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Do time-varying risk premiums explain labor market performance?[☆]

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ABSTRACT

Within the standard search and matching model, time-to-build implies that high aggregate risk premiums should forecast low employment growth in the short run but high employment growth in the long run. If there is also time-to-plan, high risk premiums should forecast low net hiring rates in the short run but high net hiring rates in the long run. Our evidence indicates two-quarter time-to-build in the aggregate payroll data, no time-to-plan in the aggregate hiring data, but two-quarter time-to-plan in the job creation data for manufacturing firms. High payroll growth and high net job creation rate in manufacturing also forecast low stock market excess returns at business cycle frequencies.

1. Introduction

Modern asset pricing research has shown that aggregate stock market returns in excess of the short-term interest rate are predictable, meaning that expected aggregate risk premiums are time-varying.[1] This body of evidence suggests that a large fraction of the variation in the cost of capital in standard labor market models is driven by time-varying risk premiums, as opposed to the interest rate. However, probably because of the long-standing divide between labor economics and finance (especially asset pricing), prior work that draws the linkage between time-varying risk premiums and labor market performance seems scarce. Our reading of the labor economics literature suggests that it has largely ignored the impact of time-varying risk premiums on the labor markets.

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[1] For example, Campbell and Shiller (1988), Fama and French (1988), and Hodrick (1992) show that the dividend yield forecasts market excess returns. Fama and Schwert (1977) and Fama (1981) show that the relative Treasury bill rate, defined as the Treasury bill rate minus its past four-quarter moving average, predicts market excess returns. Keim and Stambaugh (1986) and Fama and French (1989) find that the term premium and the default premium predict returns. Cochrane (1991) shows that the aggregate investment-to-capital ratio and Lettau and Ludvigson (2001) show that the log consumption-to-wealth ratio forecast market excess returns.

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In this article, we use the standard search and matching framework (e.g., Pissarides, 1985, 2000; Mortensen and Pissarides, 1994) to study the impact of time-varying risk premiums on the labor market. When risk premiums are time-varying, different labor market frictions give rise to different sets of temporal relations between the expected return, labor hiring, and employment growth.

Time-to-build means that hiring in the current period leads to more productive workers in the next period. Consider a discount rate drop at the beginning of the current period. The stock price rises immediately, meaning that the marginal benefit of hiring and therefore hiring also increase. With time-to-build, the employment stock increases only at the beginning of the next period. As such, the current-period employment growth is positive, and regressing it on the discount rate yields a negative slope. However, the discount rate drop also means that the realized return declines on average in the current period. The resulting lower stock price at the beginning of the next period means a lower marginal benefit of hiring and therefore lower hiring in the next period. Time-to-build implies that the next-period employment growth is negative, and that regressing it on the current-period discount rate yields a positive slope. In short, the discount rate should forecast employment growth with a negative slope in the short run but a positive slope in the long run. However, forecasting the next-period hiring rate with the current-period discount rate should yield only a positive slope without sign flipping at longer horizons. A similar logic shows that the effect of two-period time-to-build is to prolong the horizon over which the slope switches sign by one more period.

Time-to-plan means that time lags exist between the decision to hire and the actual hiring expenditure. Consider again a discount rate drop but with one-period time-to-plan (along with one-period time-to-build). The discount rate drop at the beginning of t generates a higher stock price at t. With the planning lag, hiring rises only in period $t+1$ but remains constant in t. With one-period time-to-build, employment rises at the beginning of $t+2$ but remains unchanged in $t+1$. The discount rate drop also means that the stock return drops on average over period t. The resulting lower stock price at the beginning of $t+1$, together with time-to-plan, means a drop in hiring over period $t+2$ and a fall in employment at the beginning of $t+3$. Pulling the dynamics together, we observe that the discount rate should forecast employment growth (up to $t+2$) and the hiring rate (up to $t+1$) with a negative slope in the short run, but a positive slope in the long run.

We report three empirical findings. First, measuring employment growth as the growth rate of seasonally adjusted total nonfarm payrolls from US Bureau of Labor Statistics (BLS), we find that high values of the log consumption-to-wealth ratio (CAY) of Lettau and Ludvigson (2001) predict low payroll growth at short horizons within two quarters, but high payroll growth at longer horizons. Pulling all the information contained in standard risk premium proxies including the dividend yield, CAY, the relative Treasury bill rate, the term spread, and the default premium, we correlate the one-quarter-ahead fitted risk premiums with cumulative payroll growth over various horizons. We find that the correlations are insignificantly negative within two quarters, insignificantly positive at the fourth quarter, but significantly positive from the eight-quarter horizon and onward. The evidence so far suggests that either two-period time-to-build or the combined effect of one-period time-to-build and one-period time-to-plan is at work in the aggregate employment data.

Second, we measure the hiring rate as the difference between gross hiring rate and separation rate from the Current Population Survey, conducted by the US Census Bureau for the BLS, and the BLS's Jobs Openings and Labor Turnover Survey (JOLTS). We find that high values of CAY predict high net hiring rates at various horizons. The correlations between the one-quarter-ahead fitted risk premiums with the I-quarter-ahead net hiring rates are all positive, ranging from 0.16 to 0.35, and are mostly significant. The evidence suggests that there is no time-to-plan in the aggregate hiring data and that the temporal relations between the discount rate and payroll growth must be driven by two-period time-to-build.

The evidence is more supportive of time-to-plan in manufacturing firms. When forecasting the net job creation rate in manufacturing from Davis, Faberman, and Haltiwanger (2006), the relative bill rate has a significantly positive slope in the one-quarter horizon, a weakly positive slope in the two-quarter horizon, but significantly negative slopes at the four- and eight-quarter horizons. The correlations between the one-quarter-ahead fitted risk premiums and the I-quarter-ahead net job creation rates in manufacturing are significantly negative in the one-quarter horizon, effectively zero in the two-quarter horizon, and significantly positive in the four- and eight-quarter horizons. The evidence suggests that time-to-plan for hiring lasts for about two quarters in manufacturing.

Third, lagged payroll growth predicts market excess returns, especially at business cycle frequencies. In univariate regressions, the adjusted R^2 peaks at 5% in the four-quarter horizon. Across various horizons, the slopes are universally negative and mostly significant. Judged on Newey and West (1987) t-statistics and adjusted R^2s in univariate regressions, the predictive power of payroll growth dominates that of standard risk premium proxies such as the default spread and the relative Treasury bill rate. Whereas the dividend yield and the term spread maximize their predictive power at long horizons, the predictive power of payroll growth peaks at short business cycle frequencies around four quarters. We also find similar evidence using the net job creation rate in manufacturing, but stock market predictability with the net hiring rate for the overall economy is weak.

Our work shows that time-varying risk premiums are quantitatively important in forecasting employment growth. However, leading models in labor economics ignore risk premiums. In particular, the constant discount rate assumption is embedded in the partial equilibrium Mortensen and Pissarides search and matching framework. As such, risk premiums are constant and cannot forecast future employment growth. Merz (1995), Andolfatto

(1996), and Gertler and Trigari (2009) integrate the search and matching model into the standard business cycle framework with general equilibrium. However, their models follow the real business cycle literature in assuming log utility, which in turn implies that the risk premiums in their models are close to zero and largely time-invariant.

Our work is related to Lettau and Ludvigson (2002), who build on Barro (1990) and Lamont (2000) to study the impact of time-varying risk premiums on aggregate investment. We focus on the labor market. The asset pricing literature has only started to analyze the impact of labor on stock prices. Boyd, Hu, and Jagannathan (2005) show that stock market index responds positively to an announcement of rising unemployment in expansions but negatively in contractions. Merz and Yashiv (2007) quantify the importance of labor in explaining stock market valuation. Bazdresch, Belo, and Lin (2009) show that high employment growth predicts low average returns in the cross section. We instead study the impact of time-varying risk premiums on the labor market as well as stock market predictability with labor market variables. Finally, the voluminous literature on stock market predictability (see footnote 1) has largely ignored labor market variables. We fill this gap.

The rest of the paper is organized as follows. Section 2 develops testable hypotheses, Section 3 describes our data and test design, Section 4 presents the results, and Section 5 concludes.

2. Hypothesis development

We formulate the search and matching model as in Yashiv (2000) and Merz and Yashiv (2007) in Section 2.1, and we develop testable hypotheses in Subsection 2.2.

2.1. The model

The economy is populated by identical workers and identical firms. Time is discrete and horizon infinite. Labor is the only input in a constant-return-to-scale production function. The operating profits are given by $\Pi(N_t,X_t)=f(X_t)N_t$, in which N_t is total employment and X_t is productivity shock. To attract new workers, a firm needs to post a number of job vacancies, J_t. For each vacancy posted, the firm takes as given the probability λ_t at which the vacancy is filled. The firm's gross hires are given by $H_t \equiv \lambda_t J_t$. Workers are paid a gross compensation rate of W_t. Hiring costs include both the cost of advertising, screening, and selecting new workers and the cost of training. These costs depend on the stock of employment, the number of vacancies, and the probability of filling the vacancy.

For simplicity, we assume that the hiring costs function is quadratic: $(a/2)(\lambda_t J_t/N_t)^2 N_t$, in which $a>0$. The hiring costs are increasing and convex in the number of new hires and are decreasing in the employment stock. (The costs depend on λ_t and J_t only through their product.) These properties are desirable because training costs and costs of time spent on screening and selecting new workers increase with the number of new hires. Firms make hiring decisions at the beginning of each period t, and the new hires enter production in the beginning of period $t+1$. Separation of workers from jobs occurs at a constant rate of $s, 0 \le s \le 1$, which firms take as given. As a result, the employment stock evolves as

$$N_{t+1}=(1-s)N_t+\lambda_t J_t. \tag{1}$$

Firms choose the number of job vacancies to post each period to maximize the discounted present value of future free cash flows. When discounting, firms take as given the stochastic discount factor from period t to $t+i$, denoted M_{t+i}. The dynamic problem of the firms is given by

$$\max_{\{J_{t+i},N_{t+i+1}\}} E_t\left[\sum_{i=0}^{\infty} M_{t+i}\left[\Pi(N_{t+i},X_{t+i})-W_{t+i}N_{t+i}-\frac{a}{2}\left(\frac{\lambda_{t+i}J_{t+i}}{N_{t+i}}\right)^2 N_{t+i}\right]\right], \tag{2}$$

subject to Eq. (1). Let q_t denote the Lagrangian multiplier associated with the constraint given by Eq. (1). The multiplier is the marginal benefit of an additional unit of employment.

The first-order conditions of J_t and N_{t+1} are given by, respectively,

$$q_t = a\left(\frac{\lambda_t J_t}{N_t}\right), \tag{3}$$

and

$$q_t = E_t\left[M_{t+1}\left[f(X_{t+1})-W_{t+1}+\frac{a}{2}\left(\frac{\lambda_{t+1}J_{t+1}}{N_{t+1}}\right)+(1-s)q_{t+1}\right]\right]. \tag{4}$$

Eq. (3) says that the marginal benefit of hiring equals the marginal cost of hiring. Eq. (4) says that the marginal benefit of hiring equals the next period marginal product of labor net of gross compensation plus the saving of hiring costs and the continuation value of the employment stock net of separation, discounted to time t using M_{t+1}.

Combining the two first-order conditions, using Eq. (1) to substitute out $\lambda_t J_t$, and simplifying, we obtain $E_t[M_{t+1}R^H_{t+1}]=1$, in which R^H_{t+1} is the hiring return, defined as

$$R^H_{t+1} \equiv \frac{f(X_{t+1})-W_{t+1}+(a/2)(N_{t+2}/N_{t+1})^2-(a/2)(1-s)^2}{a(N_{t+1}/N_t)-a(1-s)}. \tag{5}$$

As such, R^H_{t+1} is the ratio of the marginal benefit of hiring at period $t+1$ divided by the marginal cost of hiring at period t. With constant returns to scale, the hiring return equals the stock return, R_{t+1}.[2]

[2] Cochrane (1991) first outlines the basic idea underlying this equivalence. Our proof follows the logic in Liu, Whited, and Zhang (2009, Appendix A). Let V_t be the cum-dividend value of equity given by Eq. (2), $P_t \equiv V_t - D_t$ be the ex-dividend value of equity, in which $D_t \equiv f(X_t)N_t - W_tN_t - (a/2)(\lambda_t J_t/N_t)^2 N_t$ is the current-period dividend. We expand V_t as follows (noting $H_t = \lambda_t J_t$):

$$P_t + D_t = D_t - q_t[N_{t+1}-(1-s)N_t-H_t]$$

$$+E_t\left[M_{t+1}\left[f(X_{t+1})N_{t+1}-W_{t+1}N_{t+1}\right.\right.$$

2.2. Testable hypothesis

When the left-hand side is the stock market return, Eq. (5) motivates our testable hypotheses.

2.2.1. Forecasting employment growth

The empirical finance literature has shown a standard list of risk premium proxies (see footnote 1). Because the interest rate has high persistence and small variance, these variables are in effect proxies for the discount rate, $E_t[R_{t+1}]$. As such, Eq. (5) implies that regressing short-horizon employment growth, N_{t+1}/N_t, on $E_t[R_{t+1}]$ should yield negative slopes, but regressing long-horizon employment growth, N_{t+2}/N_{t+1}, on $E_t[R_{t+1}]$ should yield positive slopes.

H1. The risk premium proxies that predict market excess returns positively should have negative slopes in the short run but positive slopes in the long run in predicting employment growth. The proxies that predict market excess returns negatively should have positive slopes in the short run but negative slopes in the long run in predicting employment growth.

The one-period time-to-build embedded in Eq. (1) is important for producing the predictability of employment growth. This friction says that hiring at time t, $\lambda_t J_t$, leads only to more productive workers at the beginning of $t+1$. The effect of this friction on employment growth predictability is intuitive. The length of the decision period (e.g., one month, one quarter, one year, or longer) is unspecified in the model. If the decision period is one year, Eq. (5) says that regressing employment growth up to four quarters ahead on the discount rate should yield negative slopes and that regressing employment growth at longer horizons on the discount rate should yield positive slopes. If the decision period is one quarter instead, we should see only negative slopes from using the one-quarter-ahead employment growth as the dependent variable. Employment growth at longer horizons should produce positive slopes. As such, the horizon at which the regression slopes switch signs indicates the length of time-to-build.

2.2.2. Forecasting hiring rate

The time-to-build mechanism differs subtly from time-to-plan discussed in Lamont (2000) and Lettau and Ludvigson (2002) in the context of investment. Time-to-plan means that there are time lags between the decision to hire and the actual hiring expenditure. Fig. 1 clarifies the differences between time-to-build and time-to-plan by depicting the hypothetical responses of realized returns, stock prices, employment growth, and hiring to a one-time shock to the expected return.

In the one-period time-to-build model (Panel A), a discount rate drop at the beginning of t generates a higher stock price at the beginning of t. Without time-to-plan, hiring over period t rises immediately. With time-to-build, employment stock increases only at the beginning of $t+1$, meaning that employment growth over period t is positive. In addition, because the discount rate at the beginning of t drops, the realized return over period t, denoted R_{t+1}, declines on average. The stock price also drops, along with the hiring over period $t+1$. Time-to-build again implies that employment stock decreases only at the beginning of $t+2$, meaning that employment growth over period $t+1$ is negative. As such, regressing short-term employment growth, N_{t+1}/N_t, on the discount rate, $E_t[R_{t+1}]$, should yield a negative slope, but regressing long-term employment growth, N_{t+2}/N_{t+1}, on the discount rate should yield a positive slope. However, regressing the hiring rate, H_{t+1}/N_{t+1}, on the discount rate should yield only a positive slope without sign switching at longer horizons.

Panel B of Fig. 1 analyzes two-period time-to-build, which means that hiring at the beginning of t, H_t, leads only to more productive workers at the beginning of $t+2$. A discount rate drop at the beginning of t generates a higher stock price at the beginning of t. Hiring goes up immediately, but with two-period time-to-build, employment stock at the beginning of $t+1$ remains unchanged. Because the discount rate at the beginning of t drops, the realized return over period t declines on average. The stock price at the beginning of $t+1$ and hiring over period $t+1$ both fall. However, employment stock at the beginning of $t+2$ increases as a result of hiring two periods ago. At period $t+2$, the stock price and hiring remain constant because there is only one-time shock to the discount rate at the beginning of t. However, employment stock at the beginning of $t+3$ decreases as a result of firing at $t+1$. The bottomline is that regressing employment growth up to $t+2$, N_{t+2}/N_t, on the discount rate should yield a negative slope, but regressing long-term employment growth, N_{t+3}/N_{t+2}, should yield a positive slope. As such, two-period time-to-build prolongs the horizon over which the slope switches signs by one more period. However, hiring rate dynamics remains the same. Regressing the hiring rate, H_{t+1}/N_{t+1}, on the discount rate yields only a positive slope without sign flipping at longer horizons.

Panel C of Fig. 1 combines one-period time-to-build with one-period time-to-plan as in Lettau and Ludvigson (2002). Similar to Panels A and B, a discount rate drop at the beginning of t generates a higher stock price. With one-period time-to-plan, hiring rises only in the next period but remains unchanged in the current period. As such, employment stock at the beginning of $t+1$ remains unchanged. Because the discount rate at the beginning of t drops, the realized return over period t declines on

(*footnote continued*)

$$-\frac{a}{2}\left(\frac{H_{t+1}}{N_{t+1}}\right)^2 N_{t+1}-q_{t+1}[N_{t+2}-(1-s)N_{t+1}-H_{t+1}]\Big]\Big]+\ldots$$

Recursively substituting Eqs. (3) and (4) into Eq. (6) yields $P_t=q_t[(1-s)N_t+H_t]=q_t\,N_{t+1}$ and

$$\begin{aligned}R_{t+1}&=\frac{P_{t+1}+D_{t+1}}{P_t}\\&=\frac{q_{t+1}[H_{t+1}+(1-s)N_{t+1}]+f(X_{t+1})N_{t+1}-W_{t+1}N_{t+1}-(a/2)(H_{t+1}/N_{t+1})^2N_{t+1}}{q_tN_{t+1}}\\&=\frac{q_{t+1}[H_{t+1}/N_{t+1}+(1-s)]+f(X_{t+1})-W_{t+1}-(a/2)(H_{t+1}/N_{t+1})^2}{q_t}\\&=\frac{f(X_{t+1})-W_{t+1}+(a/2)(N_{t+2}/N_{t+1})^2-(a/2)(1-s)^2}{a(N_{t+1}/N_t)-a(1-s)}=R^H_{t+1}.\end{aligned}$$

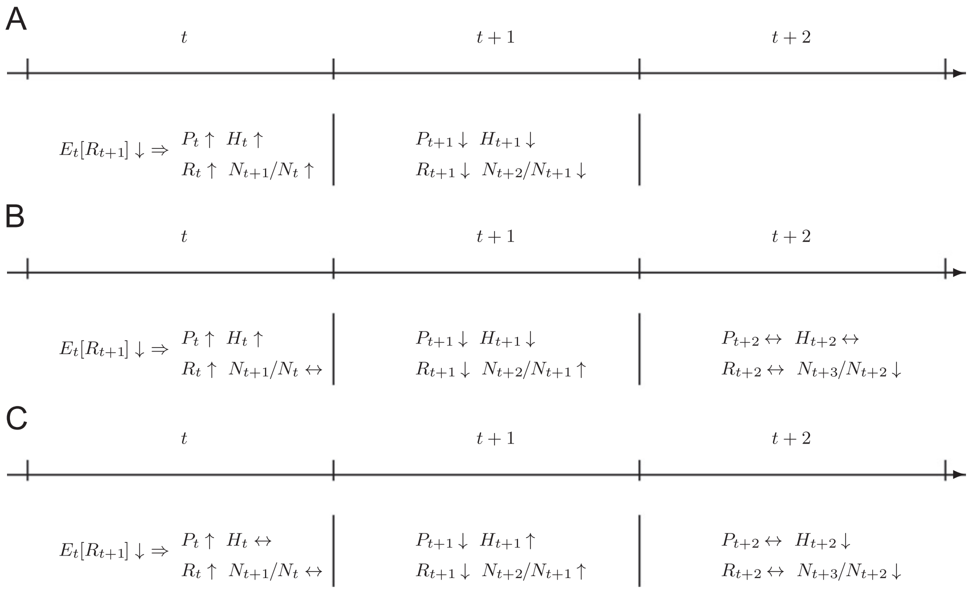

Fig. 1. Temporal relations between the expected return, labor hiring, and employment growth. The time lines depict the hypothesized responses of hiring, employment growth, stock prices, and realized returns to a one-time shock to the expected return. $E_t[R_{t+1}]$ is the expected return from the beginning to the end of period t conditional on information at the beginning of t. P_t is the ex-dividend stock price at the beginning of t. H_t is the number of new hires (a flow variable) over period t. N_{t+1}/N_t is employment growth from the beginning to the end of period t. R_{t+1} is the realized return from the beginning to the end of t. We depict the time lines for three models: standard one-period time-to-build (no time-to-plan, Panel A), two-period time-to-build (no time-to-plan, Panel B), and one-period time-to-build (and one-period time-to-plan, Panel C).

average. The stock price at the beginning of $t+1$ drops and causes firms to commit to decreasing hiring over the next period. However, because of the hiring commitment made at period t, hiring rises in period $t+1$. With one-period time-to-build, employment stock increases at the beginning of $t+2$. Over period $t+2$, the stock price and the stock return are constant, hiring falls per the prior commitment, and employment stock falls at the beginning of $t+3$. Comparing Panels B and C shows that employment growth dynamics remain the same. However, hiring dynamics are different. Regressing the hiring rate on the discount rate yields negative slopes in short horizons but positive slopes in long horizons. As such, we can test the empirical relevance of time-to-plan by studying the dynamic relations between the hiring rate and the discount rate.

H2. With time-to-plan, the risk premium proxies that predict market excess returns positively should have negative slopes in the short run but positive slopes in the long run in forecasting hiring rate. Without time-to-plan, these proxies should have only positive slopes in forecasting hiring rate. With time-to-plan, the risk premium proxies that predict market excess returns negatively should have positive slopes in the short run but negative slopes in the long run in forecasting hiring rate. Without time-to-plan, these proxies should have only negative slopes.

2.2.3. Forecasting market excess returns

Eq. (5) also has implications for stock market predictability. If employment growth is persistent, meaning that lagged employment growth, N_t/N_{t-1}, forecasts current employment growth, N_{t+1}/N_t, with a positive slope, lagged employment growth should forecast market excess return, R_{t+1}, with a negative slope. In addition, this forecasting power should concentrate in short horizons. It is R_{t+1}, instead of R_{t+2}, for example, that appears in the left-hand side of Eq. (5).[3]

Using Eq. (1), we can rewrite the denominator of the hiring return Eq. (5) as $a(H_t/N_t)$. This formulation, derived under one-period time-to-build without time-to-plan, implies that the current hiring rate should forecast market excess returns, R_{t+1}, with a negative slope. With one-period time-to-plan, the actual hiring expenditure is delayed by one period, and neither the current hiring rate nor the lagged employment growth predicts future returns. However, this result implicitly assumes that the length of one period in time-to-plan and in time-to-build equals the length of the period that it takes for the average realized return to converge to the expected return, $E_t[R_{t+1}]$. If this convergence takes longer than it takes to plan and to build, both the hiring rate and lagged employment growth should forecast returns.

H3. With time-to-build, hiring rate and lagged employment growth forecast market excess returns with negative slopes. With time-to-plan, whether the hiring rate and lagged employment growth forecast returns depends on the relative length of time-to-plan, time-to-build, and

[3] We use lagged employment growth, instead of current employment growth, to predict returns. Strictly speaking, in the context of the model with one-period time-to-build, N_{t+1} is known at the beginning of period t. As such, N_{t+1}/N_t can be used, at least in principle, to predict R_{t+1} that goes from the beginning to the end of period t. However, in the data both R_{t+1} and N_{t+1} are observable only at the end of period t, meaning that we should use lagged employment growth to avoid look-ahead bias in forecasting returns.

the convergence time between average and expected returns.

While we have emphasized the role of labor market frictions such as time-to-build and time-to-plan, search and matching costs also are important in generating the linkages between time-varying risk premiums and labor market performance. Without search and matching costs, $a=0$, Eq. (5) collapses to $R_{t+1}=f(X_{t+1})-W_{t+1}$. As such, no relation exists between the stock return and the employment growth (and the hiring rate) across various horizons. Intuitively, in a frictionless world, hiring is perfectly elastic to changes in the discount rate, meaning that a small change in the discount rate gives rise to an infinite magnitude of the hiring rate. As such, regressing future market excess returns on past employment growth or on the hiring rate should yield a slope of zero. Stock returns are not predictable with labor market variables.

3. Data and empirical specifications

We describe our data in Section 3.1 and empirical specifications in Section 3.2.

3.1. Data

Stock market returns. Following Lettau and Ludvigson (2002), we use the returns on the Standard and Poor (S&P) index of 500 stocks from the Center for Research in Security Prices (CRSP). The sample is quarterly from the first quarter of 1952 to the first quarter of 2009. Let r_t denote the log return of the S&P index and r_{ft} the log return on the three-month Treasury bill from the Federal Reserve. The log market excess return is then r_t-r_{ft}.

Employment growth. Employment growth is the log growth rate of payrolls (seasonally adjusted total nonfarm payrolls of all employees) from the US Bureau of Labor Statistics. The sample is quarterly from the first quarter of 1952 to the first quarter of 2009.

Net hiring rate. In the model, the separation rate, s, is constant, meaning that the hiring rate (H_t/N_t) captures the same amount of information as the net hiring rate (H_t/N_t-s). In the data, however, the separation rate is time-varying and countercyclical. There is more job destruction in recessions than in booms. To capture this feature of the data, we use net hiring rates in the data to test the model's implications for hiring rate dynamics.

We merge two series to construct net hiring rates. The first series are the differences between gross hiring rates and separation rates from the Current Population Survey from the first quarter of 1977 to the fourth quarter of 2002 (e.g., Bleakley, Ferris, and Fuhrer, 1999; and Merz and Yashiv, 2007). The second series are the differences between gross hiring rates and separation rates from the Jobs Openings and Labor Turnover Survey from the first quarter of 2001 to the first quarter of 2009. To make the two series comparable in magnitude, we scale the JOLTS series from the first quarter of 2003 to the first quarter of 2009 by the ratio of the average CPS net hiring rate to the average JOLTS net hiring rate in the 2001–2002 period (the only overlapping period for the two series). The merged series contain the CPS net hiring rates from the first quarter of 1977 to the fourth quarter of 2002 and the JOLTS net hiring rates from the first quarter of 2003 to the first quarter of 2009.

Net job creation rate in manufacturing. We calculate the net job creation rates in manufacturing as the job creation rates minus the job destruction rates for manufacturing firms from Davis, Faberman, and Haltiwanger (2006). The data from the first quarter of 1952 to the first quarter of 2005 are from John Haltiwanger's website.

Risk premium proxies. The empirical finance literature has uncovered a list of financial variables that forecast market excess returns (see footnote 1). We measure the dividend yield, DP, as the natural logarithm of the sum of the past four quarters of dividends per share minus the natural logarithm of the S&P 500 index level. The source for the S&P index and its dividends is CRSP. The relative bill rate, TB, is the three-month Treasury bill rate from the Federal Reserve minus its four-quarter moving average. The term premium, TRM, is the difference between the ten-year Treasury bond yield and the three-month Treasury bill yield from the Federal Reserve. The default premium, DEF, is the difference between the BAA-rated corporate bond yield and the AAA-rated corporate bond yield from the Federal Reserve. The data for CAY are from Sydney Ludvigson's website. The sample for all the risk premium proxies is from the first quarter of 1952 to the first quarter of 2009.

Macro controls. To quantify the incremental predictive power of risk premium proxies, we employ a group of macro control variables used in prior studies to forecast future macroeconomic performance (e.g., Barro, 1990; and Lettau and Ludvigson, 2002). These macro controls are lagged payroll growth, De; lagged net hiring rate, Dh; lagged net job creation rate in manufacturing, Dhm; lagged corporate profit growth, Dprofit, measured as the growth of the after-tax corporate profit with inventory valuation and capital consumption adjustments, seasonally adjusted in current dollars, from the Bureau of Economic Analysis; lagged growth of gross domestic product, Dgdp, measured as the growth of gross domestic product (GDP), seasonally adjusted in chain-weighted 2000 dollars, from Bureau of Economic Analysis; and the growth of average Q, Dq.[4]

Table 1 reports the descriptive statistics for the variables listed above. The payroll growth has a mean of 0.43% per quarter and a standard deviation of 0.64%. Lagged payroll growth forecasts future payroll growth up

[4] We define a firm's average Q as the ratio of the market value of assets to the book value of assets (Compustat annual item AT). The market value of assets equals the market value of common equity (price per share times common shares outstanding from CRSP) plus the book value of preferred stock (in sequence of availability, items PSTKL, PSTKRV, and PSTK) plus the book value of total debt [the sum of total short-term debt (item DLC) and total long-term debt (item DLTT)]. We calculate the aggregate average Q as the aggregate market value of assets divided by the aggregate value of book assets (excluding financial firms). To calculate the average Q observations within a given year, we use the market value of common equity observed at the end of each quarter within the year along with all the other components observed at the last fiscal year-end.

Table 1
Summary statistics.
For a list of key variables, we report the summary statistics such as mean, standard deviation (Std), minimum, 25th percentile, median, 75th percentile, maximum, and the first-, second-, and fourth-order autocorrelations (ρ_1,ρ_2, and ρ_4, respectively). Standard & Poor's 500 index returns are from the Center for Research in Security Prices. Payroll growth is the log growth rate of payroll (seasonally adjusted total nonfarm payrolls of all employees) from the US Bureau of Labor Statistics. Net hiring rate is the merged series of the difference between gross hiring and separation rates from the Current Population Survey (CPS) from 1977:Q1 to 2002:Q4 and the difference between gross hiring and separation rates from Jobs Openings and Labor Turnover Survey (JOLTS) from 2003:Q1 to 2009:Q1. We scale the JOLTS series from the first quarter of 2003 to the first quarter of 2009 by the ratio of the average CPS net hiring rate to the average JOLTS net hiring rate in the period 2001–2002. The net job creation rate in manufacturing is the difference between the job creation and job destruction rates for manufacturing firms from Davis, Faberman, and Haltiwanger (2006). The series is from 1952:Q1 to 2005:Q1 and is from John Haltiwanger's website. DP is the natural logarithm of the sum of the past four quarters of dividends per share minus the natural logarithm of the S&P index level. TB is the relative bill rate, measured as the three-month Treasury bill rate from the Federal Reserve Board minus its four-quarter moving average. TRM is the difference between the ten-year Treasury bond yield and the three-month Treasury bill yield from the Federal Reserve. DEF is the difference between BAA-rated and AAA-rated corporate bond yields from the Federal Reserve. CAY is Lettau and Ludvigson's (2001) log consumption-wealth ratio and is from Sydney Ludvigson's website. Corporate profit growth is the growth rate of the after-tax corporate profit with inventory valuation and capital consumption adjustments, seasonally adjusted in current dollars, from the Bureau of Economic Analysis. GDP growth is the growth rate of gross domestic product, seasonally adjusted in chain-weighted 2000 dollars, from the Bureau of Economic Analysis. Tobin's Q is the ratio of the aggregate market value of assets divided by the aggregate book value of assets (excluding financial firms). The market value of assets is the sum of the market value of common equity, the book value of preferred stock, and the book value of total debt. Except for net hiring rate and net job creation rate in manufacturing, the sample for all the other variables is from 1952:Q1 to 2009:Q1. All the series, except for DP, CAY, and Tobin's Q, are in quarterly percent.

Variables	Mean	Std	Minimum	25%	Median	75%	Maximum	ρ_1	ρ_2	ρ_4
Log S&P 500 excess return	1.22	8.09	−31.57	−2.94	2.47	6.53	19.06	0.10	−0.03	0.02
Payroll growth	0.43	0.64	−2.12	0.10	0.54	0.82	2.09	0.70	0.43	0.03
Net hiring rate	0.26	0.36	−0.82	0.07	0.28	0.46	1.49	0.44	0.29	0.18
Net job creation rate in manufacturing	−0.22	1.22	−4.31	−0.83	−0.07	0.44	4.50	0.70	0.40	−0.11
DP	−3.47	0.41	−4.49	−3.59	−3.43	−3.18	−2.78	0.97	0.95	0.89
CAY	0.00	0.01	−0.03	−0.01	0.00	0.01	0.04	0.88	0.80	0.67
TB	−0.01	0.83	−4.07	−0.37	0.04	0.42	3.56	0.46	0.10	0.11
TRM	1.37	1.20	−2.65	0.51	1.32	2.25	4.42	0.79	0.63	0.41
DEF	0.97	0.46	0.34	0.68	0.82	1.16	3.38	0.88	0.74	0.57
Corporate profit growth	1.47	5.41	−25.82	−1.85	1.57	4.61	15.10	0.15	0.03	−0.13
GDP growth	0.49	0.98	−3.26	−0.03	0.54	1.01	3.39	0.37	0.19	−0.08
Tobin's Q	1.09	0.24	0.71	0.90	1.03	1.29	1.67	0.95	0.89	0.80

to two quarters. The first-order autocorrelation is 0.70, the second-order autocorrelation is 0.43, but the fourth-order autocorrelation is close to zero. The net hiring rate is on average 0.26% per quarter with a standard deviation of 0.36%. The net job creation rate in manufacturing is on average −0.22% per quarter, meaning that the manufacturing sector has been declining in our sample period. The net hiring rate for the manufacturing sector is also more volatile (with a standard deviation of 1.22% per quarter) than the net hiring rate for the overall economy. Both the net hiring rate and the net job creation rate in manufacturing are autocorrelated at short horizons.

3.2. Empirical specification

To forecast market excess returns and payroll growth, we use standard long-horizon predictive regressions (e.g., Lettau and Ludvigson, 2002). For market excess returns, we use as the dependent variables the I-quarter cumulative log excess returns on the S&P 500 composite index, $\sum_{i=1}^{I} r_{t+i}-r_{ft+i}$, in which I is the forecast horizon ranging from one quarter to 16 quarters. For payroll growth, we use as the dependent variables the I-quarter cumulative growth rates of total nonfarm payrolls, $\sum_{i=1}^{I} n_{t+i}-n_{t+i-1}=n_{t+I}-n_t$, where n_t is the natural logarithm of total nonfarm payrolls in quarter t. For each regression, we report the slopes, the Newey and West (1987) corrected t-statistics, the adjusted R^2s, and the implied R^2s adjusted for overlapping observations in long-horizon regressions and calculated from vector autoregressions per Hodrick (1992).

To forecast net hiring rates, we use as the dependent variables the I-quarter-ahead net hiring rate, $H_{t+I}/N_{t+I}-s_{t+I}$, where H_{t+I}/N_{t+I} and s_{t+I} are the I-quarter-ahead gross hiring rate and separation rate, respectively. The dependent variables in forecasting the net job creation rate in manufacturing are defined analogously. We forecast the single-period net hiring rates because time-aggregating net hiring rates (using Eq. (1)) leads to long-horizon employment growth, which is irrelevant for testing the hiring rate dynamics per Hypothesis 2. For each regression, we report the slopes, the Newey and West corrected t-statistics, and the adjusted R^2s. Because the single-period net hiring rates do not involve overlapping observations, there is no need for the Hodrick adjustment.

4. Empirical results

We use risk premium proxies to forecast payroll growth in Section 4.1 and net hiring rates in Section 4.2. In Subsection 4.3 we use payroll growth and net hiring rates to forecast market excess returns.

4.1. Do risk premium proxies forecast payroll growth?

To provide background on time-varying risk premiums, we present up-to-date long-horizon forecasts of market excess returns with standard risk premium proxies. We then use these proxies to forecast payroll growth, with and without macro controls.

4.1.1. Risk premium proxies

Using our updated sample, Table 2 reports the long-horizon forecasts of S&P 500 index excess returns. Panel A shows that the dividend yield reveals some ability to forecast excess returns. The slopes are all positive, with the Newey and West t-statistics mostly above two. Using the same empirical specifications but in a shorter sample through 1999, Lettau and Ludvigson (2002) show only weak predictability with the dividend yield. Our evidence suggests that the dividend yield's predictive power has substantially increased over the past decade, probably because market valuation ratios have mean-reverted from their exceedingly high levels in the late 1990s.

Consistent with Lettau and Ludvigson's (2001), Panel B shows that CAY reliably predicts market excess returns. The implied R^2 starts at 5% at the quarterly horizon, rises to 15% at the four-quarter horizon, and increases further to 21% at the 16-quarter horizon. The slopes are universally positive. The Newey and West t-statistics start at 4.0 at the quarterly horizon, increase to 4.2 at the four-quarter horizon and further to 5.7 at the 16-quarter horizon. The relative bill rate forecasts market excess returns, but the predictive power is low. The slopes are insignificantly negative, and the adjusted R^2 remains at 1% across all horizons. The term spread forecasts excess returns with a positive slope, albeit insignificant. As in the sample through 1999 in Lettau and Ludvigson (2002), the default premium does not show any forecasting power in our sample. The slopes have mixed signs and are all within 0.5 standard errors from zero. In multiple regressions with all five regressors, CAY is the strongest proxy, followed by the dividend yield.

Table 2
Forecasting stock market excess returns with financial variables (1952:Q1–2009:Q1).

This table reports long-horizon regressions of log excess returns on the Standard & Poor's 500 index, $\sum_{i=1}^{I} r_{t+i} - r_{ft+i}$, in which I is the forecast horizon in quarters. The regressors are one-quarter lagged values of the log consumption-to-wealth ratio (CAY), the log dividend yield (DP), the relative Treasury bill rate (TB), the term premium (TRM), the default premium (DEF), and their combination. We report the ordinary least squares estimate of the slopes (Slope), the Newey and West corrected t-statistics (t_{NW}), the adjusted R^2s, and the implied R^2s calculated from vector autoregressions per Hodrick (1992).

	Forecast horizon in quarters					
	1	2	4	8	12	16
Panel A: Univariate regressions with DP						
Slope	0.03	0.06	0.11	0.20	0.26	0.29
t_{NW}	1.94	2.12	2.31	2.48	2.57	2.83
Adjusted R^2	0.01	0.03	0.07	0.12	0.15	0.15
Implied R^2	0.01	0.03	0.05	0.09	0.15	0.18
Panel B: Univariate regressions with CAY						
Slope	1.19	2.37	4.57	8.17	10.66	12.35
t_{NW}	3.96	4.08	4.20	4.98	5.24	5.71
Adjusted R^2	0.04	0.08	0.14	0.25	0.31	0.34
Implied R^2	0.05	0.09	0.15	0.20	0.21	0.21
Panel C: Univariate regressions with TB						
Slope	−1.15	−1.97	−2.86	−3.51	−3.61	−3.71
t_{NW}	−1.81	−1.65	−1.18	−1.57	−1.61	−1.22
Adjusted R^2	0.01	0.01	0.01	0.01	0.01	0.01
Implied R^2	0.01	0.02	0.02	0.01	0.01	0.01
Panel D: Univariate regressions with TRM						
Slope	0.79	1.38	2.91	4.72	5.95	7.36
t_{NW}	1.51	1.42	1.91	2.71	3.44	3.24
Adjusted R^2	0.01	0.01	0.04	0.05	0.07	0.09
Implied R^2	0.01	0.02	0.04	0.04	0.03	0.02
Panel E: Univariate regressions with DEF						
Slope	0.14	0.32	0.22	−2.32	−3.21	0.00
t_{NW}	0.09	0.12	0.05	−0.43	−0.45	0.00
Adjusted R^2	0.00	0.00	0.00	0.00	0.00	0.00
Implied R^2	0.00	0.00	0.01	0.01	0.01	0.01
Panel F: Multiple regressions						
DP, Slope	0.03	0.06	0.12	0.19	0.23	0.26
DP, t_{NW}	1.73	1.97	2.14	2.30	2.60	2.85
CAY, Slope	0.90	1.81	3.41	6.38	8.86	10.64
CAY, t_{NW}	2.42	2.80	2.99	3.34	3.74	4.37
TB, Slope	−0.98	−1.69	−1.71	−0.71	1.04	2.38
TB, t_{NW}	−1.26	−1.33	−0.76	−0.27	0.43	0.85
TRM, Slope	0.24	0.37	1.59	3.09	4.68	6.24
TRM, t_{NW}	0.35	0.33	0.96	1.21	1.81	2.51
DEF, Slope	−1.16	−2.29	−4.70	−8.33	−7.81	−4.68
DEF, t_{NW}	−0.72	−0.90	−0.99	−1.50	−1.32	−0.61
Adjusted R^2	0.05	0.10	0.20	0.35	0.45	0.51
Implied R^2	0.08	0.13	0.25	0.37	0.44	0.44

4.1.2. Forecasting payroll growth

Table 3 reports the long-horizon regressions of the quarterly growth rate of total nonfarm payrolls on the risk premium proxies. Consistent with Hypothesis 1, the evidence shows that time-varying aggregate risk premiums are negatively correlated with short-horizon employment growth but are positively correlated with long-horizon employment growth.

From Panel A, the dividend yield forecasts short-horizon payroll growth with a negative slope and long-horizon payroll growth with a positive slope. However, the predictability evidence is weak. The slopes across different horizons are all within 1.6 standard errors from zero. Panel B shows that the results using CAY as a risk premium proxy are slightly stronger than those using the dividend yield. High values of CAY weakly predict low payroll growth at short horizons but high payroll growth at long horizons. In particular, the Newey and West t-statistic is 1.5 at the eight-quarter horizon and about 1.8 at the 12- and 16-quarter horizons. From Panel C, the results using the relative bill rate strongly conform to Hypothesis 1. High values of the relative bill rate that predict low risk premiums (see Table 2) also forecast high payroll growth at short horizons but low payroll growth at long horizons. The dynamic sign before pattern is significant. The Newey and West t-statistics of the slope start at 2.9 by the first quarter, decrease to 2.0 by the second quarter and further to 0.8 by the fourth quarter, before turning significantly negative from the eight-quarter horizon and onwards.

Consistent with Lettau and Ludvigson's (2002) evidence that the term spread has strong forecasting power for investment growth, Panel D shows that the term spread also forecasts payroll growth. However, the slopes are all positive and mostly significant across all horizons. Following Lettau

Table 3
Forecasting payroll growth with risk premium proxies (1952:Q1–2009:Q1).

This table reports long-horizon regressions of payroll growth. The dependent variable is the I-quarter cumulative growth of seasonally adjusted total nonfarm payrolls of all employees, $n_{t+I}-n_t$, in which n_t is the logarithm of total payrolls in period t. The regressors are one-quarter lagged values of the log consumption-to-wealth ratio (CAY), the log dividend yield (DP), the detrended short-term Treasury bill rate (TB), the term premium (TRM), the default premium (DEF), and their combination. We report the ordinary least squares estimate of the slopes (Slope), the Newey and West corrected t-statistics (t_{NW}), the adjusted R^2s, and the implied R^2s calculated from vector autoregressions per Hodrick (1992).

	Forecast horizon in quarters					
	1	2	4	8	12	16
Panel A: Univariate regressions with DP						
Slope	−0.00	−0.00	0.00	0.01	0.02	0.02
t_{NW}	−0.32	−0.08	0.42	0.99	1.41	1.54
Adjusted R^2	0.00	0.00	0.00	0.01	0.04	0.06
Implied R^2	0.00	0.00	0.00	0.01	0.02	0.03
Panel B: Univariate regressions with CAY						
Slope	−0.02	−0.02	0.12	0.39	0.52	0.60
t_{NW}	−0.80	−0.27	0.92	1.54	1.79	1.85
Adjusted R^2	0.00	0.00	0.00	0.03	0.04	0.04
Implied R^2	0.00	0.00	0.00	0.00	0.00	0.00
Panel C: Univariate regressions with TB						
Slope	0.22	0.29	0.18	−0.71	−1.06	−0.94
t_{NW}	2.87	2.03	0.79	−2.42	−2.79	−2.22
Adjusted R^2	0.08	0.04	0.00	0.03	0.05	0.03
Implied R^2	0.09	0.06	0.03	0.01	0.01	0.01
Panel D: Univariate regressions with TRM						
Slope	0.03	0.13	0.44	1.05	1.10	0.81
t_{NW}	0.65	1.53	2.86	3.96	3.19	1.91
Adjusted R^2	0.00	0.01	0.06	0.17	0.12	0.05
Implied R^2	0.00	0.01	0.06	0.10	0.08	0.06
Panel E: Univariate regressions with DEF						
Slope	−0.49	−0.78	−0.74	−0.03	0.53	0.91
t_{NW}	−4.30	−2.93	−1.25	−0.03	0.38	0.61
Adjusted R^2	0.12	0.08	0.02	0.00	0.00	0.00
Implied R^2	0.17	0.12	0.05	0.03	0.02	0.02
Panel F: Multiple regressions						
DP, Slope	0.00	0.00	0.01	0.02	0.03	0.03
DP, t_{NW}	0.87	0.85	1.18	2.28	2.48	1.96
CAY, Slope	−0.07	−0.12	−0.11	−0.07	0.08	0.31
CAY, t_{NW}	−2.37	−1.92	−0.77	−0.26	0.27	0.90
TB, Slope	0.27	0.43	0.57	−0.04	−0.41	−0.49
TB, t_{NW}	3.52	3.01	2.52	−0.11	−0.87	−0.88
TRM, Slope	0.22	0.44	0.83	1.27	1.14	0.70
TRM, t_{NW}	4.75	4.69	4.86	4.62	3.00	1.61
DEF, Slope	−0.52	−0.91	−1.30	−1.95	−1.63	−0.86
DEF, t_{NW}	−3.72	−2.88	−1.94	−1.85	−1.19	−0.51
Adjusted R^2	0.25	0.21	0.17	0.25	0.21	0.14
Implied R^2	0.26	0.16	0.11	0.12	0.12	0.11

and Ludvigson, we interpret the evidence as indicating the term spread's strong forecasting power for output growth.[5] The reason might be that the effect of the term spread works primarily through the cash flow channel, as opposed to the risk premium channel that we focus on. In particular, the term spread is strongly affected by inflationary expectations and monetary policy, and the predictive power of the term spread for economic growth depends on the degree to which the Federal Reserve reacts to deviations in output from its long-term trend (e.g., Estrella, 2005). The term spread tends to rise when the Federal Reserve cuts the short-term interest rate to stimulate the economy, and a boom in economic activity and inflation typically follows such a policy move with a lag. The term spread tends to fall when the Federal Reserve raises the short-term interest rate to curb the inflation, and a slowdown in economic activity and inflation typically follows with a lag.

From Panel E, the default spread predicts payroll growth with significantly negative slopes at short horizons but with insignificant slopes at long horizons. Although the sign pattern is consistent with Hypothesis 1, the predictability at long horizons is negligible. However, this evidence might suggest that the default spread is a weak risk premium proxy at long horizons (see Table 2). Panel F reports long-horizon multiple regressions of payroll growth with all five risk premium proxies. All the proxies show marginal predictive power for payroll growth at some horizons. With all five proxies included, the empirical specification has reliable predictive power for payroll growth at every horizon, with the adjusted R^2 varying from 14% to 25% and the implied R^2 from 11% to 26%.

However, multicollinearity between regressors can make the sign pattern of any individual proxy in the multiple regressions difficult to interpret. To facilitate the economic interpretation, we calculate the correlations between the fitted one-quarter-ahead risk premiums using all five proxies and cumulative payroll growth rates at the various future horizons. (The slopes of the proxies in the fitted one-quarter-ahead risk premiums are reported in the first column of Panel F in Table 2.) We use the expected one-quarter-ahead risk premiums because our testable hypotheses are derived under a one-time shock to the discount rate, $E_t[R_{t+1}]$. In any case, using the fitted multi-quarter-ahead risk premiums yields largely similar results (not reported).

Panel A of Fig. 2 shows the impact of time-varying risk premiums. The correlations between the one-quarter-ahead expected risk premiums and cumulative payroll growth are insignificantly negative within two horizons, insignificantly positive at the four-quarter horizon, but significantly positive from the eight-quarter horizon and onward. Realized payroll growth rates, however, are affected by ex post shocks that can bias the estimated correlations toward zero. As such, we also report in Panel B the correlations between the fitted one-quarter-ahead risk premiums and the fitted payroll growth from the long-horizon regressions in Panel F of Table 3. The evidence is clear. The correlations between risk premiums

[5] A large body of work shows the predictive power of the term spread for real economic activity. Harvey (1988) shows the predictive relation of the term spread with consumption growth. Stock and Watson (1989) and Chen (1991) show that the term spread forecasts output growth. Estrella and Hardouvelis (1991) report that the term spread predicts the growth of gross national product, consumption (nondurables plus services), consumption durables, investment, and recession probabilities.

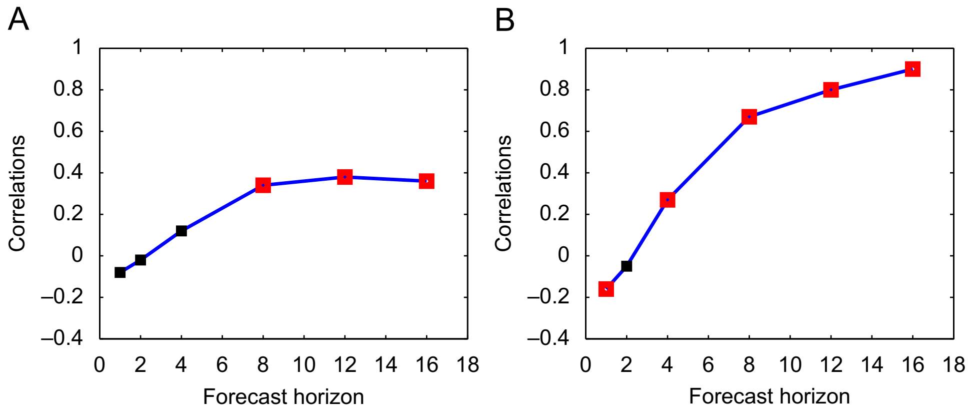

Fig. 2. Correlations between the fitted one-quarter-ahead risk premiums and cumulative payroll growth, both realized and expected, across different forecast horizons. Panel A plots the correlations between the fitted one-quarter-ahead risk premiums, $E_t[R_{t+1}]$, using all five risk premium proxies and the I-quarter-ahead cumulative payroll growth rate, where I varies from one quarter to 16 quarters. (The slopes for the proxies in the fitted one-quarter-ahead risk premiums are from the first column of Panel F in Table 2.) Panel B plots the correlations between the fitted one-quarter-ahead risk premiums and the fitted I-quarter-ahead cumulative payroll growth. Both fitted series use all five risk premium proxies. The correlations that are significant at the 5% level are indicated with big squares in red, and the correlations that are insignificant at the 5% level are indicated with small squares in black. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

and the expected payroll growth are significantly negative in the one-quarter horizon, are close to zero in the two-quarter horizon, and are significantly positive in all subsequent horizons. The evidence suggests that the combined effect of time-to-build and time-to-plan lasts for about two quarters in the aggregate payroll data.

In untabulated results we also have studied long-horizon regressions on risk premium proxies using the growth rate of average weekly hours (seasonally adjusted average weekly hours of total private industries from the US Bureau of Labor Statistics). This variable is also an indicator of labor market performance (e.g., Stock and Watson, 1999). Without showing the details, we can report that CAY, the term spread, and to a lesser extent the default spread all predict the growth of weekly hours with significantly positive slopes, especially at long horizons. The relative bill rate predicts the growth of weekly hours with significantly negative slopes across most horizons. More important, there is no dynamic sign switching pattern as in the case of payroll growth. The evidence suggests that adjusting average weekly hours is a relatively smooth process, whereas adjusting total nonfarm payrolls is a more sluggish process. Adjusting payrolls means hiring and firing workers, a process that is time-consuming and costly. In contrast, adjusting weekly hours means changing the utilization rate of existing workers, a process that is likely smooth.

4.1.3. *Forecasting payroll growth relative to macro controls*

As an indicator of the macroeconomy, payroll growth is likely correlated with past macroeconomic performance. We ask whether the risk premium proxies contain any information about future payroll growth beyond what is already contained in standard macro control variables.

Table 4 reports the forecasts of payroll growth with macro controls. From Panel A, the lagged values of payroll growth, corporate profit growth, and GDP growth predict future payroll growth with largely positive slopes. Unlike risk premium proxies, their predictive power mostly concentrates at short horizons. The adjusted R^2 peaks at 51% at the one-quarter horizon and monotonically decreases to 20% at the four-quarter horizon and to 3% at the 12-quarter horizon. The implied R^2 peaks at 53% at the one-quarter horizon and monotonically decreases to 28% at the four-quarter horizon and to 15% at the 12-quarter horizon. Turning to the slopes, the lagged payroll growth has predictive power within four quarters. Lagged GDP growth has some predictive power from the two to 12-quarter horizons. Lagged corporate profit growth retains some predictive power at horizons longer than four quarters, but lagged growth of Tobin's Q has insignificant slopes across all horizons.

From Panel B of Table 4, when we include all five risk premium proxies into the empirical specification with four macro controls, the regression explains a larger fraction of the variation in future payroll growth than what can be explained by macro controls alone. The incremental fraction explained per the adjusted R^2 is substantial. Using only the macro controls, the regression explains only 5% and 1% of the payroll growth variation at the eight-quarter and the 16-quarter horizons, respectively. Adding risk premium proxies increases the respective fractions to 33% and 26%. However, the improvement is more modest in the implied R^2. Risk premium proxies increase the implied R^2 by only 3% to 12%. Also, there is no evidence that the improvement is larger in long horizons. The improvement in the adjusted R^2 seems mostly driven by overlapping observations.

4.2. *Do risk premium proxies forecast net hiring rates?*

Hypothesis 2 says that, without time-to-plan, regressing future hiring rates on the discount rate should yield only positive slopes without sign switching at long

Table 4
Payroll growth regressions (1952:Q1–2009:Q1).

The dependent variable is the I-quarter cumulative growth of seasonally adjusted total nonfarm payrolls of all employees, $n_{t+I}-n_t$, in which n_t is the logarithm of total payrolls in period t. The regressors are combinations of one-period lagged values of employment growth (Dn), profit growth (Dprofit), growth of average Q (Dq), growth of gross domestic product (Dgdp), one-quarter lagged values of the log consumption-to-wealth ratio (CAY), the log dividend yield (DP), the relative Treasury bill rate (TB), the term premium (TRM), and the default premium (DEF). We report the ordinary least squares estimate of the slopes (Slope), the Newey-West corrected t-statistics (t_{NW}), the adjusted R^2s, and the implied R^2s calculated from vector autoregressions per Hodrick (1992).

	Forecast horizon in quarters					
	1	2	4	8	12	16
Panel A: Multiple regressions with macro controls						
Dn, Slope	0.60	0.88	0.81	0.15	−0.19	−0.04
Dn, t_{NW}	7.47	4.58	1.93	0.23	−0.26	−0.04
Dprofit, Slope	0.01	0.02	0.04	0.09	0.10	0.08
Dprofit, t_{NW}	1.18	1.14	1.17	1.88	1.62	0.98
Dq, Slope	0.00	0.00	0.01	0.00	−0.00	−0.00
Dq, t_{NW}	1.63	1.35	0.63	0.08	−0.14	−0.04
Dgdp, Slope	0.05	0.18	0.38	0.32	0.39	0.34
Dgdp, t_{NW}	1.12	1.91	1.74	0.97	1.16	0.91
Adjusted R^2	0.51	0.41	0.20	0.05	0.03	0.01
Implied R^2	0.53	0.43	0.28	0.18	0.15	0.14
Panel F: Multiple regressions with macro controls and risk premium proxies						
Dn, Slope	0.66	1.05	1.12	0.97	0.80	1.17
Dn, t_{NW}	6.66	4.44	2.46	1.66	1.22	1.57
Dprofit, Slope	0.01	0.01	0.01	0.03	0.05	0.04
Dprofit, t_{NW}	0.82	0.88	0.43	0.63	0.87	0.53
Dq, Slope	0.00	0.01	0.02	0.03	0.04	0.07
Dq,t_{NW}	1.73	1.85	2.04	1.66	1.87	1.97
Dgdp, Slope	0.04	0.14	0.35	0.32	0.38	0.38
Dgdp, t_{NW}	0.83	1.47	1.92	1.12	1.13	0.87
DP, Slope	0.00	0.00	0.01	0.03	0.04	0.04
DP, t_{NW}	1.21	1.40	1.83	2.70	2.96	2.77
CAY, Slope	−0.01	−0.01	0.07	0.14	0.36	0.75
CAY, t_{NW}	−0.57	−0.21	0.61	0.61	1.31	2.10
TB, Slope	−0.01	−0.06	0.01	−0.52	−0.81	−0.87
TB, t_{NW}	−0.22	−0.52	0.03	−1.36	−1.54	−1.43
TRM, Slope	0.10	0.23	0.59	1.06	0.98	0.64
TRM, t_{NW}	3.14	3.30	4.04	3.66	2.38	1.23
DEF, Slope	−0.07	−0.13	−0.03	−0.50	0.20	1.89
DEF, t_{NW}	−0.68	−0.46	−0.05	−0.59	0.22	1.40
Adjusted R^2	0.58	0.50	0.36	0.33	0.30	0.26
Implied R^2	0.60	0.52	0.40	0.28	0.22	0.17

horizons. With time-to-plan, however, regressing the hiring rates on the discount rate should yield negative slopes at short horizons but positive slopes at long horizons. We test this hypothesis in this subsection.

Table 5 regresses the I-quarter-ahead net hiring rate constructed from the merged CPS and JOLTS series on risk premium proxies. Overall, there is no evidence in support of time-to-plan. From the univariate regressions, the dividend yield, CAY, and term spread slopes are mostly positive. The relative bill rate slopes show the hypothesized sign switching pattern, but the slopes in the short horizons are only insignificantly positive. The default spread slopes show a more clear-cut sign switching pattern, but, as shown in Table 2, the default spread is only a weak risk premium proxy.

Table 5
Forecasting net hiring rate with risk premium proxies (1977:Q1–2009:Q1).

The dependent variable is the I-quarter-ahead net hiring rate. The regressors are one-quarter lagged values of the log consumption-to-wealth ratio (CAY), the log dividend yield (DP), the relative Treasury bill rate (TB), the term premium (TRM), the default premium (DEF), and their combination. We report the ordinary least squares estimate of the slopes (Slope), the Newey and West corrected t-statistics (t_{NW}), and the adjusted R^2s.

	Forecast horizon in quarters					
	1	2	4	8	12	16
Panel A: Univariate regressions with DP						
Slope	0.00	0.00	0.00	0.00	0.00	0.00
t_{NW}	1.57	1.88	2.26	2.43	2.49	2.30
Adjusted R^2	0.02	0.03	0.05	0.08	0.09	0.07
Panel B: Univariate regressions with CAY						
Slope	0.01	0.01	0.03	0.04	0.05	0.02
t_{NW}	0.64	0.92	1.31	1.27	1.30	0.51
Adjusted R^2	−0.01	0.00	0.01	0.03	0.03	0.00
Panel C: Univariate regressions with TB						
Slope	0.03	0.00	−0.00	−0.07	−0.10	−0.01
t_{NW}	0.61	0.07	−0.08	−1.99	−2.18	−0.38
Adjusted R^2	0.00	−0.01	−0.01	0.02	0.06	−0.01
Panel D: Univariate regressions with TRM						
Slope	0.03	0.05	0.05	0.08	0.03	−0.04
t_{NW}	1.14	2.11	1.74	2.28	0.66	−1.24
Adjusted R^2	0.00	0.02	0.03	0.08	0.00	0.01
Panel E: Univariate regressions with DEF						
Slope	−0.22	−0.13	0.04	0.19	0.22	0.12
t_{NW}	−2.35	−1.11	0.33	1.92	2.29	1.41
Adjusted R^2	0.09	0.02	−0.01	0.05	0.07	0.02
Panel F: Multiple regressions						
DP, Slope	0.00	0.00	0.00	0.00	0.00	0.00
DP, t_{NW}	4.76	4.03	2.40	1.74	1.11	1.33
CAY, Slope	−0.06	−0.05	−0.01	0.03	0.05	0.03
CAY, t_{NW}	−3.21	−2.62	−0.45	0.86	1.24	0.53
TB, Slope	−0.03	−0.03	0.01	−0.00	−0.10	−0.07
TB, t_{NW}	−0.50	−0.70	0.22	−0.04	−1.81	−1.26
TRM, Slope	0.05	0.06	0.06	0.06	−0.03	−0.07
TRM, t_{NW}	2.35	2.31	1.80	1.76	−0.66	−1.94
DEF, Slope	−0.49	−0.39	−0.14	0.10	0.12	0.01
DEF, t_{NW}	−5.57	−3.78	−0.92	0.83	0.70	0.08
Adjusted R^2	0.26	0.17	0.07	0.14	0.16	0.09

Summarizing the information contained in different risk premium proxies, we plot the correlations between the fitted one-quarter-ahead risk premiums (estimated with all five proxies) with the I-quarter-ahead net hiring rates, where I varies from one to 16 quarters. Panel A of Fig. 3 shows that the correlations are all positive, ranging from 0.16 to 0.35, and are mostly significant at the 5% level. Using an instrumental variables approach to control for noises in realized net hiring rates, we also correlate the fitted one-quarter-ahead risk premiums with the fitted I-quarter-ahead net hiring rates (estimated in Panel F of Table 5). The correlations are significantly positive across all horizons, suggesting that there is no time-to-plan in the aggregate hiring data.

The evidence is more supportive of time-to-plan for manufacturing firms. Table 6 regresses the I-quarter-ahead net job creation rate in manufacturing on risk premium proxies. The dynamic sign pattern predicted by time-to-plan

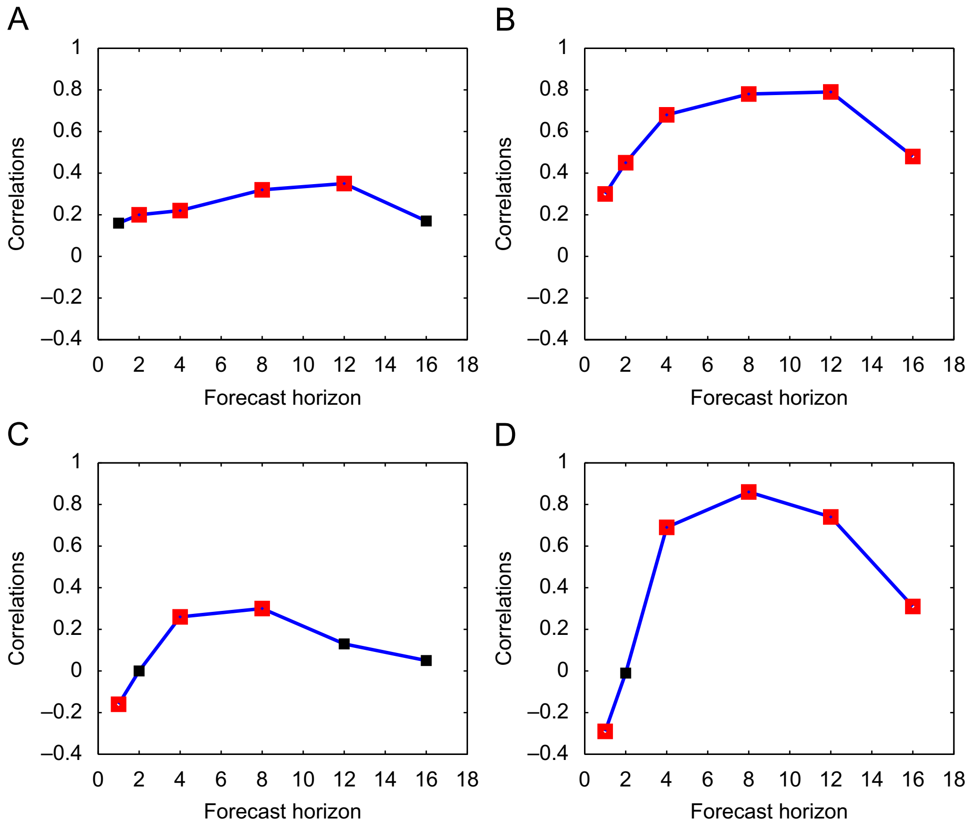

Fig. 3. Correlations of the fitted one-quarter-ahead risk premiums with the net hiring rate and the net job creation rate in manufacturing, both realized and expected, across different forecast horizons. Panel A plots the correlations between the fitted one-quarter-ahead risk premiums, $E_t[R_{t+1}]$, using all five risk premium proxies and the I-quarter-ahead net hiring rates, where I varies from one quarter to 16 quarters. (The slopes for the proxies in the fitted one-quarter-ahead risk premiums are from the first column of Panel F in Table 2.) Panel B plots the correlations between the fitted one-quarter-ahead risk premiums and the fitted I-quarter-ahead net hiring rates. Both fitted series use all five risk premium proxies. Panel C plots the correlations between the fitted one-quarter-ahead risk premiums and the I-quarter-ahead net job creation rates in manufacturing. Panel D plots the correlations between the fitted one-quarter-ahead risk premiums and the fitted I-quarter-ahead net job creation rates in manufacturing. Both fitted series again use all five risk premium proxies. The correlations that are significant at the 5% level are indicated with big squares in red, and the correlations that are insignificant at the 5% level are indicated with small squares in black. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

is clearly visible in the relative bill rate slopes in Panel C. The relative bill rate has a significantly positive slope of 0.48 (t=2.96) in the one-quarter horizon, a weakly positive slope in the two-quarter horizon, and a significantly negative slope of −0.27 (t=−2.46) in the four-quarter horizon. The slope remains significantly negative at the eight-quarter horizon but is close to zero afterward.

Aggregating the information from different risk premium proxies, we correlate the fitted one-quarter-ahead risk premiums with the I-quarter-ahead realized net job creation rates in manufacturing. Panel C of Fig. 3 reports a clear sign switching pattern in support of time-to-plan. The correlation is significantly negative at −0.16 in the one-quarter horizon, close to zero in the two-quarter horizon, and significantly positive at 0.26 and 0.30 in the four- and eight-quarter horizons. Using the instrumental variables approach to control for noises in realized net job creation rates in manufacturing, Panel D correlates the fitted one-quarter-ahead risk premiums with the fitted I-quarter-ahead net job creation rates (estimated in Panel F of Table 6). The correlation starts by being significantly negative, −0.29, in the one-quarter horizon, becomes zero in the two-quarter horizon, and turns significantly positive in the subsequent horizons. In all, the evidence suggests the length of time-to-plan of about two quarters in job creation in the manufacturing sector.

4.3. Do labor market variables forecast stock market excess returns?

To test stock market predictability with labor market variables, we use empirical specifications similar to those in Table 2. The dependent variables are future log excess returns on the S&P 500 index over various horizons. The regressors are one-quarter lagged values of payroll growth, net hiring rate, and net job creation rate in manufacturing, with and without the lagged values of the dividend yield, CAY, the relative bill rate, the term spread, and the default spread in multiple regressions.

From Panel A of Table 7, payroll growth predicts market excess returns, especially at business cycle frequencies. The adjusted R^2 is hump-shaped. It starts at 1% at the one-quarter horizon, peaks at 5% at the

Table 6
Forecasting net job creation rate in manufacturing with risk premium proxies (1952:Q1–2005:Q1).

The dependent variable is the *I*-quarter-ahead net job creation rate in manufacturing. The regressors are one-quarter lagged values of the log consumption-to-wealth ratio (CAY), the log dividend yield (DP), the relative Treasury bill rate (TB), the term premium (TRM), the default premium (DEF), and their combination. We report the ordinary least squares estimate of slopes (Slope), the Newey and West *t*-statistics (t_{NW}), and adjusted R^2s.

	Forecast horizon in quarters					
	1	2	4	8	12	16
Panel A: Univariate regressions with DP						
Slope	−0.00	−0.00	0.00	0.00	0.00	0.00
t_{NW}	−0.28	−0.20	0.61	0.69	0.97	0.18
Adjusted R^2	0.00	0.00	0.00	0.00	0.01	0.00
Panel B: Univariate regressions with CAY						
Slope	−0.06	0.00	0.12	0.11	0.11	0.07
t_{NW}	−1.12	0.08	1.47	1.36	1.55	0.96
Adjusted R^2	0.00	0.00	0.01	0.01	0.01	0.00
Panel C: Univariate regressions with TB						
Slope	0.48	0.10	−0.27	−0.32	0.03	0.07
t_{NW}	2.96	0.71	−2.46	−2.57	0.22	0.62
Adjusted R^2	0.11	0.00	0.03	0.05	0.00	0.00
Panel D: Univariate regressions with TRM						
Slope	0.04	0.20	0.28	0.13	−0.01	−0.06
t_{NW}	0.57	2.47	2.88	1.60	−0.05	−0.74
Adjusted R^2	0.00	0.04	0.09	0.01	−0.01	0.00
Panel E: Univariate regressions with DEF						
Slope	−1.08	−0.67	−0.17	−0.02	−0.14	−0.23
t_{NW}	−4.10	−2.14	−0.45	−0.06	−0.51	−1.04
Adjusted R^2	0.14	0.05	0.00	0.00	0.00	0.00
Panel F: Multiple regressions						
DP, Slope	0.00	0.00	0.00	0.01	0.00	0.00
DP, t_{NW}	0.39	0.24	1.38	2.02	0.62	0.17
CAY, Slope	−0.12	−0.09	0.01	0.06	0.13	0.11
CAY, t_{NW}	−2.41	−1.48	0.11	0.75	1.77	1.25
TB, Slope	0.60	0.26	−0.13	−0.38	−0.01	−0.01
TB, t_{NW}	3.95	1.69	−1.03	−2.25	−0.05	−0.04
TRM, Slope	0.40	0.40	0.30	0.01	−0.06	−0.10
TRM, t_{NW}	5.13	4.14	2.74	0.11	−0.45	−0.82
DEF, Slope	−0.95	−0.75	−0.58	−0.47	−0.04	−0.12
DEF, t_{NW}	−3.16	−2.08	−1.73	−1.36	−0.13	−0.38
Adjusted R^2	0.29	0.14	0.12	0.10	0.01	0.00

four-quarter horizon, and declines to 3% at the 16-quarter horizon. The implied R^2 pattern is similar. The slopes are all negative and are significant at the four-quarter horizon and onward. As such, high payroll growth forecasts low market excess returns, and low payroll growth forecasts high market excess returns from one quarter to 16 quarters ahead. This evidence is consistent with the view that aggregate risk premiums are countercyclical, whereas payroll growth is procyclical.

It is useful to compare the evidence with payroll growth and the evidence with the standard risk premium proxies in Table 2. Judged on the Newey and West *t*-statistics and R^2s, the predictive power of payroll growth dominates that of the default spread. The R^2s of the default spread are close to zero, and the slopes are within 0.5 standard errors from zero across all horizons. Payroll growth also dominates the relative bill rate in forecasting returns. The R^2s of the relative bill rate are flat across different horizons at 1–2% and are lower than those of payroll growth. The slopes for the relative bill rate are all within 1.9 standard errors from zero, while the slopes for the payroll growth are all significant from the four-quarter horizon and onward. The predictive power of payroll growth differs from that of the dividend yield and that of the term spread. Whereas the forecasting power of payroll growth peaks at relatively short business cycle frequencies, the dividend yield and the term spread maximize their predictive power at long horizons.

Only CAY dominates payroll growth in predicting market excess returns, as evidenced by Newey and West *t*-statistics and R^2s in univariate regressions (Panel B of Table 2). Even with CAY in bivariate regressions, payroll growth retains some predictive power for returns, as shown in Panel B of Table 7. Panel C of the same table includes all five risk premium proxies along with payroll growth in forecasting long-horizon excess returns. Payroll growth retains some predictive power from the fourth-quarter horizon and onward. Judged on the *t*-statistics, payroll growth dominates the relative bill rate, the term spread, and the default spread in predicting returns. The default spread even has negative slopes across all horizons.

Panels D to F of Table 7 show that the net hiring rate has no predictive power for market excess returns. Although the slopes are negative in univariate regressions across most horizons, going in the right direction as predicted by Hypothesis 3, the negative slopes are all within one standard error from zero. The results from bivariate regressions with CAY are largely similar. When all five risk premium proxies are included, the net hiring rate has significantly negative slopes at the fourth-quarter horizon and beyond. However, multicollinearity makes the interpretation of any individual slope in multiple regressions difficult.

From Panel G, the net job creation rate in manufacturing strongly predicts market excess returns with negative slopes within four quarters. The adjusted R^2 starts at 2% at the one-quarter horizon, peaks at 7% at the four-quarter horizon, and drops to zero in subsequent horizons. The implied R^2 starts at 3% at the one-quarter horizon, peaks at 4% at the four-quarter horizon, and drops to 2% in subsequent horizons. The slopes are negative across all horizons and are more than 2.3 standard errors from zero within four quarters. Panel H shows that although controlling for CAY weakens the predictive power of the net job creation rate in manufacturing, its negative slopes are still more than two standard errors within the fourth-quarter horizon. In the multiple regressions that include all five risk premium proxies, the forecasting power of the net job creation rate in manufacturing dominates that of the relative bill rate, the term premium, and the default spread, comparable with that of the dividend yield, and is only dominated by the forecasting power of CAY.

5. Conclusion

We show empirical linkages between the stock market and the labor market. We report three major findings.

Table 7
Forecasting stock market excess returns with labor market variables.

This table reports long-horizon regressions of log excess returns on the Standard & Poor's 500 index, $\sum_{i=1}^{I} r_{t+i} - r_{ft+i}$, in which I is the return forecast horizon in quarters. The regressors are one-quarter lagged values of employment growth (Dn), net hiring rate (Dh), and net job creation rate in manufacturing (Dhm), with and without one-period lagged values of the log consumption-to-wealth ratio (CAY), the log dividend yield (DP), the detrended short-term Treasury bill rate (TB), the term premium (TRM), the default premium (DEF), and their combination. Employment is the seasonally adjusted total nonfarm payrolls of all employees and Dn is $n_t - n_{t-1}$, in which n_t is the logarithm of employment in quarter t. We report the ordinary least squares estimate of the slopes (Slope), the Newey and West corrected t-statistics (t_{NW}), the adjusted R^2s, and the implied R^2s calculated from vector autoregressions per Hodrick (1992). The sample is from 1952:Q1 to 2009:Q1 for Panels A to C, from 1977:Q1 to 2009:Q1 for Panels D to F, and from 1952:Q1 to 2005:Q1 for Panels G to H.

	Forecast horizon in quarters					
	1	2	4	8	12	16
Panel A: Univariate regressions with Dn						
Slope	−1.54	−2.92	−6.74	−7.80	−7.40	−8.82
t_{NW}	−1.60	−1.74	−2.57	−2.05	−2.07	−2.27
Adjusted R^2	0.01	0.02	0.05	0.04	0.02	0.03
Implied R^2	0.01	0.02	0.04	0.03	0.02	0.01
Panel B: Bivariate regressions with Dn and CAY						
CAY, Slope	1.14	2.26	4.34	7.91	10.42	12.05
CAY, t_{NW}	3.78	3.86	3.96	4.75	4.99	5.25
Dn, Slope	−1.27	−2.39	−5.81	−5.88	−4.66	−5.62
Dn, t_{NW}	−1.33	−1.41	−2.21	−1.58	−1.30	−1.38
AdjustedR^2	0.05	0.09	0.18	0.28	0.32	0.35
Implied R^2	0.06	0.11	0.18	0.20	0.20	0.19
Panel C: Multiple regressions with Dn and all five risk premium proxies						
DP, Slope	0.03	0.06	0.12	0.20	0.24	0.27
DP, t_{NW}	1.85	2.08	2.34	2.63	3.08	3.63
CAY, Slope	0.79	1.65	2.94	5.71	8.19	9.85
CAY, t_{NW}	2.11	2.51	2.62	3.07	3.50	4.00
TB, Slope	−0.26	−0.56	1.86	4.33	5.94	7.72
TB, t_{NW}	−0.29	−0.38	0.78	1.64	2.19	2.64
TRM, Slope	0.52	0.81	2.96	5.04	6.57	8.26
TRM, t_{NW}	0.72	0.69	1.79	1.98	2.59	3.62
DEF, Slope	−2.02	−3.47	−8.11	−13.07	−12.42	−9.59
DEF, t_{NW}	−1.27	−1.41	−1.83	−2.51	−2.22	−1.44
Dn, Slope	−2.02	−3.47	−8.11	−13.07	−12.42	−9.59
Dn, t_{NW}	−1.66	−1.47	−3.35	−3.03	−2.93	−3.42
Adjusted R^2	0.05	0.11	0.25	0.41	0.49	0.55
Implied R^2	0.09	0.15	0.29	0.36	0.40	0.40
Panel D: Univariate regressions with Dh						
Slope	2.53	−0.74	−4.57	−0.83	−2.36	−5.85
t_{NW}	1.05	−0.18	−0.81	−0.14	−0.39	−0.69
Adjusted R^2	0.00	−0.01	0.00	−0.01	−0.01	0.00
Implied R^2	0.03	0.02	0.00	0.00	0.00	0.00
Panel E: Bivariate regressions with Dh and CAY						
CAY, Slope	0.77	1.61	3.53	7.29	10.68	13.29
CAY, t_{NW}	2.30	2.65	2.99	3.54	3.83	4.16
Dh, Slope	2.35	−1.13	−5.87	−2.69	−4.31	−8.14
Dh, t_{NW}	0.98	−0.28	−1.08	−0.44	−0.65	−0.89
Adjusted R^2	0.02	0.03	0.11	0.26	0.36	0.42
Implied R^2	0.06	0.07	0.12	0.16	0.21	0.22
Panel F: Multiple regressions with Dh and all five risk premium proxies						
DP, Slope	0.02	0.06	0.11	0.12	0.10	0.09
DP, t_{NW}	0.81	1.64	1.67	1.41	1.22	1.23
CAY, Slope	0.59	0.89	1.97	5.26	9.67	13.66
CAY,t_{NW}	1.24	1.24	1.58	2.62	3.78	4.74
TB, Slope	−1.54	−0.87	3.38	6.65	7.54	8.45
TB, t_{NW}	−1.34	−0.53	1.24	2.51	2.54	2.98
TRM, Slope	−0.41	0.02	2.81	7.17	8.78	9.13
TRM, t_{NW}	−0.48	0.02	1.60	2.91	3.44	3.56
DEF, Slope	−1.04	−4.85	−7.37	−3.49	7.16	18.44
DEF, t_{NW}	−0.45	−1.57	−1.00	−0.63	1.21	2.75
Dh, Slope	3.22	−3.61	−14.92	−14.48	−13.43	−14.90
Dh, t_{NW}	1.11	−0.93	−2.95	−2.70	−2.06	−2.14
Adjusted R^2	0.01	0.03	0.16	0.39	0.52	0.63
Implied R^2	0.10	0.13	0.15	0.24	0.35	0.37
Panel G: Univariate regressions with Dhm						
Slope	−1.02	−1.92	−3.80	−2.28	−0.63	−0.98
t_{NW}	−2.35	−2.51	−2.65	−1.04	−0.26	−0.34
Adjusted R^2	0.02	0.04	0.07	0.01	0.00	0.00
Implied R^2	0.03	0.03	0.04	0.03	0.02	0.02
Panel H: Bivariate regressions with Dhm and CAY						
CAY, Slope	1.25	2.35	4.14	7.33	10.33	12.40
CAY, t_{NW}	3.86	3.77	3.74	4.45	4.98	5.64
Dhm, Slope	−0.87	−1.63	−3.29	−1.39	0.63	0.51
Dhm, t_{NW}	−2.00	−2.11	−2.38	−0.69	0.27	0.18
Adjusted R^2	0.06	0.11	0.20	0.22	0.29	0.34
Implied R^2	0.08	0.14	0.20	0.22	0.21	0.19
Panel I: Multiple regressions with Dhm and all five risk premium proxies						
DP, Slope	0.02	0.06	0.12	0.20	0.23	0.27
DP, t_{NW}	1.56	1.85	2.17	2.23	2.66	3.18
CAY, Slope	1.01	1.86	2.98	5.62	8.29	10.25
CAY, t_{NW}	2.67	2.70	2.65	2.94	3.37	4.09
TB, Slope	−0.58	−0.97	0.79	3.04	4.48	5.58
TB, t_{NW}	−0.59	−0.62	0.36	1.12	1.51	1.71
TRM, Slope	0.47	0.95	2.78	4.09	5.73	7.32
TRM, t_{NW}	0.63	0.79	1.64	1.58	2.19	2.89
DEF, Slope	−1.07	−2.60	−8.85	−13.29	−11.63	−8.55
DEF, t_{NW}	−0.63	−0.93	−2.20	−2.29	−1.89	−1.18
Dhm, Slope	−0.71	−1.38	−4.80	−5.21	−4.05	−3.88
Dhm, t_{NW}	−1.18	−1.31	−3.08	−2.53	−2.02	−1.84
Adjusted R^2	0.06	0.13	0.27	0.34	0.44	0.52
Implied R^2	0.15	0.24	0.33	0.40	0.43	0.42

First, high aggregate risk premiums forecast low payroll growth within two quarters but high payroll growth in subsequent horizons. Second, high aggregate risk premiums forecast high net hiring rates for the overall economy from one to 16 quarters ahead. The evidence suggests that time-to-build, but not time-to-plan, is at work in the aggregate employment and hiring data. However, we also find that high aggregate risk premiums forecast low net job creation rates in manufacturing at the one-quarter horizon but high net job creation rates in the four- and eight-quarter horizons. The evidence suggests two-quarter time-to-plan in the manufacturing sector. Finally, we find that lagged payroll growth and net job creation rate in manufacturing predict market excess returns at business cycle frequencies, but that the net hiring rate for the overall economy does not.

Our empirical analysis has implications for the existing labor economics literature. Most of the labor studies that build on the adjustment costs formulation of the labor demand (e.g., Hamermesh, 1996) or on the search and matching framework of Pissarides (1985, 2000) and Mortensen and Pissarides (1994) assume constant discount rates over the business cycles. However, the constant risk premiums cannot forecast future employment growth.

Because of their log utility assumption, the general equilibrium models of Merz (1995), Andolfatto (1996), and Gertler and Trigari (2009) are likely to imply low and largely time-invariant risk premiums. As such, their models cannot explain our evidence on the linkages between time-varying risk premiums and labor market performance either. In all, our empirical analysis calls for a deep integration between labor economics and asset pricing.

References

Andolfatto, D., 1996. Business cycles and labor-market search. American Economic Review 86, 112–132.

Barro, R.J., 1990. The stock market and investment. Review of Financial Studies 3, 115–131.

Bazdresch, S., Belo, F., Lin, X., 2009. Labor hiring, investment, and stock return predictability in the cross section. Unpublished working paper, University of Minnesota, Minneapolis, MN.

Bleakley, H., Ferris, A.E., Fuhrer, J.C., 1999. New data on worker flows during business cycles. New England Economic Review (July/August), 49–76.

Boyd, J.H., Hu, J., Jagannathan, R., 2005. The stock market's reaction to unemployment news: Why bad news is usually good for stocks. Journal of Finance 60, 649–672.

Campbell, J.Y., Shiller, R., 1988. The dividend–price ratio and expectations of future dividends and discount factors. Review of Financial Studies 1, 195–228.

Chen, N., 1991. Financial investment opportunities and the macroeconomy. Journal of Finance 46, 529–554.

Cochrane, J.H., 1991. Production-based asset pricing and the link between stock returns and economic fluctuations. Journal of Finance 46, 209–237.

Davis, S.J., Faberman, R.J., Haltiwanger, J., 2006. The flow approach to labor markets: new data sources and micro–macro links. Journal of Economic Perspectives 20, 3–26.

Estrella, A., 2005. Why does the yield curve predict output and inflation? Economic Journal 115, 722–744

Estrella, A., Hardouvelis, G.A., 1991. The term structure as a predictor of real economic activity. Journal of Finance 46, 555–576.

Fama, E.F., 1981. Stock returns, real activity, inflation, and money. American Economic Review 71, 545–565.

Fama, E.F., French, K.R., 1988. Dividend yields and expected stock returns. Journal of Financial Economics 22, 3–25.

Fama, E.F., French, K.R., 1989. Business conditions and expected returns on stocks and bonds. Journal of Financial Economics 25, 23–49.

Fama, E.F., Schwert, G.W., 1977. Asset returns and inflation. Journal of Financial Economics 5, 115–146.

Gertler, M., Trigari, A., 2009. Unemployment fluctuations with staggered Nash wage bargaining. Journal of Political Economy 117, 38–86.

Hamermesh, D.S., 1996. Labor Demand. Princeton University Press, Princeton, NJ.

Harvey, C.R., 1988. The real term structure and consumption growth. Journal of Financial Economics 22, 305–333.

Hodrick, R.J., 1992. Dividend yields and expected stock returns: alternative procedures for inference and measurement. Review of Financial Studies 5, 357–386.

Keim, D.B., Stambaugh, R.F., 1986. Predicting returns in the stock and bond markets. Journal of Financial Economics 17, 357–390.

Lamont, O., 2000. Investment plans and stock returns. Journal of Finance 55, 2719–2745.

Lettau, M., Ludvigson, S., 2001. Consumption, aggregate wealth, and expected stock returns. Journal of Finance 56, 815–849.

Lettau, M., Ludvigson, S., 2002. Time-varying risk premia and the cost of capital: an alternative implication of the Q theory of investment. Journal of Monetary Economics 49, 31–66.

Liu, L.X., Whited, T.M., Zhang, L., 2009. Investment-based expected stock returns. Journal of Political Economy 117, 1105–1139.

Merz, M., 1995. Search in the labor market and the real business cycle. Journal of Monetary Economics 36, 269–300.

Merz, M., Yashiv, E., 2007. Labor and the market value of the firm. American Economic Review 97, 1419–1431.

Mortensen, D.T., Pissarides, C.A., 1994. Job creation and job destruction in the theory of unemployment. Review of Economic Studies 61, 397–415.

Newey, W.K., West, K.D., 1987. A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. Econometrica 55, 703–708.

Pissarides, C.A., 1985. Short-run dynamics of unemployment, vacancies, and real wages. American Economic Review 75, 676–690.

Pissarides, C.A., 2000. Equilibrium Unemployment Theory, second ed. MIT Press, Cambridge, MA.

Stock, J.H., Watson, M.W., 1989. New indexes of coincident and leading economic indicators. In: Blanchard, O.J., Fischer, S. (Eds.), NBER Macroeconomic Annual. MIT Press, Cambridge, MA, pp. 351–394.

Stock, J.H., Watson, M.W., 1999. Business cycle fluctuations in US macroeconomic time series. In: Taylor, J.B., Woodford, M. (Eds.), Handbook of Macroeconomics. Elsevier B.V., pp. 3–64.

Yashiv, E., 2000. The determinants of equilibrium unemployment. American Economics Review 90, 1297–1322.