returns can be broken down into the risk-free return plus the equity risk premium. The risk-free component is typically assumed to be the return on short-term Treasury bills or longer-term Treasury bonds, depending on the investment horizon of the investor, and the equity risk premium can be interpreted as the reward that investors can expect to earn for bearing the risk of holding stocks. All else equal, a higher risk-free return should therefore imply higher total expected stock returns. For instance, an equity risk premium of 4% in combination with a risk-free return of 6% gives a total return of 10%, but if the risk-free return is 1%, then the same equity risk premium only gives a total return of 5%.

Empirically this notion was already challenged by Fama and Schwert (1977), who found a negative relation between total stock returns and the return on risk-free Treasury bills. However, their analysis was based on a relatively short sample period spanning less than two decades. Moreover, Fama and French (1989) and Chen (1991) argued that the anomalous result disappears when controlling for the term premium, that is, the slope of the yield curve. Ang and Bekaert (2007) found fresh evidence that the short rate strongly negatively predicts stock returns, as a side result in a study that focuses on the role of the dividend yield. Unfortunately, their sample did not include the last two decades, which are particularly interesting because interest rates were exceptionally low throughout most of this period.

In this article, we revisit the empirical relation between stock returns and risk-free returns. Using long-term historical data for the US equity market, our statistical tests strongly reject the hypothesis that a higher risk-free return implies higher total expected stock returns. Instead, total expected stock returns appear to be unrelated (or perhaps even inversely related) to the level of the risk-free return, implying that, as the risk-free return decreases, the equity risk premium increases. This conclusion is robust to the inclusion of various control factors and over subsamples. Our findings challenge the conventional wisdom about expected stock returns and have important implications for asset allocation decisions, in particular when the prevailing risk-free return is well above or well below its historical average.

Our study relates to many existing studies on the equity risk premium. One stream of literature attempts to pinpoint the magnitude of the equity risk premium, for example, by examining long-term historical data (Dimson, Marsh, and Staunton 2000) or by conducting surveys among academics and investment professionals (Fernandez 2021). The estimates in these studies typically range between 3% and 8%. Another stream of literature, starting with Mehra and Prescott (1985), tries to rationalize why these empirical estimates of the equity risk premium are much higher than the level predicted by theoretical models. Others have attempted to explain the apparent time variation in the magnitude of the equity risk premium. For instance, Shiller (2000) found that higher equity market valuations, as measured by the cyclically adjusted price to earnings (CAPE) ratio, tend to be followed by lower subsequent returns.

Various studies have also examined stock return predictability using multivariate models, with the short rate or related metrics included among a wide range of predictors. For an overview of such approaches we refer to Duarte and Rosa (2015) and Damodaran (2021). The significance and even the sign of the estimated coefficient for the short rate varies across these studies, but this is hard to interpret given the interaction with all the other explanatory variables used simultaneously—some of which may be highly correlated, such as long-term interest rate levels. In an influential study, Welch and Goyal (2008) examined many proposed predictors for the equity risk premium and concluded that these generally perform poorly out-of-sample and sometimes even in-sample as well. Their analysis specifically included the risk-free rate, as well as several related metrics, and their conclusions were reaffirmed in Goyal, Welch, and Zafirov (2021). We discuss how this relates to our findings in a separate section.

The remainder of the article is organized as follows. We first describe our data. Next, we present our empirical evidence, consisting of our base-case results, expected stock returns over time implied by our model, and international evidence. We then proceed by discussing possible explanations for our findings and the methodological challenges involved with this kind of research. Finally, we conclude.

DATA

US Data

We obtain monthly US equity market returns and risk-free Treasury bill returns from the Kenneth French online data library (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html) from July 1926 to June 2021, which we augment with data from Baltussen, van Vliet, and van Vliet (2021) for the period January 1866 to June 1926. We define the equity excess return as the total equity return minus the return on risk-free Treasury bills and the equity risk premium as the long-term average equity excess return. Throughout our analyses, we log-transform all equity (excess) returns in order to make them additive over time. In this way, we account for the fact that recovering a loss of 20% (wealth going from 100 to 80) requires a gain of 25% to break even again.[1]

Our main control factor is the CAPE ratio of Robert Shiller (http://www.econ.yale.edu/~shiller/data.htm), a valuation factor that is available from January 1881 onward.[2] By taking the inverse of CAPE, we convert it to an earnings yield measure that is more stable[3] and better interpretable as an expected return measure. We consider several additional control factors, including fast and slow ones. The fast control factors are equity momentum and bond momentum. For equity momentum, we use a simplified version of the trading rule of Faber (2007), namely the log of the total equity return over the past 12 months. Our proxy for bond momentum is the change in the 10-year Treasury bond yield over the past 12 months, using data from Robert Shiller,[4] where falling (rising) yields correspond to positive (negative) bond returns. The slow control factors are the term spread (TERM) and default spread (DEF), inspired by the finding of Fama and French (1989) and Chen (1991) that these may negate the relation between stock returns and the risk-free rate. We define the term spread as the yield difference between 10-year Treasury bonds and Treasury bills and the default spread as the yield difference between BAA- and AAA-rated corporate bonds.[5] The latter series is available from 1919 onward.

International Data

To corroborate our evidence for the US stock market, we also examine international stock markets. For this analysis we use the dataset of the Jordà et al. (2019) study (https://www.macrohistory.net/database). The main difference with the US data is that the international data are only available at an annual frequency. Moreover, the earnings yield (inverted CAPE) control factor is not available. Thus, we only have annual stock returns and risk-free returns on short-term government bills or bonds. Data are available for 16 countries, namely Australia (AU), Belgium (BE), Switzerland (CH), Germany (DE), Denmark (DK), Spain (ES), Finland (FI), France (FR), Italy (IT), Japan (JP), Netherlands (NL), Norway (NO), Portugal (PT), Sweden (SE), United Kingdom (UK), and the United States.[6] The start date of the series varies between 1870 and 1900 for the various countries. The end date for all series is 2015, but we add the calendar years from 2016 to 2021 using publicly available stock return and short-term interest rate data.[7] We delete a small number of observations from the sample due to missing or very extreme data, namely the 1915 to

[1] The log-transformation actually has little impact in the regressions with monthly returns but becomes more relevant in regressions with longer-term (e.g., annual) returns.

[2] We do not use the stock index of Robert Shiller because it is computed using monthly averages of daily closing prices, which can lead to major distortions. For instance, the stock index of Robert Shiller has a return of –12.1% in October 1987 versus –22.6% for the Kenneth French Center for Research in Securities Prices (CRSP) market portfolio.

[3] If earnings approach zero, a price-to-earnings ratio explodes to infinity.

[4] This is the same series as in the Federal Reserve Economic Data (FRED) database from the Federal Reserve.

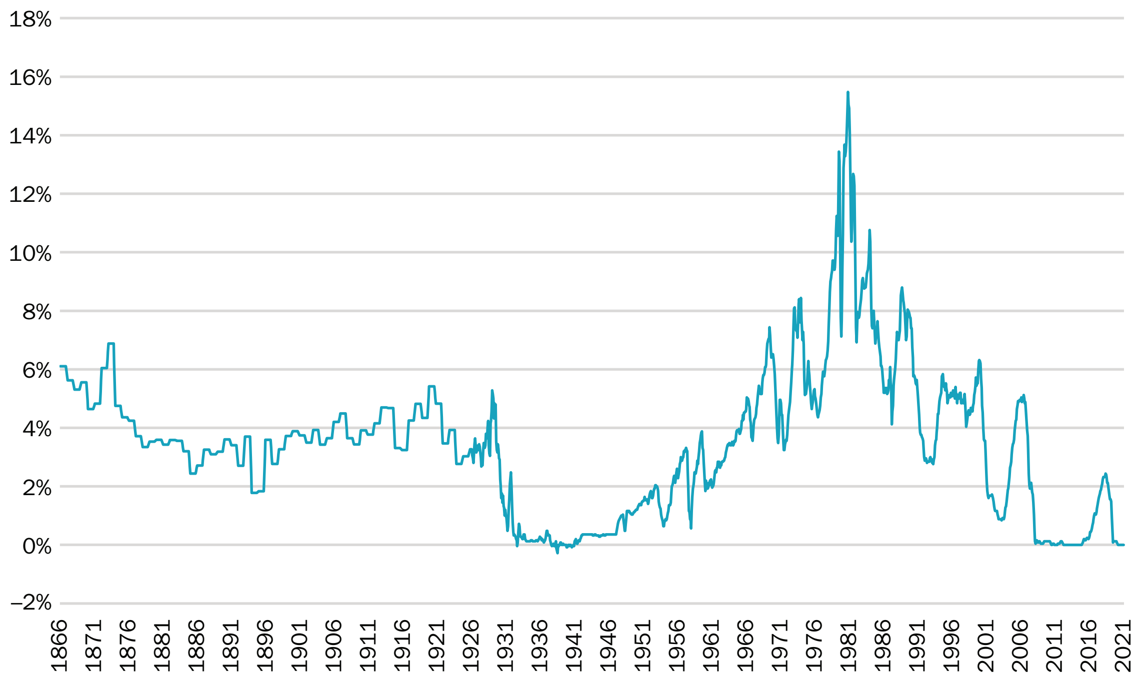
[5] Obtained from the FRED database from the Federal Reserve.

[6] Canada (CA) is included in the raw dataset, but stock return data are unfortunately missing.

[7] Stock return data are from MSCI, using country indexes in local currency, and the short-term interest rate data is from https://tradingeconomics.com/.

EXHIBIT 1

The Risk-Free Return over Time, January 1866–June 2021 (annualized)



1924 and 1945 to 1949 periods for Germany and the years 1946 and 1947 for Japan (wipeout events due to hyperinflation or war).

EMPIRICAL RESULTS

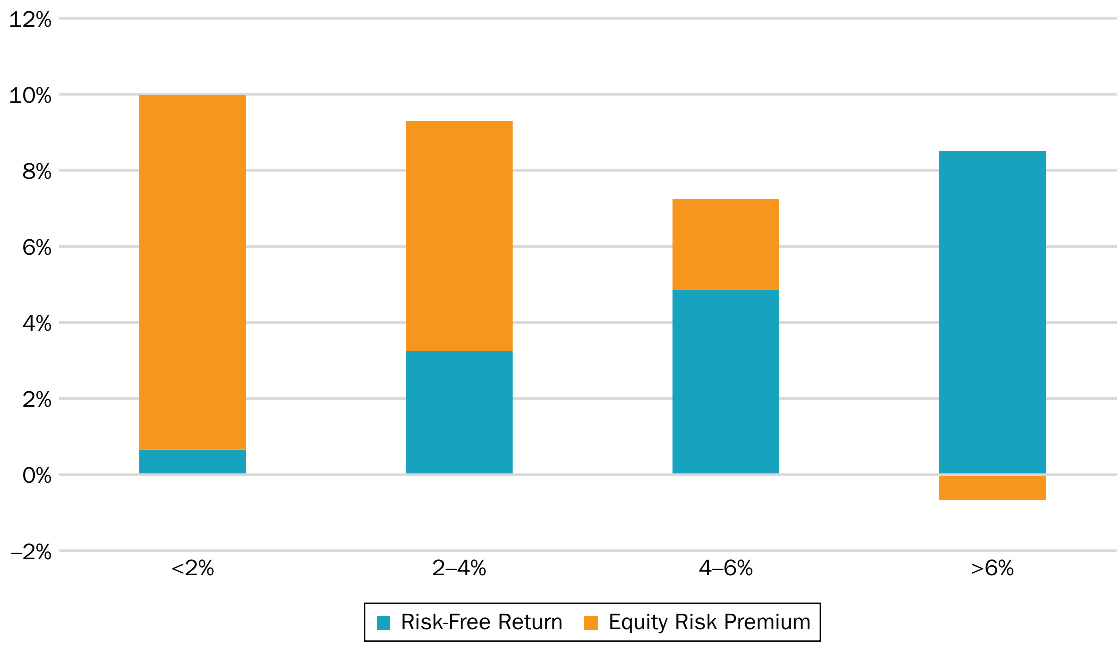
Main US Results

Exhibit 1 shows the development of the (annualized) risk-free return over time. The risk-free return typically ranged between 2% and 6% before the Great Depression of the 1930s, but during the 1930s and 1940s, it dropped to very low levels, in the 0% to 2% range. In the subsequent decades, the risk-free return steadily rose, peaking at over 15% in the early 1980s. After that, it steadily fell again, effectively reaching zero at the end of 2008, and remaining at or close to zero subsequently.

Exhibit 2 shows average realized stock returns conditional on the level of the risk-free return, where we distinguish between risk-free returns of less than 2%, 2–4%, 4–6%, and over 6% (annualized). If equities offer a fairly stable risk premium, then we would expect to observe a similar-sized risk premium for all levels of the risk-free return and total returns that are clearly increasing with the level of the risk-free return. The actual picture looks very different though, with similar-sized total returns for all levels of the risk-free return and an inverse relation between the equity risk premium and the risk-free return. For instance, when the risk-free return is below 2%, the average total return on equities is about 10%, resulting in a risk premium of over 9%. However, when the risk-free return is over 6%, the average total return on equities is about 8%, which is not even sufficient for obtaining a positive average risk premium.

EXHIBIT 2

Stock Returns Conditional on the Level of the Risk-Free Return, January 1866–June 2021



We proceed with a more formal examination of the relation between equity returns and the risk-free return. Specifically, we regress monthly equity returns minus the risk-free return ($R_m - R_{bills}$) on the prevailing risk-free return (R_{bills}) and earnings yield (inverted CAPE). We use the longest sample period for which all variables are available, which is from February 1881 to June 2021. If the equity risk premium was independent of the level of the risk-free return, then we would expect the estimated coefficient for the risk-free regressor to be indistinguishable from zero. However, if total equity returns are more or less the same regardless of the level of the risk-free return, then we would expect the estimated coefficient to be about –1, to offset the subtraction of the risk-free return from the equity returns on the left-hand side of the regression.

Full sample regression results are reported in Panel A of Exhibit 3. The estimated coefficient for the risk-free return turns out to be strongly negative, at –2.07 ($t = -3.59$). This clearly rejects the hypothesis that the equity risk premium is independent of the level of the risk-free return and is more supportive for the alternative hypothesis that total expected equity returns are similar during times of low and high risk-free returns. In fact, because the estimated coefficient for the risk-free return is well below –1, it seems that there is even an inverse relation between total expected equity returns and the level of the risk-free return, similar to what we saw before in Exhibit 2.

The estimated coefficient for earnings yield has the expected positive sign and is also statistically significant ($t = 3.09$). Taken together, these regression results imply that the equity risk premium increases with the earnings yield but decreases with the risk-free return. This is consistent with Maio (2013), who found that the difference between stock yields and bond yields has predictive power for future stock returns, the so-called Federal Reserve (FED) model. However, for the purposes of this study, we are mainly interested in the relation between risk-free returns and stock returns, and we do not wish to impose a one-to-one relation between stock and bond yields as assumed in the FED model.

EXHIBIT 3

Regression Results, January 1866–June 2021

	Intercept	Risk-Free Return	Earnings Yield	Equity Mom.	Bond Mom.	TERM	DEF
Panel A: Full Sample Results							
February 1881–June 2021	0.20%	–2.07	0.12				
	0.65	–3.59***	3.09***				
Panel B: Subsample Results							
January 1881–December 1950	–0.29%	–2.26	0.15				
	–0.54	–1.64	2.58***				
January 1951–June 2021	–0.13%	–3.55	0.27				
	0.35	–4.86***	3.78***				
Panel C: Other Control Variables							
Only risk-free return	0.91%	–1.61					
	4.69	–2.88***					
Additional fast variables	–0.23%	–1.80	0.15	0.02	0.50		
	–0.73	–3.04***	3.69***	2.90***	2.99***		
Additional slow variables	0.34%	–2.11	0.24			0.19	–0.99
(January 1919–June 2021)	0.77	–3.12***	4.38***			1.30	–3.77***
Panel D: Other Variable							
Market–bond return	0.09%	–2.04	0.12				
	0.29	–3.37***	2.83***				
Market–inflation	0.30%	–1.64	0.10				
	0.98	–2.84***	2.52**				

NOTES: Dependent variable is the monthly log equity market return in excess of the risk-free return. *T*-statistics are reported below the estimated coefficients. *, **, and *** denoting statistical significance at the 10%, 5%, and 1% confidence levels, respectively.

As a first robustness test, we split the 140-year sample period into two independent 70-year subperiods and repeat the regression. Panel B of Exhibit 3 shows that the estimated coefficient for the risk-free return is –2.26 (t = –1.64) over the 1881–1950 period and –3.55 (t = –4.86) over the 1951–2021 period, indicating that our results hold in both subsamples and, if anything, have only strengthened over time.[8]

In our next robustness test, we examine the (full sample) results without the earnings yield variable (i.e., using the risk-free return as the sole explanatory factor), results with two additional fast control variables (equity momentum and bond momentum), and results with the two additional slow control factors (TERM and DEF). Panel C of Exhibit 3 shows that the estimated coefficient for the risk-free return remains well below –1 and highly significant in all three instances, implying that our conclusion is robust to the choice of control variables.[9] The two fast control factors are both significant in these regressions, with the expected (positive) signs, but only one of the slow factors (DEF) is significant while the other (TERM) is not. Thus, contrary to the findings of Fama and French (1989) and Chen (1991), the inclusion of the TERM spread does not render the risk-free return insignificant in our analysis.

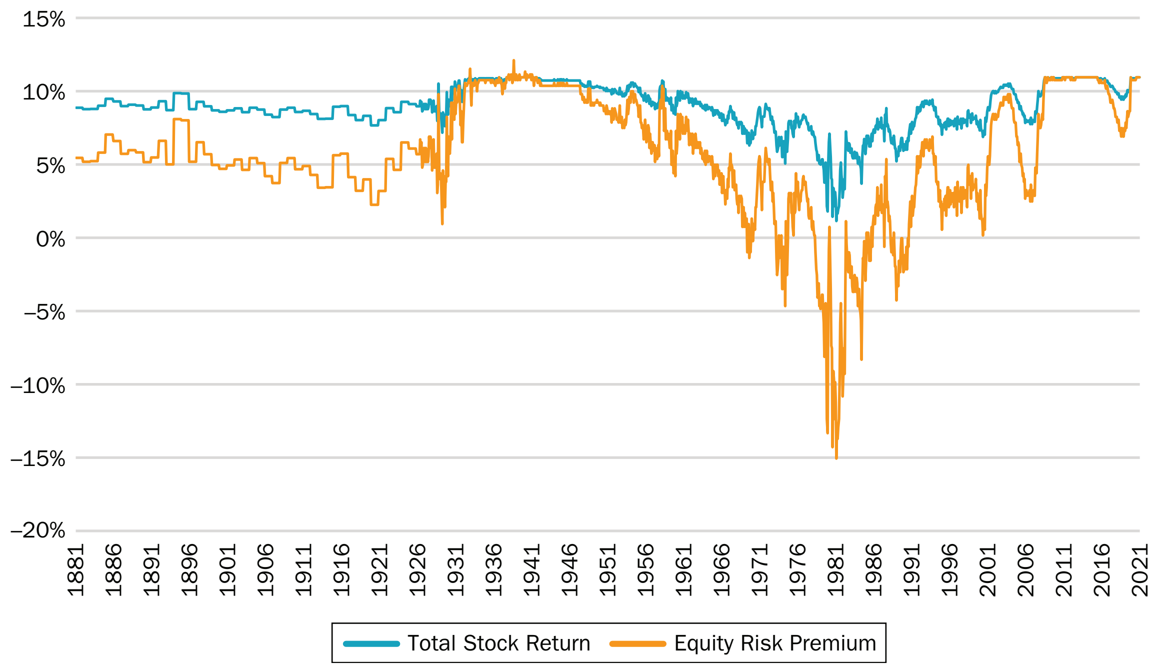
In yet another robustness test, we consider alternative definitions of the equity risk premium. Instead of defining the equity risk premium as the total return on

[8] We do not think that it is appropriate to split the sample into shorter periods because subsamples need to contain periods with high risk-free returns and also periods with low risk-free returns in order to reliably estimate the relation between the risk-free return and stock returns.

[9] Our results are also robust to including the Halloween indicator of Bouman and Jacobsen (2002) as an additional control factor, defined as a dummy variable that is zero from May to October and one from November to April.

EXHIBIT 4

Fitted Stock Returns in the Regression with Only the Risk-Free Return, February 1881–June 2021



equities minus the return on short-term Treasury bills ($R_m - R_{bills}$), we consider the total return on equities minus the return on Treasury bonds ($R_m - R_{bonds}$) or the real return on equities (R_m – Inflation) as the dependent variable in the regressions. We obtain data for bond returns and inflation from the Shiller dataset, where we define the inflation in month T as the percentage change in the Consumer Price Index (CPI) level from month T – 12 to T divided by 12, in order to alleviate the noise and seasonal effects in the CPI data. Panel D of Exhibit 3 shows that our results are highly robust to using these alternative equity risk premium definitions, with similar estimated coefficients for the explanatory variables.

In unreported tests we also find very similar results if we use bond returns or bond yields instead of bill returns as the risk-free asset on the right-hand side of the regressions (Blitz 2020) or if we conduct the regressions with annual instead of monthly data.

Implied Equity Risk Premium Estimates

In this section, we examine the fitted values of the (full-sample) regressions, which can be interpreted as conditional predictions for the equity risk premium. We also compute the corresponding conditional total equity returns by adding back the prevailing risk-free return. For ease of interpretation, we annualize all these figures. Exhibit 4 shows the results for the regression with the risk-free return as the only explanatory variable. We observe that the predicted total return is more stable than the predicted equity risk premium, which is in line with the interpretation of the regression results in the previous section. The predicted total equity return is typically around 8% to 11%. The most notable deviation is during the late 1970s and early 1980s when interest rates were very high, which translates into lower expected returns given the estimated regression coefficients. The expected total return is still positive, but after accounting for the high risk-free return, the expected equity risk premium becomes deeply negative during this period.

EXHIBIT 5

Fitted Stock Returns in the Regression with the Risk-Free Return and Earnings Yield, February 1881–June 2021

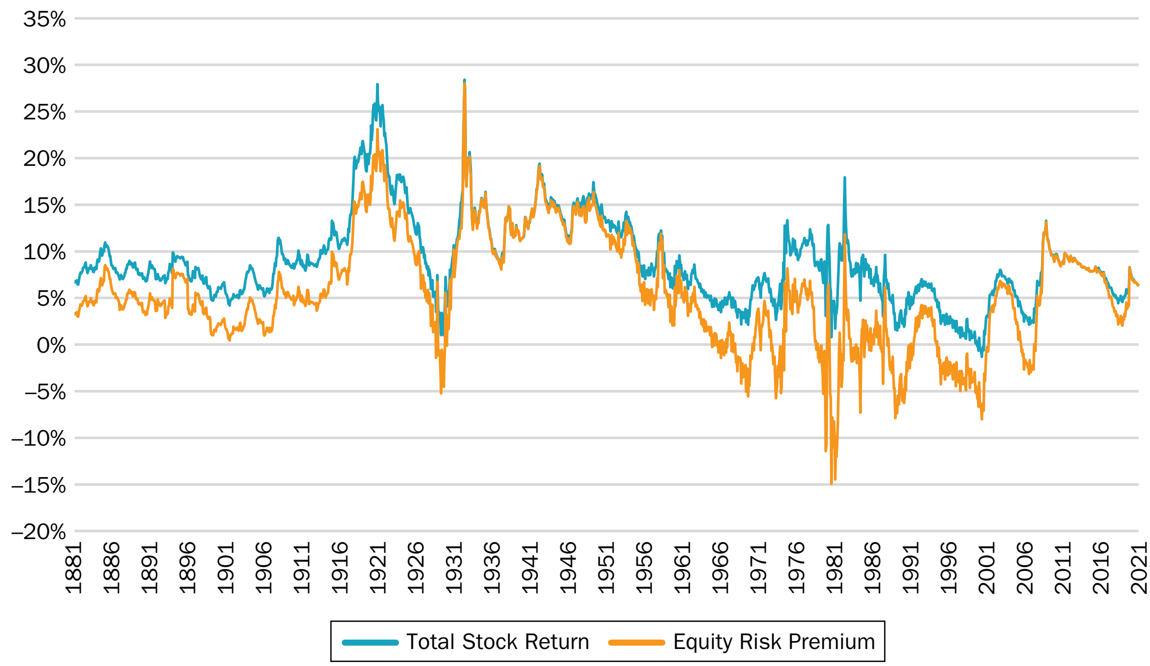


Exhibit 5 shows that the predicted returns exhibit much stronger time variation when additionally controlling for earnings yield, that is, inverted CAPE. However, predicted total returns remain more stable than the predicted risk premium. Moreover, predicted total returns are not lower during the periods with a low risk-free return, such as the 1940s and 2010s, than during the periods with a high risk-free return, such as the 1970s and 1980s. As a result, the predicted equity risk premium is generally higher in the periods with a low risk-free return.

At the very end of the sample, the risk-free return is virtually zero, so the predicted total return and risk premium are practically identical. The predicted equity return is about 11% based on the regression with just the risk-free return, but this drops to about 6.5% when additionally accounting for the level of the earnings yield, which is relatively low (i.e., the market trades at a relatively high valuation).

International Evidence

To alleviate data snooping concerns, we proceed by examining if our results carry over to international markets, using the dataset of the Jordà et al. (2019) study. As discussed in the data section, the international data are only available at an annual frequency, and valuation metrics are not available. Thus, we only have annual stock returns and risk-free returns on short-term government bills or bonds. For each country, we regress the stock returns in excess of the risk-free return on the risk-free return, using short-term government bills as the risk-free asset. The estimated regression coefficients and t-statistics are reported in Exhibit 6. We observe that the sign of the coefficients is negative for all 16 countries, with an average across all 16 countries of –1.10 and a median of –0.94. Both values are close to –1, which is the level that corresponds to expected total stock returns being constant and the equity risk premium being inversely related to the risk-free return. The coefficients are statistically significant at the 5% level for 7 countries and at the 10% level for 12 countries.

EXHIBIT 6

Estimated Coefficients and *t*-Statistics for Risk-Free Return in Regressions of Country Excess Stock Returns on Risk-Free Returns, Annual Data from 1870/1900 to 2021

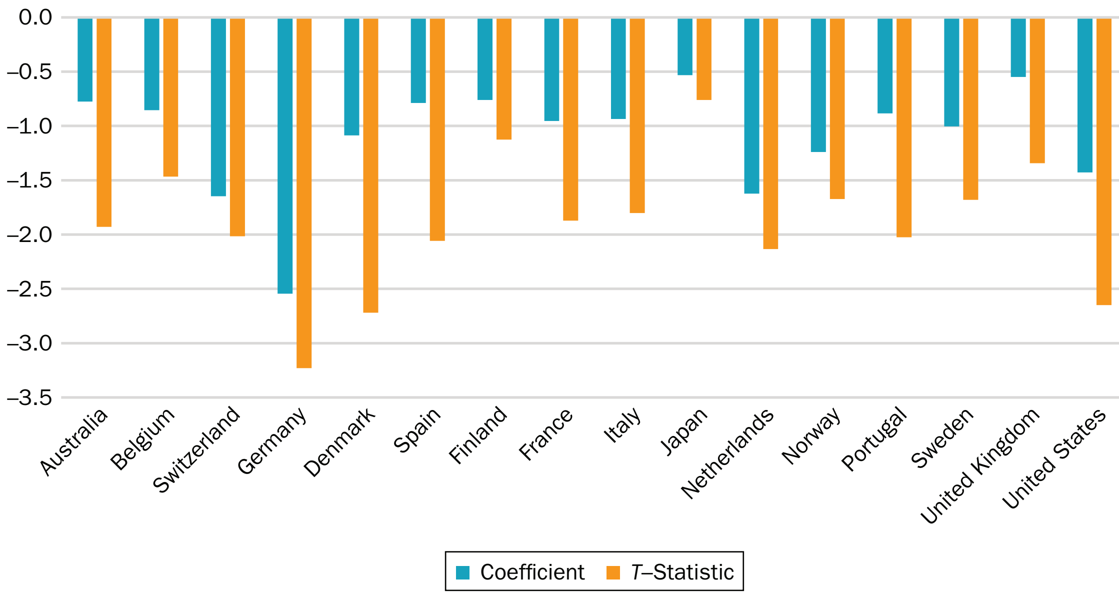


Exhibit 7 shows for each country the average realized stock return conditional on the level of the risk-free return, similar to Exhibit 2 discussed before for the US. For most countries the total stock returns are flat or even inversely related to the level of the risk-free return, implying a very high equity risk premium when the risk-free return is low, and a very low equity risk premium when the risk-free return is high. The main exceptions are Spain, Finland, Japan, and Portugal. For Spain and Finland it must be noted that the risk-free return below 2% environment is only the 2008–2021 period, as the risk-free return in these countries used to be structurally above 2%. Moreover, Finland and Portugal are very small stock markets, for example, the MSCI Finland index only contains 11 stocks and the MSCI Portugal index a mere 4.

Japan appears to be a special case, as so often in finance. Until 1994, the risk-free return was structurally above 2%, which includes the Japanese great post-WW2 bull market period from 1949 to 1989. From 1995 onwards, the risk-free return has been structurally below 2%, but stock market returns have not been great throughout most of this period. An important omitted factor here could be the high valuation (i.e., low earnings yield) of the Japanese stock market following its great bull run. A CAPE series with a long history is unfortunately not available for the Japanese market, but we conjecture that including such data would lead to more consistency with the other markets.

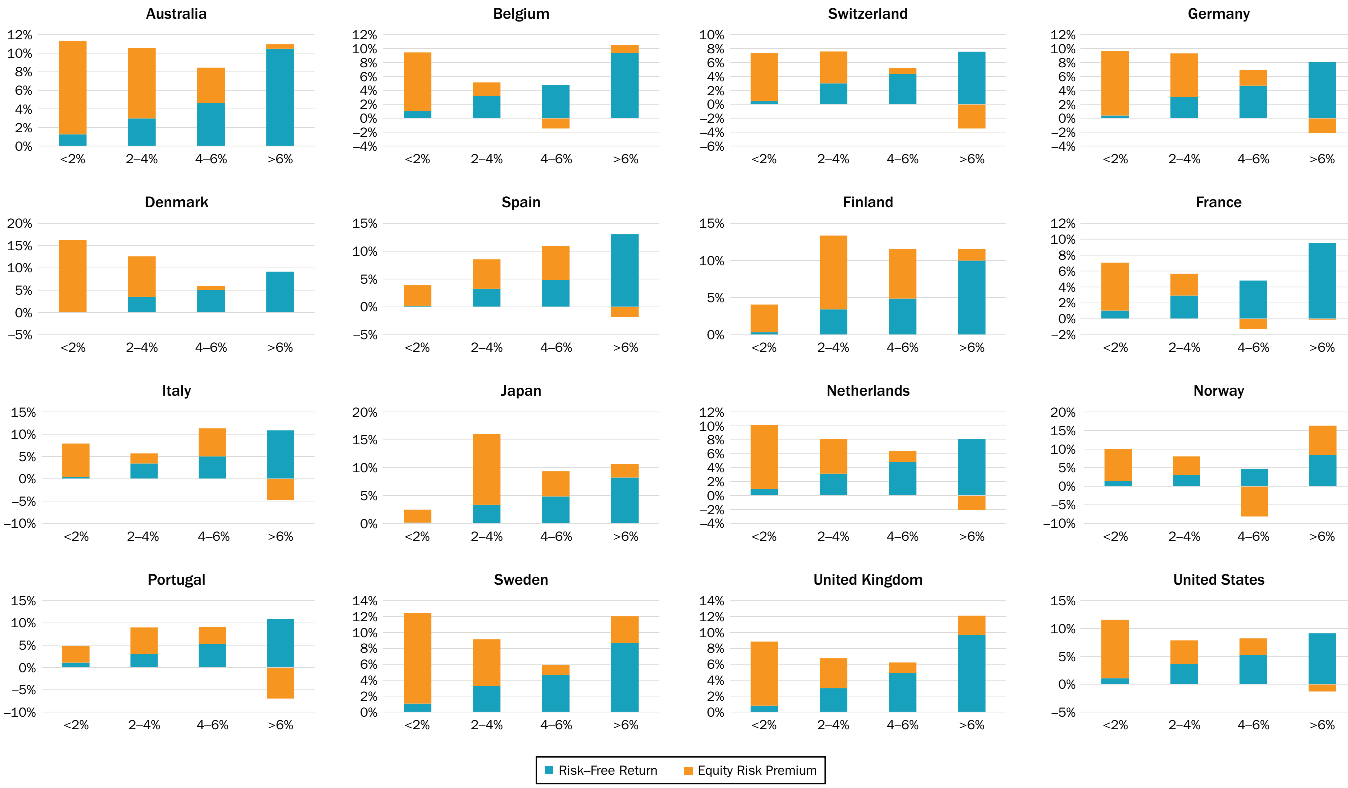
DISCUSSION

Possible Explanations

In this section we discuss various possible explanations for our key finding that total stock returns are not lower when the risk-free return is low. In particular, we consider a risk-based explanation, a “there is no alternative” (TINA) explanation that comes down to multiple expansion, and an explanation based on fundamentals.

EXHIBIT 7

Stock Returns Conditional on the Level of the Risk-Free Return, Annual Data from 1870/1900 to 2021



Our discussion is brief and mostly qualitative because formal tests for these hypotheses lack statistical power.

A higher equity risk premium during low-risk free return periods could be fully consistent with rational asset pricing if stocks happen to be considerably riskier during such periods. This explanation does not appear to be plausible though, because realized stock volatility has generally been below average throughout most of these periods. The only exception is the very first low risk-free return period from 1930 to 1940, when stock returns were extremely volatile due to the great depression and onset of war. However, the realized equity risk premium was negative during this period, so the high risk was not associated with a high return. In other words, the high equity risk premium during low risk-free return periods fully accrued in the relatively calm times instead of the turbulent times. Thus, there appears to be no empirical support for a risk-based explanation of our findings.

We next consider the "there is no alternative," or TINA, explanation. The idea here is that as the risk-free return falls, fixed income investments such as bonds and bills lose their attractiveness, so investors flock to the only alternative left, namely stocks. This hypothesis predicts a widening of valuation multiples during low risk-free return periods, as investors push up share prices solely for lack of a better alternative. According to the Shiller data, multiples have indeed widened substantially over the most recent decade. However, during the preceding decade, when the risk-free return was also predominantly low, there was clear multiple contraction. Moreover, valuation multiples were more or less stable, on balance, over the 1930 to 1955 low-risk free return period. Thus, the TINA hypothesis also does not seem to be supported by the data.

If stocks have high returns but no multiple expansion when risk-free returns are low, then this would seem to imply that firms have a strong operating performance during such periods. This should not be the case in theory, because if the equity risk premium were a stable reward on top of the prevailing risk-free return, then total stock returns should be increasing with the risk-free return, and hence, operating performance should exhibit a similar pattern. These two competing hypotheses can be put to the test by examining the relation between earnings growth and risk-free returns. Using the Shiller earnings data, we find a negative coefficient in a regression of annual percentage earnings changes on risk-free return levels. Although this negative coefficient is only weakly statistically significant, the clear absence of a positive sign is consistent with the hypothesis that operating performance is at least as strong when the risk-free return is low as when it is high. Thus, the empirical relation between stock returns and the risk-free return appears to be mirrored by a similar relation between operating performance and the risk-free return. At best, however, this only offers a partial explanation because the new puzzle becomes why operating performance behaves this way.

Methodological Challenges

Our results may appear to be at odds with the influential work of Welch and Goyal (2008), recently updated in Goyal, Welch, and Zafirov (2021), who examined many proposed predictors for the equity risk premium and found that these generally perform poorly out-of-sample—and sometimes even in-sample as well. They concluded that these signals would not have helped investors with access only to information available in real time to profitably time the market. Among the predictors that they rejected are the short-term risk-free return rate as well as several other metrics related to interest rates. How should our results be interpreted in light of their results?

First, it is important to realize that we do not propose a market timing strategy. We find that the equity risk premium tends to be larger when the risk-free return is low and that the equity risk premium tends to be smaller when the risk-free return is high. However, we do not identify scenarios in which the equity risk premium is strongly negative, which would be needed to justify short positions. Thus, when used as a tactical asset allocation strategy, our signal would be long 100% of the time. We see the application of our insights more at the strategic asset allocation level, such as asset liability management studies.

Second, we acknowledge that our insights are based on ex post observations. The first period with prolonged (US) risk-free returns below 2% occurs from 1930 to 1955, so prior to 1930, investors had basically zero historical guidance for what to expect about stock returns in such an environment. It took until the end of 2001 before the risk-free return dropped again below 2%. For most of the subsequent 20 years, the risk-free return remained below 2%, which gives us our second observation period. We now know that this was also a very good period for equities, but prior to 2001, an investor would only have known about the 1930 to 1955 period, which might have been considered insufficient evidence. Thus, although 140 years may sound like a very long period, it is actually still a small sample for uncovering time variation in the equity risk premium with a strict in-sample/out-of-sample approach because of the very long cycles in risk-free return levels. Nevertheless, we believe that our insights are too striking to be ignored.

Another methodological concern is that regressing stock returns on highly persistent explanatory factors may lead to spurious results. The first-order autocorrelations over the full sample period are 97.6% for the risk-free return and 99.3% for the earnings yield, and Ferson, Sarkissian, and Simin (2003a, 2003b) showed that such persistent variables can appear to be better at predicting returns than they actually are. The problem diminishes with longer sample periods, but, again, even 140 years of data is not all that much in this context. We mitigate data snooping concerns by considering international evidence, but the caveat here is that these tests are only partially independent due to the positive correlations between global stock markets. Ferson, Sarkissian, and Simin (2003a, 2003b) recommended to prevent spurious results by raising the threshold for the significance of t-statistics to around 3 instead of 2. Applying such thresholds would render some of our results borderline significant instead of strongly significant.

CONCLUSION

We examined empirically whether expected stock returns increase with the level of the risk-free return, as expected if the equity risk premium is a stable reward on top of the prevailing risk-free return. Using long-term historical data for the US equity market, our statistical tests strongly reject the hypothesis that a higher risk-free return implies higher total expected stock returns. Instead, total expected stock returns appear to be unrelated (or perhaps even inversely related) to the level of the risk-free return, which implies that the equity risk premium is much higher when the risk-free return is low than when it is high. This conclusion is robust to including various control factors and over subsamples.

Important caveats are that our findings do not imply a profitable tactical asset allocation rule that could have been applied in real time and that there is a risk of spurious regression results because explanatory variables such as the risk-free return are highly persistent. Nevertheless, we believe that our findings challenge the conventional wisdom about expected stock returns and should be considered in strategic asset allocation decisions, in particular when the risk-free return is very high or very low compared to its historical average.

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REFERENCES

Ang, A., and G. Bekaert. 2007. "Stock Return Predictability: Is It There?" *The Review of Financial Studies* 20 (3): 651–707.

Baltussen, G., B. van Vliet, and P. van Vliet. "The Cross-Section of Stock Returns before 1926 (and Beyond)." Working paper no. 3969743, SSRN, 2021.

Blitz, D. 2020. "The Risk-Free Asset Implied by the Market: Medium-Term Bonds instead of Short-Term Bills." *The Journal of Portfolio Management* 46 (8): 120–132.

Bouman, S., and B. Jacobsen. 2002. "The Halloween Indicator, 'Sell in May and Go Away': Another Puzzle." *The American Economic Review* 92 (5): 1618–1635.

Chen, N. 1991. "Financial Investment Opportunities and the Macroeconomy." *The Journal of Finance* 46 (2): 529–554.

Damodaran, A. 2021. "Equity Risk Premiums (ERP): Determinants, Estimation, and Implications—The 2021 Edition." Working paper no. 3825823, SSRN, 2021.

Dimson, E., P. Marsh, and M. Staunton. *The Millennium Book: A Century of Investment Returns*. ABN-AMRO/London Business School, 2000. London, United Kingdom.

Duarte, F. M., and C. Rosa. "The Equity Risk Premium: A Review of Models." Staff report, no. 714, Federal Reserve Bank of New York, 2015.

Faber, M. T. 2007. "A Quantitative Approach to Tactical Asset Allocation." *The Journal of Wealth Management* 9 (4): 69–79.

Fama, E. F., and K. R. French. 1989. "Business Conditions and Expected Returns on Stocks and Bonds." *Journal of Financial Economics* 25 (1): 23–49.

——. "A Five-Factor Asset Pricing Model." *Journal of Financial Economics* 116 (1): 1–22.

Fama, E. F., and G. W. Schwert. 1977. "Asset Returns and Inflation." *Journal of Financial Economics* 5 (2): 115–146.

Fernandez, P. "Survey: Market Risk Premium and Risk-Free Rate Used for 88 Countries in 2021." Working paper no. 3861152, SSRN, 2021.

Ferson, W. E., S. Sarkissian, and T. Simin. 2003. "Spurious Regression in Financial Economics?" *The Journal of Finance* 58 (4): 1393–1413.

——. 2003. "Is Stock Return Predictability Spurious?" *The Journal of Investment Management* 1 (3): 1–10.

Goyal, A., I. Welch, and A. Zafirov. 2021. "A Comprehensive Look at the Empirical Performance of Equity Premium Prediction II." Working paper no. 3929119, SSRN, 2021.

Jordà, Ò., K. Knoll, D. Kuvshinov, M. Schularick, and A. M. Taylor. 2019. "The Rate of Return on Everything, 1870–2015." *The Quarterly Journal of Economics* 134 (3): 1225–1298.

Maio, P. 2013. "The 'Fed Model' and the Predictability of Stock Returns." *Review of Finance* 17 (4): 1489–1533.

Mehra, R., and E. C. Prescott. 1985. "The Equity Premium: A Puzzle." *Journal of Monetary Economics* 15 (2): 145–161.

Shiller, R. J. *Irrational Exuberance*. Princeton, NJ: Princeton University Press, 2000.

Welch, I., and A. Goyal. 2008. "A Comprehensive Look at The Empirical Performance of Equity Premium Prediction." *The Review of Financial Studies* 21 (4): 1455–1508.