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ABSTRACT

We find that procyclical stocks, whose returns comove with business cycles, earn higher average returns than countercyclical stocks. We use almost a three-quarter century of real GDP growth expectations from economists' surveys to determine forecasted economic states. This approach largely avoids the confounding effects of econometric forecasting model error. The loading on the expected real GDP growth rate is a priced risk measure. A fully tradable, ex-ante portfolio formed on this loading generates a procyclicality premium that is statistically significant, economically large, long-lasting over a few years, and independent of the size, book-to-market, and momentum effects.

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The link between macroeconomic fundamentals and stock returns is an important yet unresolved issue in finance. There is a long strand of literature that examines the effect of expected business conditions on expected stock returns. The traditional approach has been to proxy expected business conditions by realized macroeconomic variables, financial market instruments, or combination thereof.[1] It has been more challenging to identify a direct measure of macroeconomic expectations for asset pricing tests, because most expectations data is not available in time series for periods long enough to draw inferences about asset return premia.

In addition, there is a more subtle issue. Expectations about macroeconomic factors are not formed mechanically, but instead created through a process of human reasoning that, at the very least relies upon current, observed conditions and past experience in ways that are difficult to simply proxy with a linear model and a handful of quantitative variables. While some economic forecasts are predictable given the model, others may be based upon intuition, shifting inputs, or even on polling of corporate opinion. Equity market participants presumably rely on an extensive institutional network of professional economic forecasters in the public and private sector. Most major financial institutions have a chief economist. These forecasters publish outlooks, talk to the media, convey proprietary information to the firms that employ them, write newsletters and blogs – in short, economists are important agents in the development of a consensus (or lack thereof) about the direction of the economy. In any test of the relation between asset prices and macroeconomic expectations, it would be particularly useful to filter macroeconomic data through the mind of the forecaster, and use this "processed" expectational information to test whether asset returns reflect macroeconomic expectations. That is the objective of this paper.

Specifically, we use almost three-quarters of a century of expectational survey data to examine

[1] For the use of macroeconomic variables such as industrial production and the inflation rate, see, for example, Chen, Roll, and Ross (1986) and Chen (1991). Campbell and Shiller (1988), Fama and French (1988, 1989), and Ferson and Harvey (1991, 1999) employ financial market variables, such as the dividend yield, the default and term premia, and the short rate, to predict equity returns. The aggregate consumption-wealth ratio proposed by Lettau and Ludvigson (2001a, 2001b) can be considered a hybrid of macroeconomic and financial variables.

whether stocks whose returns comove with business cycles, or procyclical stocks, earn higher returns. Our motivation comes from the intuition that such stocks protect investors less well against a decline in wealth during economic downturns, and hence should offer higher average returns to be held in equilibrium. In fact, this is a prediction common to many equilibrium models with sufficient risk aversion. For example, Cochrane (1999, p.39) nicely puts it in his summary of Merton's (1973) Intertemporal Capital Asset Pricing Model (ICAPM):

> "In sum, we should expect that *procyclical stocks* that do well in booms and worse in recessions will have to offer higher average returns than *countercyclical stocks* that do well in recessions, even if the stocks have the same market beta. We expect that another dimension of risk covariation with recessions will matter in determining average returns." (our emphasis)

To determine subjective beliefs about business cycles, we employ a direct measure of investor expectations about the future prospect of the economy. The Livingston Survey publishes leading economists' forecasts about national output, prices, unemployment, and interest rates semiannually. Initiated by Joseph Livingston in 1946 and currently maintained by the Federal Reserve Bank (FRB) of Philadelphia, the survey provides almost a three-quarter century of direct investor expectations. Using this dataset, Campbell and Diebold (2009) find that the growth rate in expected real Gross Domestic Product (GDP) negatively predicts aggregate stock returns controlling for standard predictive variables. This implies that expected returns rise when future business conditions are expected to be poor and vice versa. Importantly to our purpose, this result implies that the expected real GDP growth rate qualifies as a conditioning variable in a cross-sectional asset pricing test. While the design of the Livingston Survey allows us to only construct a two semiannual-period-ahead forecast for most of the sample period, it is unclear if investors should respond to the survey result immediately. For example, suppose the survey predicts that the real economy will deteriorate after expanding for six months. If investors immediately tilt their holdings toward countercyclical stocks, they will forgo the benefits of the remaining expansion. This makes the growth expectation measure from the Livingston Survey an unlikely candidate for constructing an ICAPM factor, because in Merton's (1973) ICAPM the state variables affect investor demand immediately. Therefore, we lag the growth expectation measure for two semiannual periods to match the forecast horizon to the measurement period of returns, and use it as a conditioning variable in a scaled factor model. Campbell and Diebold (2009) also take the second lag of the same expectation measure to examine its return predictability.

We start by examining the ability of the expectation measure to explain the cross-sectional variation in returns. Our benchmark two-factor model consists of the excess market return and the second semiannual lag of the expected real GDP growth rate, $LEGDP$. Using the cross-sectional Fama-MacBeth (1973) regressions with 25 portfolios sorted on size and the book-to-market ratio (BM) as test assets, we find that the $LEGDP$ premium is positive and significant. This is consistent with the hypothesis that procyclical stocks earn higher average returns. The adjusted R^2 from a single cross-sectional regression of the average realized excess returns on estimated betas is 57% (Figure 2). By comparison, the adjusted R^2 for the four-factor model comprised of the market, size, value, and momentum factors is 61%. Thus, adding the non-traded $LEGDP$ factor to the market model dramatically improves the model's cross-sectional explanatory power from virtually zero to just below the level achieved by a set of four prominent return factors. In addition, when the test assets are replaced by 30 portfolios that combine ten size, ten book-to-market, and ten momentum portfolios based on one-way sorts, the $LEGDP$ premium is significantly positive controlling for the market, size, and value factors and a momentum characteristic, measured by the past six-month return of the test assets.

We next assess the economic significance of the procyclicality premium using a portfolio-sorting approach. We sort individual stocks on their return sensitivity to $LEGDP$ from the benchmark two-factor model. We employ one-way and multi-way sorts controlling for the size, BM, and momentum characteristics and compute procyclicality premium as the return spread between the highest and lowest $LEGDP$ beta portfolios. The procyclicality premium so constructed is a return on a fully tradable long-short portfolio formed on publicly available information at each point in time. The estimated procyclicality premium with and without size-BM controls ranges from 0.18% to 0.44% per month with a three factor alpha between 0.25% and 0.51% and a four factor alpha between 0.20% and 0.46%, depending on the characteristics controlled. These figures are significant both statistically and economically. With a momentum characteristic control, the procyclicality premium and alphas fall in similar ranges for a variety of past return periods and holding periods up to one year. Thus, momentum profits cannot fully explain the procyclicality premium, although we confirm the findings of Chordia and Shivakumar (2002) and Liu and Zhang (2008) that they are positively correlated. The procyclicality spread is large among big value firms and momentum winners; among these types of firms, the premium ranges between 0.52% and 0.68% per month with three- and four-factor alphas of 0.46% to 0.69%. In addition, the loading on the momentum factor indicates that countercyclical stocks tend to be losers that recently experienced low returns. We further examine the long-run pricing of procyclicality risk. Using a variety of sorting methods, we find that the procyclicality risk premium persists for two to three years after portfolio formation controlling for prominent characteristics and factors. This is consistent with the hypothesis that procyclicality risk arises at the business cycle frequency.

In this paper, lagged expected GDP growth reported in the Livingston Survey is a contemporaneously observable measure of investor expectations that is recognized by market participants as potentially of value. This is important, because any factor model that relies upon the pervasive perception of risk factors and sensitivities must also address the issue of common observability.

Our paper is related to the literature that examines the link between macroeconomic variables and asset returns. Chordia and Shivakumar (2002) show that momentum profits can be explained by lagged macroeconomic variables and disappear once stock returns are adjusted for their predictability based on these macroeconomic variables. Contrarily, applying a battery of asset pricing models to international data, Griffin, Ji, and Martin (2003) conclude that macroeconomic variables cannot explain momentum. This is partly reversed by Liu and Zhang (2008), who find that the growth rate of industrial production is a priced risk factor that explains more than half of momentum profits in the U.S. market. These authors mostly focus on the connection between macroeconomic risk and momentum returns, and do not construct a procyclicality-mimicking portfolio. In contrast, our main objective is to measure the procyclicality premium that is separate from the momentum as well as size and value effects using portfolios formed on fully ex-ante information. In work relevant to the current paper, Vassalou (2003) proposes that news to future realized GDP growth is priced in the cross section of stock returns. Using Lamont's (2001) economic tracking portfolio, she extracts the component of the realized *future* GDP growth rate that is reflected on basis asset returns as a proxy for investors' expectations about future investment opportunities.

Our paper is also related to the literature on expectations and asset returns. Much of the current literature in this domain has focused on the relationship between macroeconomic forecasting variables and subjective expectations on the one hand, and the relationship between subjective expectations and realized outcomes on the other. Consistent with the results of Campbell and Diebold (2009), Greenwood and Shleifer (2014) show that several survey-based forecasts are contrary predictors of market returns and are also contrary to fundamental predictive measures. In recent work Nagel and Xu (2023) find that the *negative* of prior realized industrial production predicts Livingston Survey expected market returns, although with modest economic magnitude. Similarly, De la O and Meyers (2021) find that the dividend price ratio explains relatively little of the market forecast, although Dahlquist and Ibert (2022) exploit the panel nature of the Livingston Survey and document a strong countercyclical pattern for one-year ahead forecasts.

In contrast to much of the prior work, Goetzmann, Watanabe and Watanabe (2022) focus on the co-movement of expectations alone and document a contemporaneous relationship between expectations of industrial production growth and stock market return forecasts. This suggests that Livingston forecasters expect procyclical aggregate market comovement with fundamentals. Interestingly, it is contrary in sign to the documented relationship of a negative relationship to *realized* aggregate market returns.

There is also recent related work about expectations as a priced factor in cross-section. Brandon and Wang (2020) propose aggregate earnings expectations as a candidate pricing variable, comparing it to expected GDP growth and replicating our earlier results for different sub-periods. They point out that the expected GDP growth variable is not necessarily correlated to beliefs about earnings but may share a common determinant, for example sentiment about the economy. Along these lines Hasan et. al. (2023) explicitly test whether an aggregate market emotion index is priced in the cross-section of US stocks. In related work, Shen, Yu and Zhao (2017) show that variation in an aggregate sentiment index attenuates the expected relationship between macroeconomic factor exposure and expected return. Thus there may be a common factor driving macroeconomic and market expectations but it apparently has countercyclical implications for realized market outcomes. In this paper we focus on sensitivity to expert predictions about the future state of the economy as a pervasive risk factor and test whether it is priced in cross-section as predicted by asset pricing theory.

The rest of the paper is organized as follows. The next section explains the data and confirms the return-predictive ability of the expected real GDP growth rate from the Livingston Survey, which is an important qualification for it to serve as a state variable. Section 2 conducts asset-pricing tests using both cross-sectional regressions and portfolio sorting. The final section concludes.

1. GDP Growth Forecast as Predictive Variable

1.1 Data and the Construction of the Expected GDP Growth Measure

Our measure of expected real GDP growth comes from the Livingston Survey, which summarizes the forecasts of approximately 50 economists from industry, government, banking, and academia. Started in 1946 by financial columnist Joseph Livingston and later taken over by the Philadelphia FRB in 1990, it is the oldest continuous survey of economists' expectations. The survey is conducted twice a year in June and December and currently consists of the forecasts of 18 different variables measuring national output, prices, unemployment, and interest rates.[2] The results of the forecasts are released by the Philadelphia FRB during the two survey months and are often reported in major newspapers and Internet newswires.[3]

Following Campbell and Diebold (2009), we construct a measure of expected real GDP growth ($EGDP$) from the median forecasts of the nominal GDP level ($GDPX$) and the CPI level (CPI). The six- and twelve-month-ahead forecasts of these variables are continuously available from the second half of 1951. This allows us to create a directly observable measure of the two-period-ahead log expected real GDP growth rate at the semiannual frequency,

$$EGDP_t^{t+1,t+2} = \ln \frac{GDPX_t^{t+2}}{CPI_t^{t+2}} - \ln \frac{GDPX_t^{t+1}}{CPI_t^{t+1}}, \tag{1}$$

where the subscript represents the current period and the superscripts the forecast period. The Livingston Survey did not request the respondents to provide forecasts on the nominal GDP and

[2]See Croushore (1997) and the Federal Reserve Bank of Philadelphia (2005) for details of the survey.

[3]Much of the existing research employing the Livingston Survey focuses on inflation forecasts (see, e.g., Ang, Bekaert, and Wei (2006), Fama and Gibbons (1984), and Gultekin (1983)). Our analysis additionally uses GDP forecasts to compute real growth expectations.

CPI levels at the end of each forecast month until June 1992. Hence, we are unable to create a one-period-ahead forecast of real GDP growth for most of our sample period. To have a sample period long enough to draw inferences in asset-pricing tests and ensure accurate timing of investor expectations, we use the two-period-ahead forecast defined above.

The first two rows of Table 1 report the summary statistics of $EGDP$ and the realized real GDP growth rate ($RGDP$), computed from data publicly available from the St. Louis FRB. The mean expected real semi-annual GDP growth rate is 1.25%, which is close to the realized growth rate of 1.32%. Figure 1 plots $RGDP$ and the second lag of $EGDP$, denoted by $LEGDP$, which matches the forecasting period to the measurement period of $RGDP$. We observe that $LEGDP$ is much smoother than $RGDP$, which, according to Campbell and Diebold (2009), is a property of optimal forecasts. The figure also shows the NBER business cycles. Each narrow band represents a recession, starting with a peak and ending with a trough. We see that $LEGDP$ tends to start declining at the peak and hit the bottom at the trough for early recessions.

1.2 Predictive Regressions

We now test the ability of $EGDP$ to forecast the future excess market return, which is the qualification for a state variable in cross-sectional asset pricing tests. We control for the following variables typically used in the predictability literature: the dividend yield (DY), default spread (DEF), term spread ($TERM$), and the consumption-wealth ratio (CAY).[4] Our full model specifies the following predictive regression for the period during which all the lags of the predictive variables

[4]See, e.g., Fama and French (1988) for the dividend yield, Keim and Stambaugh (1986) for the default spread, Fama and French (1989) for the term spread, and Lettau and Ludvigson (2001a, 2001b) for the consumption-wealth ratio. DY is the sum of dividends accruing to the Center for Research in Securities Prices (CRSP) value-weighted market portfolio over the previous 12 months divided by the level of the market index. DEF is the yield spread between Moody's Baa and Aaa corporate bonds. $TERM$ is the yield spread between the ten-year Treasury bond and the three-month Treasury bill. The data on corporate and Treasury bond/bill rates are from the St. Louis FRB, and CAY is obtained from Martin Lettau's website.

are available (the second half of 1953 through the first half of 2022),

$$MKT_t = \delta_0 + \delta_1 EGDP_{t-2}^{t-1,t} + \delta_2 DY_{t-1} + \delta_3 DEF_{t-1} + \delta_4 TERM_{t-1} + \delta_5 CAY_{t-1} + e_t, \quad (2)$$

where MKT is the semiannual CRSP value-weighted excess market return compounded from the monthly series.[5] As noted above, we use the second lag of $EGDP$ to match its forecasting horizon to the holding period of the market return. All the other variables are lagged by one semiannual period.

Table 2 shows that $LEGDP$ has a significant return-predictive ability controlling for standard predictive variables. Again, the prefix "L" represents a lagged series. The negative coefficient on $LEGDP$ captures the countercyclical pattern in expected excess returns; a large equity premium arises when the economic outlook is poor and hence the perceived risk is high. The coefficient is significant at the 1% level both alone and in the full model at the bottom, even under the significant predictive ability of the lagged dividend yield (LDY) and the term premium ($LTERM$). This confirms Campbell and Diebold's (2009) finding for an updated period.[6]

2. Cross-Sectional Pricing of Procyclicality Risk

2.1 The Asset Pricing Model

Having confirmed the return-predictive ability of the expected real GDP growth rate, we now examine its cross-sectional pricing. Consider a conditional asset pricing model, $E_{t-1}[m_t R_{it}] = 1$, where m_t is the stochastic discounting factor (SDF), R_{it} is the gross return on asset i, both at time t, and the expectation is taken given investors' information set at time $t-1$. Taking the

[5] Summary statistics for DY, DEF, $TERM$, CAY, and MKT are provided in Table 1.

[6] Campbell and Diebold's (2009) sample period is from the first half of 1952 to the second half of 2003.

unconditional mean and using the covariance formula, we can write the expected return by the covariance between the SDF and the asset return:

$$E[R_{it}] = \frac{1 - cov(m_t, R_{it})}{E[m_t]}. \tag{3}$$

Generally, the SDF is a nonlinear function of factors and the model's deep parameters. Following standard practice, we assume that the SDF can be approximated by a linear function of factors,

$$m_t = a_{t-1} + b'_{t-1} f_t, \tag{4}$$

where f_t is a vector of factors and a_{t-1} and b_{t-1} are potentially time-varying parameters. We assume that a_{t-1} and b_{t-1} are linear functions of a single state variable, $z_{t-1} = EGDP_{t-2}^{t-1,t}$,

$$a_{t-1} = a_0 + a_1 z_{t-1}, \quad b_{t-1} = b_0 + b_1 z_{t-1}. \tag{5}$$

Our minimal set of factors consists of the single market factor, $f_t = R_{Mt}$, hence:

$$m_t = a_0 + a_1 EGDP_{t-2}^{t-1,t} + b_0 R_{Mt} + b_1 EGDP_{t-2}^{t-1,t} R_{Mt}. \tag{6}$$

We expect that $a_1 < 0$, because a better economic condition, proxied by a higher expected real GDP growth rate, increases investors' consumption and decreases marginal utility. If this is the case, substituting Equation (6) in (3) shows that stocks whose returns covary with the lagged expected real GDP growth rate should have higher returns. That is, procyclical stocks should earn higher returns.

Here, procyclicality is defined by the lagged, or forecast-horizon matched, expected real GDP growth rate. This is where our framework differs from the main implication of the ICAPM, in which the return covariance should be measured with respect to the contemporaneous changes in the state variables that describe investors' future investment opportunities. In fact, it is unclear that the change in the expected real GDP growth rate from the Livingston Survey serves as a factor in ICAPM, which is a continuous-time diffusion model that does not accommodate a term structure. Forecasters two semiannual-period-ahead forecasts that need not represent an instantaneous shift in investment oportunities. Thus, in what follows we will use the expected real GDP growth rate as a conditioning variable in a scaled factor model as in Equation (6).[7]

2.2 Fama-MacBeth Regressions

As a preliminary investigation, we examine the ability of the GDP growth expectation measure to explain the cross-sectional variation in returns. We use the Fama-MacBeth (1973) procedure with 25 test portfolios formed as the intersection of independently sorted size and book-to-market quintiles. To account for the possible errors-in-variable problem, we employ the Shanken (1992) correction for standard errors. Using standard portfolios ensures reproducibility of the result.

The first row of Table 3 shows the estimated premia for the benchmark two-factor model comprised of the market factor (MKT) and the second lag of the expected real-GDP growth rate ($LEGDP$) from the Livingston Survey. The $LEGDP$ premium is positive and significant at the 1% level, implying that stocks whose returns comove with the business cycle proxy earn higher returns. The average adjusted R^2 of the cross-sectional regressions from the second pass of the Fama-MacBeth procedure is 43%. Adding the interaction term between $LEGDP$ and MKT to the benchmark model makes the scaled CAPM model in Equation (6). However, Row 2 of the table shows that the estimated slope coefficient on the interaction term is insignificant, while that on $LEGDP$ remains significant. This implies that $LEGDP$ captures the level of SDF rather than time

[7]Ferson and Harvey (1991) and Jagannathan and Wang (1996) employ alternative models in which lagged series help explain the cross section of returns.

variation in the market beta. Since the interaction term is insignificant, we will omit it in the rest of the paper. The procyclicality premium, however, dissipates when confronted with the standard three factors including the size factor (SMB) and HML in Row 3. This is not surprising as the test assets are sorted by size and the BM. A test of $LEGDP$-pricing should employ a broader set of assets that comove with it. To this end, we will construct portfolios of individual stocks sorted on the loading on $LEGDP$ in the subsequent section.

Observing that macroeconomic risk explains a substantial portion of momentum profits, Liu and Zhang (2008) include momentum-sorted portfolios in test assets.[8] Following them, we now replace the test assets with 30 value-weighted portfolios that combine ten size, ten book-to-market, and ten momentum portfolios based on one-way sorts on each characteristic. The results in Rows 4 to 6 show that the $LEGDP$ premium remains significantly positive after controlling for the three factors and additionally the momentum characteristic, measured as each test portfolio's past six-month return ($PRET$). However, it becomes insignificant when the momentum factor (MOM) is further included in Row 7.[9] Again, the potential lack of dispersion in the $LEGDP$ loading among the test assets might be the culprit for the ultimate insignificance, which we will address in the sections to follow.

We consider these seemingly mixed results promising for a non-return factor like $LEGDP$. To support this view, we plot fitted returns from the selected models against the average realized returns of the test assets using the 25 size-BM portfolios in Figure 2. The dashed line represents a 45 degree line, on which fitted returns will fall if the model perfectly explains the cross-sectional variation in average returns. The flat relation in Panel A confirms the well known fact that the unconditional CAPM cannot explain the cross-sectional variation in the returns on size-BM port-

[8]Aretz, Bartram, and Pope (2010) also find a significant link between momentum and macroeconomic fundamentals.

[9]SMB, HML, and MOM as well as the two sets of the test portfolio returns are downloaded from Kenneth French's website.

folios. The adjusted R^2 from the cross-sectional regression of the average realized excess returns on estimated betas ("Adj. R^2") is negligible. Once we add $LEGDP$ in Panel B, however, the plot gets more aligned to the 45 degree line, and the adjusted R^2 jumps to 57%. For the four-factor model in Panel C, the plot is slightly more concentrated but the adjusted R^2 is 61%: that is, the gain in the fit statistic is only a few percent, even though the model employs as many as four factors that essentially re-package the individual stock returns, which comprise the test asset returns in the left hand side of the regressions.

We make two observations from this preliminary analysis. First, there is a sign of procyclicality premium for stocks whose returns comove with business cycles. Second, this premium, like any other, may not be measured appropriately in a cross-sectional asset pricing test unless the test assets are sensibly chosen.[10]

This motivates us to pursue an approach that does not rely on a particular set of test assets. Specifically, we will form portfolios based on individual stocks' return comovement with $LEGDP$. Moreover, forming a tradable portfolio allows us to gauge the economic significance of the procyclicality premium. This is what we now turn to.

2.3 Forming Procyclical Portfolios

We form portfolios by sorting individual stocks on their return sensitivity to the expected real GDP growth rate from the Livingston Survey in the benchmark two-factor model. First, in each June and December individual stock returns are regressed on MKT and $LEGDP$ using past ten years of semiannual observations (20 periods). Then, stocks are sorted by their $LEGDP$ betas into decile portfolios, which are held for the next six months. Following much of the existing literature, we start forming portfolios in June 1963 and measure monthly returns from July 1963 through

[10] Lewellen and Nagel (2006) and Lewellen, Nagel, and Shanken (2008) raise a related point that one should examine various sets of test assets in cross-sectional asset-pricing regressions.

December 2022, which is the sample period for our asset-pricing tests. We report results based on value-weighted returns, but those for equally weighted returns are qualitatively similar.

Table 4 reports the characteristics of the $LEGDP$ beta-sorted decile portfolios. The top row shows that the distribution of the the average $LEGDP$ beta (β^{LEGDP}) exhibits a remarkable near symmetry around zero, ranging between an average beta of -44.3 in the lowest decile and 39.7 in the highest decile. Thus, stocks in lowest deciles are countercyclical and those in highest deciles are procyclical. The subsequent rows of the table show that the most and least procyclical firms tend to be smaller in market capitalization ($SIZE$) and experience larger past six-month returns (with a month skipped, or the lagged past five-month return, $PRET$). The book-to-market ratio (BM) is slightly higher for the lowest decile. The average number of stocks (N) indicates that each portfolio is well populated.

Importantly, the excess return ($EXRET$) roughly increases with ranking, albeit rather non-monotonically. The spread between the highest and lowest $LEGDP$ beta portfolios is 0.44% per month ($t = 2.32$, $p = 0.02$), much of which comes from the high return on Decile 10. This suggests that the procyclicality premium arises in a subset of stocks; in what follows, we show that it is strongest in large value stocks and momentum winners. The return spread remains significant upon standard risk adjustment; the three-factor alpha from the regression of return spread on the market, size, and value factors is 0.49% per month ($t = 2.55$, $p = 0.01$), while the four-factor alpha, which further includes the momentum factor in the regressors, is 0.36% per month ($t = 1.86$, $p = 0.06$). These alphas increase with ranking more monotonically than the excess return does.

The loadings on the market (β_{MKT}) and size (β_{SMB}) factors exhibit a U-shape, while that on the value factor (β_{HML}) is inversely U-shaped. This results in insignificant or at best marginally significant loadings of the long-short portfolio on the three factors in the rightmost column. However, the significantly negative loading of the lowest $LEGDP$ beta portfolio on the momentum factor (β_{MOM}) indicates that countercyclical stocks tend to be losers. This leads to a modest but significantly positive momentum factor beta of the long-short portfolio ($\beta_{MOM} = 0.15$, $t = 3.14$). That is, the procyclicality premium comoves with the momentum premium, and this comovement mainly comes from the short position. Since the momentum premium is positive, including the momentum factor in risk adjustment reduces the alpha, resulting in the four-factor alpha that is smaller than the three-factor alpha as observed above.

The cross-sectional variation in the size characteristic as well as the size, value, and momentum factor loadings confounds the measurement of procyclicality premium. The next sections attempt to sort them out.

2.4 Controlling for Size

To isolate the effect of characteristics known to correlate with average returns, we perform multi-way sorts. We first sort stocks independently by size and expected real GDP growth beta (from the benchmark two-factor model) into quintiles and form 25 portfolios as their intersections. For the size sort, we use the NYSE breakpoints following Fama and French (1993). Table 5 reports the result. Panel A indicates that the average $LEGDP$ beta is distributed quite symmetrically around zero within each size quintile. Thus, firms of all size come with a spectrum of procyclicality. In contrast, the market beta in Panel B exhibits a U-shaped pattern with respect to β^{LEGDP} ranking in a given size quintile. Thus, the market beta does not spread across procyclical and countercyclical firms well. The two-way sort controls for size (Panel C) and the book-to-market ratio (Panel D) fairly well, except that the largest quintile exhibits some variation in size. The past six-month return in Panel E is U-shaped within each size quintile, with countercyclical stocks having slightly lower past six-month returns. The disproportionately large number of stocks in the smallest size quintile in Panel F reflects the fact that many NASDAQ firms fall in that quintile.

The excess return in Panel G tends to increase with the β^{LEGDP} ranking within each size quintile. However, the relation is not necessarily monotonic, and the return on the portfolio long the highest $LEGDP$ beta stocks and short the lowest $LEGDP$ beta stocks is significant only within the fourth size quintile. The column labeled "Cont" reports the equally weighted average of the five size-quintile excess returns within each β^{LEGDP} quintile. This size-controlled portfolio return monotonically increases from 0.62% to 0.84% per month, leading to a size-controlled procyclicality premium of 0.21%, which is statistically significant at the 5% level. It remains significant after the three- and four-factor risk adjustments in Panels H and I. However, the relation between alpha and β^{LEGDP} is not generally monotonic within a size quintile, suggesting the influence of characteristics other than size.

2.5 Controlling for the Book-to-Market Ratio

We next replace the controlling characteristic by the book-to-market ratio and repeat the analysis. Table 6 reports the characteristics of the 25 BM-β^{LEGDP}-sorted portfolios. Again, following Fama and French (1993), we use NYSE breakpoints in BM sorting. Panel A exhibits a remarkable symmetry of the $LEGDP$ beta within each BM quintile. Thus, both value and growth firms come in procyclical and countercyclical varieties. The market beta in Panel B is U-shaped with respect to β^{LEGDP} within a BM quintile. Size in Panel C tends to be smaller for value firms, confirming what is known from existing studies. Within each BM quintile, there is little variation in the book-to-market ratio (Panel D) and the past six-month return exhibits a U-shaped pattern (Panel E). The number of stocks in Panel F assures that each portfolio is well populated.

Panels G, H, and I show different patterns from those for the size-β^{LEGDP} sorting in the previous table. The return spread between the highest and lowest β^{LEGDP} quintiles is largest within value firms (the highest BM quintile) and is 0.59% in Panel G, resulting in a three-factor alpha of 0.70%

in Panel H and a four-factor alpha of 0.65% in Panel I. All the three spreads are significant at the 1% level. However, the spreads in the other BM quintiles are smaller, leading to smaller spreads in the "Cont" column, which shows the equally weighted average of the five excess BM portfolio returns or alphas within each $LEGDP$ beta quintile. The BM-controlled procyclicality premium at the bottom right corner of Panel G is 0.23%, with the corresponding three- and four-factor alphas of 0.33% in Panel H and 0.28% in Panel I, respectively, all of which are significant at the 5% or 1% level.

2.6 Triple Sort by Size, Book-to-Market Ratio, and Procyclicality Beta

As noted above, the pattern of size in Panel C of Table 6 indicates that value stocks tend to be small stocks. To further control for this negative correlation between size and BM, we sort stocks independently into size, BM, and $LEGDP$-beta terciles and form 27 portfolios as their intersections. Table 7 shows the result of the triple sort. For simplicity, we focus on the highest nine and lowest nine β^{LEGDP} portfolios and their long-short positions. Panels A and B show the size and BM of the low and high β^{LEGDP} portfolios in Subpanels (i) and (ii), respectively. Since we are interested in the long-short portfolio returns, it is not the within-panel variation that matters, but the difference between the corresponding cells of the two subpanels. In this regard, the triple sorting controls for the two characteristics quite well, except for the largest portfolios that exhibit some variation in size between Subpanels A(i) and A(ii). The past six-month return on value stocks (BM rank 3) exhibits some difference between countercyclical stocks in Panel C(i) and procyclical stocks in Panel C(ii). If this causes any bias, factor adjustments will ultimately control for it.

The bottom right corners of Panels D, E, and F indicate that the procyclicality premium is largest among large value stocks: the premium is 0.68%, with the three- and four factor alphas of 0.75% and 0.69%, respectively. The rightmost column of each panel shows the equally weighted average of the nine size-BM portfolio returns or alphas within a $LEGDP$ beta tercile. The numbers increase monotonically in the $LEGDP$ beta ranking in all the three panels. The difference between the high and low $LEGDP$ beta terciles in Panel D is the size-BM-controlled procyclicality premium, which is 0.18%, with the three- and four-factor alphas of 0.25% in Panel E and 0.21% in Panel F, respectively. These figures are significant at the 5% or 1% level.

2.7 Controlling for the Momentum Characteristic

Given the positive relation between procyclicality and past returns (see the discussion of Table 4), we control for the momentum characteristic as well. Following Jegadeesh and Titman (1993), we implement the so-called (J, K) momentum strategies. Every month, stocks are sorted independently into quintiles by their past J month returns skipping a month (lagged $J-1$ month return, $PRET$) and the latest available $LEGDP$ beta. The $LEGDP$ beta is computed from the benchmark two-factor model using past ten years of semi-annual observations as of last June or December, whichever is later, and hence does not change for six months. First, 25 value-weighted sub-portfolios are formed as the intersection of the past return-$LEGDP$ beta quintiles and held for K months. Then for each ranking, the entire portfolio is formed as an equally weighted portfolio of the K sub-portfolios, consisting of those formed in the current and previous $K-1$ months, with overlapping holding periods when $K > 1$. Thus, we rebalance fraction $1/K$ of the stocks monthly by retiring a maturing sub-portfolio and starting a new one.

Table 8 presents the result for the $(6, 6)$ strategy. Within a past six-month return quintile, stocks with a spectrum of procyclicality are present (Panel A); the market beta exhibits a U-shape with respect to the $LEGDP$ beta (Panel B), and size an inverted-U shape (Panel C); the book-to-market ratio is flat (Panel D); losers exhibit an inverted U-shape while winners do a U-shape (Panel E). Panel F confirms that each portfolio is well populated.

The procyclicality premium and their alphas in the bottom row of Panels G, H, and I are largest and statistically significant for winner stocks ($PRET$ quintile 5): the premium is 0.52% with the three- and four-factor alphas of 0.58% and 0.46%, respectively, all of which are significant at the 1% level.

The rightmost column labeled "Cont" in Panel G shows the average excess return of the five $PRET$ portfolios within a $LEGDP$ beta quintile. This momentum characteristic-controlled excess return monotonically increases with $LEGDP$ beta, and so do its three and four factor alphas in Panels H and I, respectively. The momentum-controlled procyclicality premium, defined as the spread between the highest and lowest $LEGDP$ beta quintiles in the "Cont" column, is 0.27% with three- and four-factor alphas of 0.35% and 0.28%, respectively, all of which are statistically significant.

We next extend the analysis to general (J, K) strategies, where $J = 3, 6, 12$ and $K = 1, 3, 6, 12$. For simplicity, we only report the procyclicality premium controlled for the momentum characteristic and their alphas in Table 9. These correspond to the bottom row of the "Cont" column in Panels G, H, and I of Table 8, and therefore the estimates for the $(6, 6)$ strategy are identical. We make two observations. First, the procyclicality premium is strongest when the portfolios are controlled for the past six-month returns ($J = 6$) and held for 3 or 6 months ($K = 3, 6$). Second, nevertheless, the long holding period of 12 months yields a significant procyclicality premium and alphas when controlled for the past six-month return: the procyclicality premium for the $(6, 12)$ strategy is 0.21% in Panel A and the three- and four-factor alphas in Panels B and C are 0.29% and 0.20%, respectively. This suggests that the procyclicality premium also obtains at one-year and possibly longer horizons. This is indeed plausible if it is the reward for bearing the procyclicality risk over business cycles, the risk that one's wealth tends to decrease during bad times and may not recover for substantial periods. The next section explores this possibility.

2.8 Long-run Pricing of Procyclicality Risk

If procyclicality risk arises over business cycles, we expect its pricing to bear a long-run effect. We examine this point by reverting to semiannual portfolio formation and increasing the holding period, K, from 6 to 12, 24, 36, and 60 months. Specifically, every June and December we form sub-portfolios via the one, two, or three-way sort involving the $LEGDP$ beta, size and/or the book-to-market ratio as in Sections 2.3 and 2.4. Each sub-portfolio is value-weighted and held for K months. The entire portfolio is an equally weighted portfolio of all the running $K/6$ sub-portfolios, consisting of those formed in the current and previous $K/6-1$ semi-annual periods, with overlapping holding periods when $K > 6$.

Table 10 shows the result. In each panel, the figures for $K = 6$ match those in the corresponding previous tables as there is only a single sub-portfolio for a given rank. The long-short portfolio return between the highest and lowest $LEGDP$ beta deciles from the one way sort in Panel A monotonically decreases with the holding period, and so do their three- and four-factor alphas. They are significant for holding periods of up to three years, with returns ranging between 0.30% and 0.44% and the three- (four-) factor alphas between 0.40% and 0.49% (0.32% and 0.36%). The four-factor alpha is lower than the three-factor alpha at all holding periods except for 60 months where they equal, suggesting some dependency of the procyclicality premium on the momentum premium, although we would expect that the momentum dependency would be most relevant for holding periods of one year or shorter over which short-run return continuation is known to obtain. Nevertheless, the procyclicality risk premium is not entirely subsumed by the inclusion of the momentum factor.

We further form long-run portfolios via the two and three-way sorts. For brevity, we only report the excess returns and alphas of the size-, BM-, and size-BM-controlled portfolios in Panels B, C, and D, respectively. All these panels say that the procyclicality risk premium persists for a few years controlling for prominent characteristics and factors. Although the excess return becomes insignificant at the two- to three-year horizon when the controls include BM in Panels C and D, the alphas are significant.

In summary, the pricing of procyclicality risk persists in the long run, and the procyclicality risk premium remains significant for up to three years. This differentiates the procyclicality premium from the momentum premium, which is known to be positive for holding periods of up to approximately one year and then reverses its sign over longer horizons.

3. Conclusion

We find that procyclical stocks whose returns comove with forecasted business cycles earn higher returns than countercyclical stocks. Our proxy for business cycles is the expected real GDP growth rate constructed from the Livingston Survey, a publicly available survey data that spans almost three quarters of a century. The expected real GDP growth rate negatively forecasts the future aggregate return controlling for existing predictive variables. Thus, it satisfies the qualification for a state variable in a cross-sectional asset pricing test. A benchmark two-factor model with the excess market return and the expected real GDP growth rate explains a sizable portion of cross-sectional variation in standard test portfolio returns. We further form portfolios by sorting individual stocks on their return sensitivity to the expected real GDP growth rate. We extract the procyclicality premium that is statistically significant and economically large controlling for size, BM, and momentum characteristics. The characteristic-controlled procyclicality premium is robust to adjustment for the market, size, value, and momentum factors. The procyclicality premium is largest among large value stocks and momentum winners. The pricing of procyclicality risk persists for a few years after portfolio formation, consistent with the hypothesis that it derives from the covariance risk at the business cycle frequency.

Our analysis leaves some unresolved issues. While we are guided by the scaled factor model, the evidence is also not inconsistent with the two-beta expression of the conditional CAPM proposed by Jagannathan and Wang (1996). In fact, our previous work contained a thorough discussion on this point and an implementation of time-varying beta along the line of Petkova and Zhang (2005).[11] Also, because of the limited availability of the one-period-ahead expectation, we have dismissed the possibility of the contemporaneous change in the real GDP growth expectation to serve as an ICAPM factor. However, when enough observations are accumulated in future, this will make an interesting agenda to pursue, as Cochrane (2005, p.445) puts in the following remark:

> "Though Merton's (1971, 1973) theory says that variables which predict market returns should show up as factors which explain cross-sectional variation in average returns, surprisingly few papers have actually tried to see whether this is true."

A final puzzle is particularly challenging, in an unreported analysis, we do not find innovations to the *realized* real GDP growth rate to be priced. Expectations, not realizations, appear to matter. This may simply underscore the advantage of using processed information from survey data that is ex ante. Asset pricing models based on priced systematic risk factors rely fundamentally on a widespread perception of risks. Recession concerns may not correlate with recession outcomes but they may still price assets. Although latent variable methods and ex-post variable realizations are useful for identifying a factor structure in asset returns after the fact, ultimately researchers must look for priced factors in the public flow of economic information and beliefs that derive from them. For surely if people care a lot about a few factors they will seek news about them, and the public demand for predicting them will be met in a free information marketplace.

[11] The idea to model betas as a function of business cycle variables also appears in Chan and Chen (1988, footnote 6).

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Table 1: **Summary statistics**

	Mean	Stdev	N	Start	End
$EGDP(\%)$	1.25	0.67	143	1951S2	2022S2
$RGDP(\%)$	1.32	1.93	143	1951S2	2022S2
$DY(\%)$	2.97	1.12	141	1951S2	2021S2
$DEF(\%)$	0.082	0.037	143	1951S2	2022S2
$TERM(\%)$	0.12	0.10	140	1953S1	2022S2
$CAY(\%)$	-0.217	2.03	142	1952S1	2022S2
$MKT(\%)$	3.93	11.66	144	1951S2	2023S1

This table shows the mean, the standard deviation (Stdev), the number of observations (N), and the starting and ending semiannual periods of selected variables (S1 denotes the first half of the year, and S2 the second half). $EGDP$ is the expected real GDP growth rate from the Livingston Survey. $RGDP$ is the realized GDP growth rate. DY is the dividend yield. DEF is the default spread. $TERM$ is the term spread. CAY is the consumption-wealth ratio. Since it is available only up to the third quarter of 2019, we lag the last available value up to 2022S2. MKT is the excess return on the CRSP value-weighted portfolio.

Table 2: **Predictive return regressions**

	Const	$LEGDP$	LDY	$LDEF$	$LTERM$	$LCAY$	Adj. R^2
1	0.08***	-3.48***					0.03
	(4.37)	(-2.69)					
2	-0.02		1.95**				0.03
	(-0.65)		(2.22)				
3	0.01			32.15			0.00
	(0.54)			(1.14)			
4	0.02				15.05*		0.01
	(1.34)				(1.71)		
5	0.04***					0.65	0.01
	(4.09)					(1.22)	
6	0.00	-4.00***	1.87*	19.13	19.99**	0.09	0.08
	(-0.10)	(-3.18)	(1.81)	(0.69)	(2.29)	(0.17)	

This table shows estimated coefficients of semiannual predictive return regressions with t-statistics in parentheses, based on Newey-West robust standard errors with lag length 2. The excess return on the CRSP value-weighted portfolio (MKT) is regressed on a constant ('Const') and lags (denoted by prefix 'L') of the following predictive variables: the Livingston-Survey expected real GDP growth rate ($EGDP$), dividend yield (DY), default spread (DEF), term spread ($TERM$), and the consumption-wealth ratio (CAY). The lag order is 2 for $EGDP$ and 1 for other predictive variables. Adj.R^2 is the adjusted R-squared of the regression. *, **, and *** represent significance at 10, 5, and 1%, respectively.

Table 3: **Fama-MacBeth regressions**

	#Assets	Const	MKT	$LEGDP$	$LEGDP \cdot MKT$	SMB	HML	$PRET$	MOM	Adj.R^2
1	25	7.09***	-2.81	0.84***						0.43
		(3.11)	(-1.21)	(2.81)						
2	25	5.64***	-1.37	0.76***	0.00					0.46
		(3.49)	(-0.76)	(2.67)	(0.13)					
3	25	6.06***	-2.10	0.14		0.84	2.05**			0.50
		(3.30)	(-1.02)	(0.67)		(1.22)	(2.50)			
4	30	6.93***	-2.71	0.57**						0.30
		(4.20)	(-1.49)	(2.09)						
5	30	14.27***	-10.03***	0.64***		1.61**	0.58			0.46
		(6.73)	(-4.32)	(3.97)		(2.30)	(0.71)			
6	30	12.23***	-8.82***	0.50***		1.08*	0.35	9.87***		0.50
		(6.40)	(-4.11)	(3.15)		(1.86)	(0.41)	(3.18)		
7	30	5.12***	-1.66	0.15		0.37	0.97	5.07**	3.89***	0.58
		(2.90)	(-0.86)	(1.05)		(0.59)	(1.15)	(2.08)	(4.80)	

This table shows the estimated premia from the Fama-MacBeth (1973) two-pass procedure. In the first pass, each excess test asset return is regressed on factors at the semi-annual frequency to estimate factor loadings using the entire sample. In the second pass, a cross-sectional regression of excess test asset return is run on the factor loadings and characteristics, if any, in each semi-annual period. Reported are the time-series average slope coefficients from the second pass and t-statistics in parentheses, based on the Shanken (1992) correction for standard errors. *, **, and *** represent significance at 10, 5, and 1%, respectively. #Assets is 25 if the test assets are the 25 portfolios formed as the intersection of size and book-to-market quintiles, and 30 if the test assets are comprised of ten size, ten book-to-market-ratio, and ten momentum portfolios based on one-way sorts. 'Const' is the intercept. MKT is the excess return on the CRSP value-weighted portfolio. $LEGDP$ is the second lag of expected real GDP growth rate constructed from the Livingston Survey. $LEGDP \cdot MKT$ is the interaction term between $LEGDP$ and MKT. SMB, HML, and MOM are the size, book-to-market, and momentum factors, respectively. $PRET$ is the lagged six-month return of the test asset, included as a characteristic in the second-pass cross-sectional regressions. 'Adj.R^2' is the average adjusted R-squared of the second-pass cross-sectional regressions.

Table 4: **Decile portfolios sorted on Livingston expected real GDP growth beta**

β^{LEGDP} rank	1	2	3	4	5	6	7	8	9	10	10-1
β^{LEGDP}	-44.3	-17.5	-9.5	-4.4	-0.5	3.1	6.8	11.3	18.1	39.7	
$SIZE$	1678	3466	4449	4585	4732	4586	4055	3301	2398	1096	
BM	1.10	0.98	1.00	0.99	0.97	0.97	0.97	0.97	0.98	1.02	
$PRET$(%)	8.2	6.3	6.0	5.7	5.7	5.8	5.6	5.5	6.2	8.2	
N	187	188	190	191	191	192	192	191	189	188	
$EXRET$(%)	0.52	0.50	0.57	0.63	0.58	0.65	0.56	0.63	0.56	0.96	0.44
	(2.10)	(2.57)	(3.14)	(3.69)	(3.43)	(3.94)	(3.31)	(3.55)	(2.88)	(4.10)	(2.32)
	[0.04]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.02]
3-fac α(%)	-0.19	-0.15	-0.03	0.07	0.00	0.09	0.00	0.08	0.01	0.30	0.49
	(-1.55)	(-1.79)	(-0.53)	(1.10)	(0.00)	(1.47)	(0.02)	(1.16)	(0.13)	(2.44)	(2.55)
	[0.12]	[0.07]	[0.59]	[0.27]	[1.00]	[0.14]	[0.99]	[0.25]	[0.89]	[0.01]	[0.01]
4-fac α(%)	-0.10	-0.10	0.01	0.06	0.01	0.10	0.04	0.11	0.02	0.26	0.36
	(-0.80)	(-1.15)	(0.12)	(1.00)	(0.13)	(1.49)	(0.55)	(1.54)	(0.23)	(2.09)	(1.86)
	[0.42]	[0.25]	[0.90]	[0.32]	[0.90]	[0.14]	[0.58]	[0.13]	[0.82]	[0.04]	[0.06]
β_{MKT}	1.20	1.04	1.02	0.97	0.99	0.95	0.95	0.96	0.99	1.11	-0.09
	(42.15)	(52.18)	(67.01)	(64.80)	(69.90)	(64.11)	(61.56)	(55.99)	(42.76)	(38.24)	(-1.98)
β_{SMB}	0.27	0.06	-0.04	-0.11	-0.11	-0.11	-0.12	0.00	0.04	0.33	0.05
	(6.64)	(1.93)	(-1.70)	(-4.93)	(-5.51)	(-5.18)	(-5.45)	(0.00)	(1.12)	(7.81)	(0.84)
β_{HML}	-0.08	0.18	0.12	0.14	0.19	0.19	0.15	0.03	-0.03	-0.01	0.07
	(-1.88)	(5.99)	(5.41)	(6.38)	(9.28)	(8.52)	(6.45)	(1.08)	(-0.76)	(-0.24)	(1.03)
β_{MOM}	-0.10	-0.06	-0.05	0.01	-0.01	0.00	-0.04	-0.03	-0.01	0.04	0.15
	(-3.51)	(-2.97)	(-3.12)	(0.34)	(-0.61)	(-0.26)	(-2.59)	(-1.94)	(-0.49)	(1.42)	(3.14)

Every June and December, each excess individual stock return is regressed on the excess market return (MKT) and the lagged expected real GDP growth rate from the Livingston Survey ($LEGDP$) using past ten years of semi-annual observations. Portfolios are formed by sorting individual stocks on their $LEGDP$ loading. Value-weighted returns are measured monthly for the next six months. β^{LEGDP} is the average $LEGDP$ beta of member stocks. $SIZE$ is the average market capitalization in millions of dollars. BM is the average book-to-market ratio, constructed as in Fama and French (1993). $PRET$ is the past six-month return skipping a month (lagged past five-month return). N is the average number of stocks. $EXRET$ is the monthly excess value-weighted return in percentage. "3-fac α" is the three-factor alpha, the intercept from the time-series regression of the excess portfolio return on the excess market return (MKT) and the size (SMB) and value (HML) factors. "4-fac α" additionally includes the momentum (MOM) factor in the regressors, and the four betas are the respective factor loadings from this four-factor regression. Round and square parentheses beside the estimates carry t-statistics and p-values, respectively. The sample contains ordinary common shares of firms traded on NYSE, AMEX, and NASDAQ.

Table 5: **25 portfolios sorted on size and Livingston expected real GDP growth beta**

Panel A: *LEDGP* beta

		SIZE				
		1	2	3	4	5
	1	-34.0	-30.3	-28.8	-26.0	-22.7
	2	-7.1	-7.0	-6.8	-6.8	-6.8
β^{LEGDP}	3	1.3	1.3	1.4	1.3	1.2
	4	9.2	9.0	8.9	8.8	8.7
	5	31.5	27.1	25.5	24.2	21.8

Panel B: Market beta

		SIZE				
		1	2	3	4	5
	1	1.37	1.31	1.30	1.20	1.20
	2	1.14	1.06	1.01	1.02	0.94
β^{LEGDP}	3	1.08	0.97	0.94	0.95	0.88
	4	1.14	1.04	1.00	0.95	0.95
	5	1.56	1.43	1.35	1.30	1.26

Panel C: Size ($ million)

		SIZE				
		1	2	3	4	5
	1	78.3	448.1	1053.7	2645.1	21103.3
	2	86.0	451.1	1074.3	2718.0	22621.1
β^{LEGDP}	3	89.0	450.8	1075.0	2652.2	21543.8
	4	84.7	451.5	1078.2	2693.1	19631.9
	5	75.7	432.3	1061.0	2634.5	16289.9

Panel D: Book-to-market ratio

		SIZE				
		1	2	3	4	5
	1	1.4	0.9	0.8	0.7	0.6
	2	1.4	1.0	0.8	0.7	0.6
β^{LEGDP}	3	1.4	1.0	0.9	0.8	0.6
	4	1.3	0.9	0.8	0.7	0.7
	5	1.3	0.9	0.8	0.7	0.6

Panel E: Past six-month return (%)

		SIZE				
		1	2	3	4	5
	1	5.8	8.9	8.8	7.8	8.6
	2	4.4	6.2	6.8	7.1	7.0
β^{LEGDP}	3	4.7	6.3	5.9	6.6	6.4
	4	4.3	6.4	6.6	6.5	6.9
	5	6.1	9.1	9.3	9.3	9.4

Panel F: Number of stocks

		SIZE				
		1	2	3	4	5
	1	187.5	63.2	45.0	40.4	39.2
	2	140.1	61.3	55.5	56.7	67.3
β^{LEGDP}	3	128.7	62.6	60.1	62.8	69.2
	4	150.1	60.0	56.6	58.4	57.5
	5	209.8	58.2	41.4	35.8	32.1

Table 5: **25 portfolios sorted on size and Livingston expected real GDP growth beta–continued**

Panel G: Excess Return (%)

		SIZE						
		1	2	3	4	5	5-1	Cont
β^{LEGDP}	1	0.76***	0.77***	0.75***	0.46**	0.37*	-0.38**	0.62***
	2	0.88***	0.87***	0.81***	0.72***	0.53***	-0.35**	0.76***
	3	0.98***	0.90***	0.83***	0.78***	0.58***	-0.40***	0.81***
	4	0.97***	1.04***	0.85***	0.76***	0.52***	-0.45***	0.83***
	5	0.91***	0.90***	0.90***	0.82***	0.65***	-0.26	0.84***
	5-1	0.15	0.13	0.15	0.36***	0.27		0.21**

Panel H: Three-factor Alpha (%)

		SIZE						
		1	2	3	4	5	5-1	Cont
β^{LEGDP}	1	-0.18**	-0.13	-0.10	-0.29***	-0.18*	0.00	-0.18***
	2	0.02	0.05	0.03	-0.01	0.00	-0.01	0.02
	3	0.18**	0.12*	0.10	0.10	0.04	-0.14	0.11***
	4	0.16**	0.25***	0.13**	0.09	0.01	-0.15	0.13***
	5	0.02	0.03	0.09	0.09	0.15	0.13	0.08
	5-1	0.20**	0.16	0.20*	0.38***	0.34*		0.26***

Panel I: Four-factor Alpha (%)

		SIZE						
		1	2	3	4	5	5-1	Cont
β^{LEGDP}	1	-0.07	-0.05	-0.02	-0.19**	-0.18*	-0.10	-0.10*
	2	0.09	0.08	0.05	0.06	0.02	-0.07	0.06
	3	0.25***	0.14**	0.14**	0.15**	0.04	-0.21**	0.14***
	4	0.22***	0.30***	0.16**	0.13**	0.04	-0.17*	0.17***
	5	0.09	0.08	0.12	0.12	0.08	-0.01	0.10*
	5-1	0.17*	0.14	0.14	0.31**	0.26		0.20**

Every June and December, each excess individual stock return is regressed on the excess market return (MKT) and the lagged expected real GDP growth rate from the Livingston Survey ($LEGDP$) using past ten years of semi-annual observations. 25 portfolios are formed as the intersection of independently sorted size and $LEGDP$-beta quintiles. Value-weighted returns are measured monthly for the next six months. The panels show the following quantities: Panel A, average $LEGDP$ beta of member stocks; Panel B, average market beta; Panel C, size, measured as the average market capitalization in millions of dollars; Panel D, the average book-to-market ratio, constructed as in Fama and French (1993); Panel E, the past six-month return skipping a month (lagged past five-month return); Panel F, the average number of stocks; Panel G, the average monthly excess value-weighted return; Panel H, the three-factor alpha, computed as the intercept from the time-series regression of the excess portfolio return on the excess market return (MKT) and the size (SMB) and value (HML) factors; and Panel I, the four-factor alpha, where the regressors additionally include the momentum (MOM) factor. "Cont" in Panel G represents the size-controlled excess portfolio returns, computed as the average of the excess returns on the five size quintile portfolios within each $LEGDP$ beta quintile, and "Cont" in Panels H and I their respective alphas. *, **, and *** represent significance at 10, 5, and 1%, respectively.

Table 6: **25 portfolios sorted on BM and Livingston expected real GDP growth beta**

Panel A: *LEDGP* beta

		BM				
		1	2	3	4	5
β^{LEGDP}	1	-32.5	-29.5	-29.4	-30.2	-32.0
	2	-7.2	-7.0	-6.9	-6.8	-6.9
	3	1.3	1.3	1.3	1.4	1.3
	4	9.1	9.0	9.0	9.0	9.1
	5	32.2	28.4	27.5	27.0	29.0

Panel B: Market beta

		BM				
		1	2	3	4	5
β^{LEGDP}	1	1.41	1.31	1.27	1.22	1.28
	2	1.13	1.08	1.04	0.99	1.03
	3	1.12	1.04	0.95	0.88	0.98
	4	1.20	1.10	0.98	0.92	1.05
	5	1.66	1.46	1.40	1.34	1.40

Panel C: Size ($ million)

		BM				
		1	2	3	4	5
β^{LEGDP}	1	5763.7	2199.3	1773.4	1098.5	546.6
	2	10389.4	5257.1	3116.1	2408.7	1662.8
	3	10781.5	6000.2	3797.0	2569.0	1800.7
	4	8857.5	4562.6	2948.4	2150.9	1319.3
	5	3465.9	2063.5	1635.0	1205.3	704.0

Panel D: Book-to-market ratio

		BM				
		1	2	3	4	5
β^{LEGDP}	1	0.3	0.5	0.7	1	2.4
	2	0.3	0.5	0.7	1	2.1
	3	0.3	0.5	0.7	1	2.0
	4	0.3	0.5	0.7	1	2.0
	5	0.3	0.5	0.7	1	2.1

Panel E: Past six-month return (%)

		BM				
		1	2	3	4	5
β^{LEGDP}	1	5.5	5.3	6.0	7.3	11.6
	2	5.1	5.2	5.2	6.0	7.2
	3	4.2	5.0	5.2	6.0	7.7
	4	4.2	4.6	5.0	5.7	7.8
	5	4.8	5.3	7.0	7.3	10.4

Panel F: Number of stocks

		BM				
		1	2	3	4	5
β^{LEGDP}	1	91.6	71.6	64.8	64.5	82.9
	2	71.1	73.5	75.1	76.1	85.1
	3	59.2	70.4	79.6	88.5	85.7
	4	57.6	69.4	78.7	86.7	90.2
	5	68.6	64.7	71.9	75.1	96.9

Table 6: **25 portfolios sorted on BM and Livingston expected real GDP growth beta–continued**

Panel G: Excess Return (%)

		BM						
		1	2	3	4	5	5-1	Cont
β^{LEGDP}	1	0.54**	0.48**	0.45**	0.68***	0.62**	0.08	0.55***
	2	0.62***	0.62***	0.60***	0.60***	0.73***	0.11	0.64***
	3	0.57***	0.61***	0.72***	0.71***	0.94***	0.36**	0.71***
	4	0.51***	0.55***	0.62***	0.65***	0.89***	0.38**	0.64***
	5	0.63***	0.58***	0.57***	0.92***	1.21***	0.58**	0.78***
	5-1	0.09	0.10	0.12	0.24	0.59***		0.23**

Panel H: Three-factor Alpha (%)

		BM						
		1	2	3	4	5	5-1	Cont
β^{LEGDP}	1	-0.01	-0.20**	-0.31***	-0.17	-0.38**	-0.37**	-0.21***
	2	0.17**	0.02	-0.09	-0.19**	-0.02	-0.19	-0.02
	3	0.10	0.06	0.10	-0.02	0.13	0.02	0.07
	4	0.09	0.01	0.04	-0.11	0.05	-0.04	0.01
	5	0.22*	-0.03	-0.09	0.16	0.32**	0.10	0.12
	5-1	0.23	0.17	0.23	0.33*	0.70***		0.33***

Panel I: Four-factor Alpha (%)

		BM						
		1	2	3	4	5	5-1	Cont
β^{LEGDP}	1	0.02	-0.21**	-0.25**	-0.11	-0.32**	-0.34*	-0.17**
	2	0.19**	0.05	-0.08	-0.20**	0.01	-0.18	-0.01
	3	0.15*	0.03	0.11	0.02	0.13	-0.02	0.09*
	4	0.14	0.03	0.05	-0.05	0.03	-0.11	0.04
	5	0.18	0.02	-0.05	0.06	0.33**	0.16	0.11
	5-1	0.16	0.22	0.20	0.17	0.65***		0.28**

Every June and December, each excess individual stock return is regressed on the excess market return (MKT) and the lagged expected real GDP growth rate from the Livingston Survey ($LEGDP$) using past ten years of semi-annual observations. 25 portfolios are formed as the intersection of independently sorted book-to-market ratio (BM) and $LEGDP$-beta quintiles. Value-weighted returns are measured monthly for the next six months. The panels show the following quantities: Panel A, average $LEGDP$ beta of member stocks; Panel B, average market beta; Panel C, size, measured as the average market capitalization in millions of dollars; Panel D, the average book-to-market ratio, constructed as in Fama and French (1993); Panel E, the past six-month return skipping a month (lagged past five-month return); Panel F, the average number of stocks; Panel G, the average monthly excess value-weighted return; Panel H, the three-factor alpha, computed as the intercept from the time-series regression of the excess portfolio return on MKT and the size (SMB) and value (HML) factors; and Panel I, the four-factor alpha, where the regressors additionally include the momentum (MOM) factor. "Cont" in Panel G represents the size-controlled excess portfolio returns, computed as the average of the excess returns on the five BM quintile portfolios within each $LEGDP$ beta quintile, and "Cont" in Panels H and I their respective alphas. *, **, and *** represent significance at 10, 5, and 1%, respectively.

Table 7: **27 portfolios sorted on size, B/M, and $LEGDP$ beta**

Panel A: Size ($ million)

(i) Low β^{LEGDP} portfolios

		BM		
		1	2	3
	1	140.3	146.0	93.3
$SIZE$	2	1177.3	1062.3	1020.4
	3	17739.4	12314.9	9862.1

(ii) High β^{LEGDP} portfolios

		BM		
		1	2	3
	1	142.2	138.5	85.9
$SIZE$	2	1185.4	1069.4	1038.3
	3	14371.7	10816.9	11425.3

Panel B: Book-to-market ratio

(i) Low β^{LEGDP} portfolios

		BM		
		1	2	3
	1	0.32	0.75	2.11
$SIZE$	2	0.34	0.73	1.54
	3	0.31	0.71	1.37

(ii) High β^{LEGDP} portfolios

		BM		
		1	2	3
	1	0.33	0.76	1.85
$SIZE$	2	0.35	0.73	1.50
	3	0.32	0.72	1.43

Panel C: Past six-month return (%)

(i) Low β^{LEGDP} portfolios

		BM		
		1	2	3
	1	2.3	4.3	9.0
$SIZE$	2	6.8	7.8	10.2
	3	7.5	8.0	8.7

(ii) High β^{LEGDP} portfolios

		BM		
		1	2	3
	1	2.1	4.7	8.3
$SIZE$	2	6.4	7.6	11.3
	3	7.6	8.1	9.7

Table 7: **27 portfolios sorted on size, B/M, and *LEGDP* beta–continued**

Panel D: Spread return (high−low *LEGDP* beta)

		BM		
		1	2	3
SIZE	1	0.22	0.13	0.09
	2	0.14	0.02	0.20
	3	0.00	0.17	0.68***

		Controlled excess return (%)
β^{LEGDP}	1	0.67***
	2	0.78***
	3	0.85***
	3-1	0.18**

Panel E: 3-factor alpha (high−low *LEGDP* beta)

		BM		
		1	2	3
SIZE	1	0.25	0.20**	0.16
	2	0.20*	0.07	0.25*
	3	0.08	0.24*	0.75***

		Controlled excess return (%)
β^{LEGDP}	1	-0.14***
	2	0.07*
	3	0.11**
	3-1	0.25***

Panel F: 4-factor alpha (high−low *LEGDP* beta)

		BM		
		1	2	3
SIZE	1	0.15	0.19*	0.17
	2	0.19	0.04	0.19
	3	0.07	0.24*	0.69***

		Controlled excess return (%)
β^{LEGDP}	1	-0.08*
	2	0.10**
	3	0.13***
	3-1	0.21***

Every June and December, each excess individual stock return is regressed on the excess market return (MKT) and the lagged expected real GDP growth rate from the Livingston Survey ($LEGDP$) using past ten years of semi-annual observations. 27 portfolios are formed as the intersection of independently sorted size ($SIZE$), book-to-market ratio (BM), and $LEGDP$-beta terciles. Value-weighted returns are measured monthly for the next six months. The panels show the following quantities: Panel A, size, measured as the average market capitalization in millions of dollars; Panel B, the average book-to-market ratio, constructed as in Fama and French (1993); Panel C, the past six-month return skipping a month (lagged past five-month return); Panel D, the spread portfolio return, computed as the the monthly value-weighted excess return on the high $LEGDP$ beta portfolio less that of the low $LEGDP$ beta portfolio; Panel E, the three-factor alpha, computed as the intercept from the time-series regression of the excess portfolio return on MKT and the size (SMB) and value (HML) factors; and Panel F, the four-factor alpha, where the regressors additionally include the momentum (MOM) factor. The controlled excess returns in Panel D are the size-BM-controlled excess portfolio returns, computed as the average of the excess returns on the nine size-BM portfolios within each $LEGDP$ beta tercile, and the controlled alphas in Panels E and F are their respective alphas. *, **, and *** represent significance at 10, 5, and 1%, respectively.

Table 8: **25 portfolios sorted on past six-month return and Livingston expected real GDP growth beta**

Panel A: *LEDGP* beta

		PRET				
		1	2	3	4	5
	1	-35.1	-29.4	-28.2	-28.2	-32.1
	2	-7.3	-6.9	-6.7	-6.9	-7.1
β^{LEGDP}	3	1.0	1.2	1.3	1.3	1.3
	4	8.9	9.0	8.9	9.0	9.1
	5	31.9	27.4	26.8	26.1	29.9

Panel B: Market beta

		PRET				
		1	2	3	4	5
	1	1.42	1.29	1.26	1.27	1.38
	2	1.23	1.05	1.01	1.03	1.18
β^{LEGDP}	3	1.18	1.00	0.94	0.97	1.13
	4	1.23	1.03	0.98	1.02	1.19
	5	1.67	1.40	1.36	1.35	1.55

Panel C: Size ($ million)

		PRET				
		1	2	3	4	5
	1	893.2	2332.4	3435.2	3405.9	2347.9
	2	1518.4	3722.3	4758.3	5854.1	4133.3
β^{LEGDP}	3	1469.9	3758.0	5105.7	5875.2	4087.2
	4	1263.2	3187.8	3724.3	4642.6	3936.3
	5	721.1	1605.6	2192.9	2115.6	1779.1

Panel D: Book-to-market ratio

		PRET				
		1	2	3	4	5
	1	0.8	0.9	1.0	0.9	1.1
	2	0.9	0.9	0.9	0.9	0.9
β^{LEGDP}	3	0.8	0.7	0.9	0.9	1.1
	4	0.6	0.9	0.9	1.0	1.1
	5	0.7	0.9	0.9	0.9	1.1

Panel E: Past six-month return (%)

		PRET				
		1	2	3	4	5
	1	-10.6	-1.5	4.5	10.6	28.0
	2	-9.3	-1.2	4.4	10.1	23.7
β^{LEGDP}	3	-9.5	-0.7	4.6	10.3	23.0
	4	-9.0	-0.7	4.5	10.4	22.8
	5	-9.9	-0.9	5.1	10.9	27.0

Panel F: Number of stocks

		PRET				
		1	2	3	4	5
	1	77.3	78.7	71.1	73.5	78.9
	2	50.5	83.4	93.4	89.6	63.4
β^{LEGDP}	3	43.7	82.8	103.0	95.0	59.3
	4	48.3	85.1	95.9	92.2	62.2
	5	73.0	77.7	74.3	75.0	79.5

Table 8: **25 portfolios sorted on past six-month return and Livingston expected real GDP growth beta–continued**

Panel G: Excess Return (%)

		PRET						
		1	2	3	4	5	5-1	Cont
β^{LEGDP}	1	0.21	0.46**	0.45**	0.60***	0.66***	0.45**	0.47**
	2	0.31	0.57***	0.57***	0.61***	0.70***	0.39*	0.55***
	3	0.38	0.57***	0.61***	0.67***	0.92***	0.54***	0.63***
	4	0.64**	0.46**	0.53***	0.69***	0.83***	0.19	0.63***
	5	0.44	0.67***	0.66***	0.80***	1.18***	0.73***	0.75***
	5-1	0.23	0.21	0.20	0.20	0.52***		0.27**

Panel H: Three-factor Alpha (%)

		PRET						
		1	2	3	4	5	5-1	Cont
β^{LEGDP}	1	-0.66***	-0.28***	-0.27***	-0.07	-0.03	0.63***	-0.26***
	2	-0.46***	-0.15*	-0.02	0.06	0.12	0.59***	-0.09*
	3	-0.39***	-0.07	0.02	0.08	0.31***	0.70***	-0.01
	4	-0.10	-0.22**	-0.06	0.15**	0.24**	0.33	0.00
	5	-0.36**	0.04	0.04	0.18*	0.55***	0.91***	0.09
	5-1	0.29	0.32*	0.32**	0.25*	0.58***		0.35***

Panel I: Four-factor Alpha (%)

		PRET						
		1	2	3	4	5	5-1	Cont
β^{LEGDP}	1	-0.23	-0.04	-0.18*	-0.10	-0.23**	0.00	-0.16**
	2	-0.01	0.09	0.04	-0.02	-0.07	-0.07	0.01
	3	-0.02	0.12	0.10	0.01	0.11	0.13	0.06
	4	0.28*	0.03	0.03	0.11	-0.01	-0.30	0.09*
	5	0.04	0.20	0.05	0.11	0.23*	0.19	0.13*
	5-1	0.27	0.24	0.23	0.21	0.46***		0.28**

Every month, stocks are sorted independently into quintiles by their past J month returns skipping a month (lagged $J-1$ month return, $PRET$) and latest available beta with respect to the lagged expected real GDP growth rate ($LEGDP$) from the Livingston Survey. The $LEGDP$ beta is computed by regressing each excess individual stock return on the excess market return (MKT) and $LEGDP$ using past ten years of semi-annual observations as of last June or December, whichever is later. 25 value-weighted sub-portfolios are formed as the intersection of the past return-$LEGDP$ beta quintiles and held for K months. For each ranking, the entire portfolio is an equally weighted portfolio of K sub-portfolios, consisting of those formed in the current and previous $K-1$ months, with overlapping holding periods when $K > 1$. The panels show the following quantities for the strategy with $(J, K) = (6, 6)$: Panel A, average $LEGDP$ beta of member stocks; Panel B, average market beta; Panel C, size, measured as the average market capitalization in millions of dollars; Panel D, the average book-to-market ratio, constructed as in Fama and French (1993); Panel E, the past six-month return skipping a month (lagged past five-month return); Panel F, the average number of stocks; Panel G, the average monthly excess return; Panel H, the three-factor alpha, computed as the intercept from the time-series regression of the excess portfolio return on MKT and the size (SMB) and value (HML) factors; and Panel I, the four-factor alpha, where the regressors additionally include the momentum (MOM) factor. "Cont" in Panel G represents the past return-controlled excess portfolio returns, computed as the average of the excess returns on the five $PRET$ quintile portfolios within each $LEGDP$ beta quintile, and "Cont" in Panels H and I their respective alphas. *, **, and *** represent significance at 10, 5, and 1%, respectively.

Table 9: **Momentum-controlled $LEGDP$ Spread Portfolios**

Panel A: Spread returns (%)

		K			
		1	3	6	12
	3	0.20*	0.21*	0.20*	0.16
J	6	0.23**	0.27**	0.27**	0.21**
	12	0.22*	0.24**	0.19*	0.12

Panel B: Three-factor alpha (%)

		K			
		1	3	6	12
	3	0.28**	0.30**	0.29**	0.23**
J	6	0.31***	0.35***	0.35***	0.29***
	12	0.30***	0.33***	0.28**	0.18*

Panel C: Four-factor alpha (%)

		K			
		1	3	6	12
	3	0.24*	0.25**	0.23*	0.14
J	6	0.26**	0.30***	0.28**	0.20*
	12	0.22*	0.27**	0.22*	0.10

Every month, stocks are sorted independently into quintiles by their past J month returns skipping a month (lagged $J-1$ month return, $PRET$) and latest available beta with respect to the lagged expected real GDP growth rate ($LEGDP$) from the Livingston Survey. The $LEGDP$ beta is computed by regressing each excess individual stock return on the excess market return (MKT) and $LEGDP$ using past ten years of semi-annual observations as of last June or December, whichever is later. 25 value-weighted sub-portfolios are formed as the intersection of the past return-$LEGDP$ beta quintiles and held for K months. For each ranking, the entire portfolio is an equally weighted portfolio of K sub-portfolios, consisting of those formed in the current and previous $K-1$ months, with overlapping holding periods when $K>1$. The $PRET$-controlled excess portfolio return is the average of the excess returns on the five $PRET$ quintile portfolios within a given $LEGDP$ beta quintile. The spread portfolio return in Panel A is the excess return on the $PRET$-controlled highest $LEGDP$ beta portfolio less the excess return on the $PRET$-controlled lowest $LEGDP$ beta portfolio for given J and K. The three-factor alpha in Panel B is computed as the intercept from the time-series regression of the spread return on the excess market return (MKT) and the size (SMB) and value (HML) factors, and the four-factor alpha in Panel C additionally includes the momentum (MOM) factor in the regressors. *, **, and *** represent significance at 10, 5, and 1%, respectively.

Table 10: **Long-run pricing of procyclicality risk**

Panel A: Excess return (%)

	Holding Period (months)				
β^{LEGDP} rank	6	12	24	36	60
1	0.52**	0.50**	0.51**	0.54**	0.59***
2	0.50**	0.53***	0.57***	0.60***	0.60***
3	0.57***	0.57***	0.57***	0.57***	0.60***
4	0.63***	0.62***	0.59***	0.61***	0.63***
5	0.58***	0.61***	0.60***	0.60***	0.60***
6	0.65***	0.63***	0.64***	0.62***	0.59***
7	0.56***	0.60***	0.60***	0.57***	0.55***
8	0.63***	0.58***	0.58***	0.53***	0.53***
9	0.56***	0.61***	0.62***	0.59***	0.54***
10	0.96***	0.92***	0.87***	0.84***	0.74***
10-1	0.44**	0.42**	0.36**	0.30**	0.15
10-1: 3-fac α	0.49**	0.47***	0.44***	0.40***	0.23*
10-1: 4-fac α	0.36*	0.36**	0.35**	0.32**	0.23*

Panel B: Size-controlled excess return (%)

	Holding Period (months)				
β^{LEGDP} rank	6	12	24	36	60
1	0.62***	0.63***	0.66***	0.68***	0.72***
2	0.76***	0.77***	0.77***	0.75***	0.74***
3	0.81***	0.80***	0.80***	0.78***	0.74***
4	0.83***	0.81***	0.78***	0.74***	0.71***
5	0.84***	0.85***	0.83***	0.81***	0.76***
5-1	0.21**	0.22***	0.17**	0.13*	0.04
5-1: 3-fac α	0.26***	0.26***	0.23***	0.18**	0.08
5-1: 4-fac α	0.20**	0.20**	0.17**	0.14**	0.09

Table 10: **Long-run pricing of procyclicality risk–continued**

Panel C: BM-controlled excess return (%)

	Holding Period (months)				
β^{LEGDP} rank	6	12	24	36	60
1	0.55***	0.58***	0.60***	0.61***	0.65***
2	0.64***	0.65***	0.65***	0.64***	0.65***
3	0.71***	0.69***	0.67***	0.66***	0.64***
4	0.64***	0.66***	0.65***	0.61***	0.60***
5	0.78***	0.78***	0.78***	0.76***	0.70***
5-1	0.23**	0.20*	0.19*	0.14	0.05
5-1: 3-fac α	0.33***	0.30***	0.30***	0.26***	0.14
5-1: 4-fac α	0.28**	0.24**	0.22**	0.19**	0.13

Panel D: SIZE-BM-controlled excess return (%)

	Holding Period (months)				
β^{LEGDP} rank	6	12	24	36	60
1	0.67***	0.68***	0.69***	0.70***	0.72***
2	0.78***	0.78***	0.76***	0.74***	0.72***
3	0.85***	0.81***	0.79***	0.76***	0.71***
3-1	0.18**	0.13**	0.10	0.06	0.00
3-1: 3-fac α	0.25***	0.20***	0.16**	0.12**	0.04
3-1: 4-fac α	0.21***	0.15**	0.12*	0.10	0.05

Every June and December, each excess individual stock return is regressed on the excess market return (MKT) and the lagged expected real GDP growth rate from the Livingston Survey ($LEGDP$) using past ten years of semi-annual observations. In Panel A, stocks are sorted into decile sub-portfolios by their $LEGDP$ beta. In Panel B (C), 25 sub-portfolios are first formed as the intersection of independently sorted size (book-to-market ratio, BM) and $LEGDP$-beta quintiles. Then the excess return of a size- (BM-) controlled sub-portfolio is the average of the excess returns on the five size (BM) portfolios within each $LEGDP$ beta quintile. In Panel D, 27 sub-portfolios are first formed as the intersection of independently sorted size, BM, and $LEGDP$-beta terciles. Then the excess return of a size-BM-controlled sub-portfolio is the average of the excess returns on the nine size-BM portfolios within each $LEGDP$ beta tercile. Each sub-portfolio is value-weighted and is held for K months. For each ranking, the entire portfolio is an equally weighted portfolio of K sub-portfolios, consisting of those formed in the current and previous $K-1$ semi-annual periods, with overlapping holding periods when $K > 1$. "3-fac α" is the three-factor alpha, computed as the intercept from the time-series regression of the spread portfolio return on MKT and the size (SMB) and value (HML) factors. "4-fac α" additionally includes the momentum (MOM) factor in the regressors. *, **, and *** represent significance at 10, 5, and 1%, respectively.

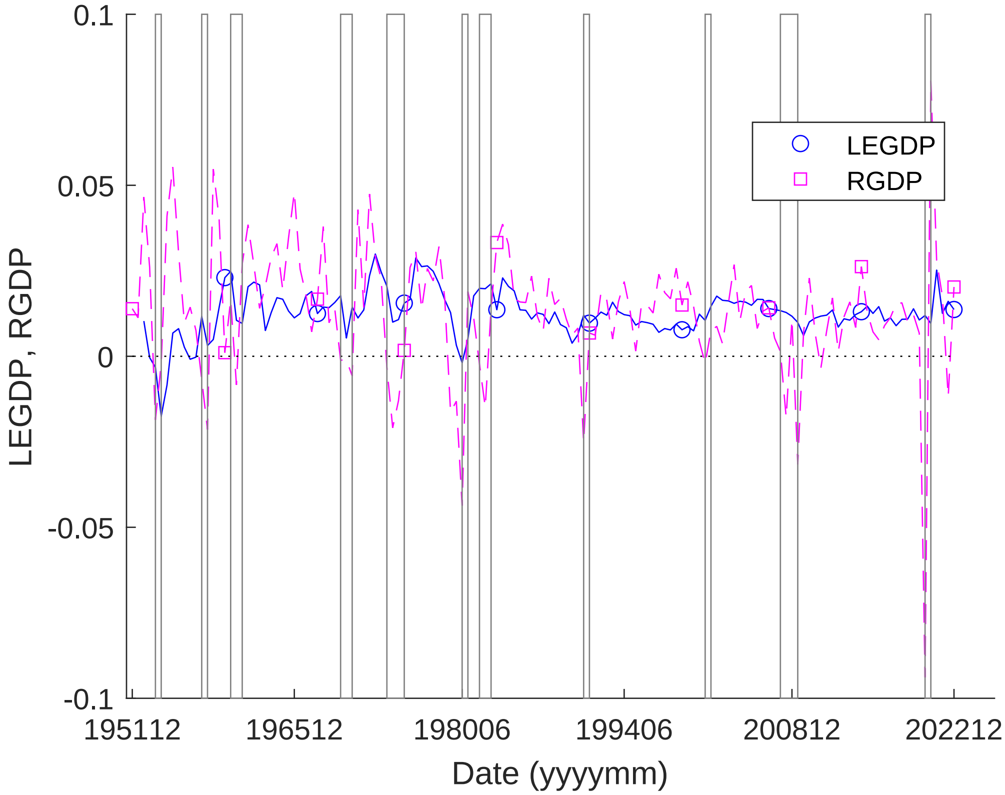

Figure 1: **Expected and realized real GDP growth rates.** This figure plots the expected real GDP growth rate from the Livingston Survey ($LEGDP$, lagged to match the forecast horizon and the plotted date) and the realized real GDP growth rate ($RGDP$). Each narrow band represents a recession period as defined by the NBER, starting with a peak and ending with a trough.

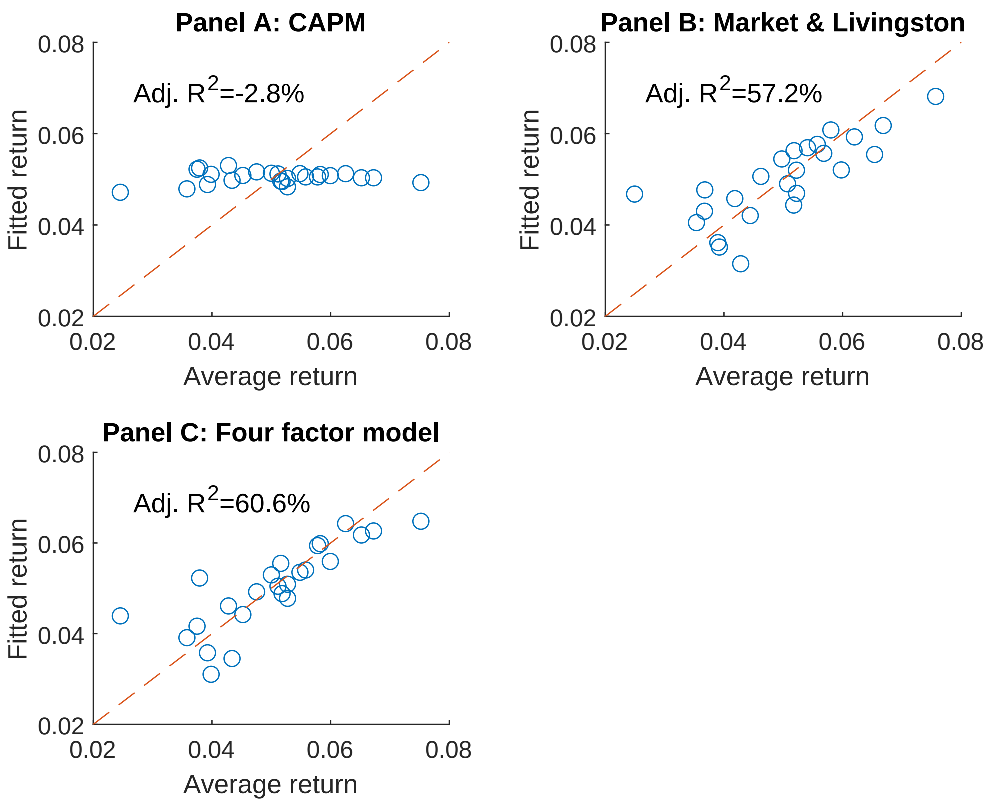

Figure 2: **Fitted and realized returns.** Using the 25 size-B/M portfolios, we run a single cross-sectional regression of the average realized excess return on a constant and the portfolio's betas (estimated from the full, semiannual sample) with respect to the following factors: the excess market return (MKT) in Panel A (CAPM); MKT and the lagged expected real GDP growth rate from the Livingston Survey ($LEGDP$) in Panel B; MKT and the size (SMB), book-to-market (HML), and momentum (MOM) factors in Panel C (the four-factor model). The figure plots the fitted return from this regression against the average return. The adjusted R-squared of the regression is shown as "Adj.R^2".