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William N. Goetzmann
Akiko Watanabe
Masahiro Watanabe

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ABSTRACT

The covariance of asset returns with economic states of the world is a fundamental input to asset pricing models. Using a semi-annual survey of forecasts by a panel of U.S. economists over more than 70 years, we infer forecaster beliefs about covariance between the S&P index and macro-economic factors. We find evidence that life-experience was a significant determinant of beliefs about the co-movement of inflation and stock returns

William N. Goetzmann
School of Management
Yale University
Box 208200
New Haven, CT 06520-8200
and NBER
william.goetzmann@yale.edu

Akiko Watanabe
University of Alberta School of Business
fujimoto@ualberta.ca

Masahiro Watanabe
School of Business - Finance
University of Alberta
Edmonton, Alberta T6G 2R6, Canada
masa@ualberta.ca

I. Introduction

The covariance of expected asset returns and macroeconomic factors plays an important role in modern financial theory. In this paper we infer beliefs about the expected co-movement of stock prices with macroeconomic variables held by participants in the Livingston Survey; a panel of economic forecasters providing semi-annual predictions on a variety of variables over more than 70 years. We find realized covariances of stock returns with macroeconomic variables differed significantly from the covariance of the forecasted stock returns with forecasted macroeconomic variables. In other words, beliefs about how stocks co-move with economic fundamentals was, for long periods of time, counterfactual.

On average, we find that economists expected aggregate stock prices to covary positively with growth in industrial production and gross national product. These expectations were not static, however. The expected covariance between expected inflation and expected stock price growth changed dramatically from positive in the 1970's to negative in the 2000's. This shift in the covariance of expectations followed the oil price shock in the U.S. in the 1970's and coincided with academic studies about inflation risk in the 1980's.

We use panel regressions to test whether cross-sectional differences in covariance beliefs are related to personal characteristics of forecasters. Consistent with the experience effect documented by Malmendier and Nagel [MN] (2011 & 2016) we find significant age-cohort effects with respect to inflation. Our results are consistent with the hypothesis that the experience effect extends to expected covariances of macroeconomic variables and asset returns.

II Prior literature

II.1 Experience effects and dispersion of beliefs

The influence of personal experience on expectations about macroeconomic variables is well documented. Malmendier and Nagel (2011) show that stock market participation is related to the personal experience of historical stock market performance. Likewise, they show that people overweight their personal inflation experiences – and that the weights also depend on age.

Malmendier, Nagel and Yan (2020) find that the experience effect can affect the dispersion of opinion among experts. Their results indicate that the votes and views of FOMC members depended on lifetime inflation experience. This is particularly relevant because of the central role the Fed plays in the economy. Using the Livingston survey and two other surveys, Mankiw, Reis, and Wolfers (2003) find that dispersion of inflation forecasts comoves with the inflation rate, output gap, and relative price variability. They also show that individual inflation expectations became bimodal during the Volker disinflation period. This implies that a location statistic such as the mean and the median may not adequately represent a set of individual beliefs. Their findings motivate the use of a panel. Bomberger et.al. (1981) find that dispersion among forecasters is a metric for inflation uncertainty, and hence a potentially priced risk for fixed income. For equity securities, Bali et.al. (2015) and Gao et.al. (2019) study the effect of divergent opinion among macroeconomic forecasters on expected stock returns. This evidence is consistent with an earlier literature on expected return and the dispersion of opinion among stock market analysts. The implication of Diether et. al. (2002) and Goetzmann & Massa (2005) is that dispersion proxies for uncertainty, and uncertainty may be a priced risk factor. In contrast to this prior work, our focus is not on the separate variable forecasts and their dispersion, but instead on implied forecasts of co-movement. We are interested to test whether insights from prior work about forecast heterogeneity – and particularly heterogeneity due to differential life experience – extends to a broader context of expected co-movement.

II.2 Macroeconomic beliefs about covariance

In this work, we find that heterogeneity exists not only in the predictions about macroeconomic variables but also in predictions about how these variables co-move with asset prices. Some recent papers investigate individual beliefs about the extent to which stocks hedge inflation, and whether macroeconomic variables are relevant to asset prices and expected returns at all. In a survey of more than a thousand participants, Choi and Robertson (2020) found that 20% held strong beliefs that stocks are a hedge against inflation. Giglio et al. (2020) document coincident mutual fund investor beliefs about market crash probabilities and real economic activity. In contrast, Chinco et. al. (2020) find that a less obvious factor, aggregate consumption, is not perceived as relevant to asset prices. Matthias (2020) uses the Survey of Professional Forecasters to test for biased expectations in co-movement across macroeconomic variables. He finds that economists bias their expected correlation between GDP and other macro-variables towards moderate beliefs, resulting in predictable errors in forecast correlations.

Greenwood and Shleifer (2014), in their review of surveys about market forecasts, highlight the paradox of a negative relationship between survey market expectations and academic models based on such factors as the dividend yield, consumption and the consumption-wealth ratio. They point out that expected returns in asset pricing models are inversely related to forecasts of market returns by survey respondents: survey forecasts negatively predict future market returns while academic models positively predict future returns. Campbell and Diebold (2009) empirically document a similar relationship for the Livingston Survey. They find that GDP forecasts at the 6-12 month horizon negatively predict stock market returns, even when controlling for variables identified in the academic literature. Livingston GDP forecasts thus may covary with a priced risk factor. In our own work, Goetzmann, Watanabe and Watanabe (2012), we find evidence that procyclical stocks defined as those with higher betas with respect to Livingston Survey forecasts of real GDP growth, earn higher returns, despite, as we show in this paper, expected market growth and expected economic growth positively co-vary.

Tests of macroeconomic factors as priced sources of risk have a long history. Chen, Roll and Ross (1986) [CRR] estimate the relation between asset returns and macroeconomic sources of risk. They point out that the systematic forces that influence asset returns are those that change discount factors and expected cash flows, where expectations are taken under the martingale pricing measure. They find a significantly positive premium on the business cycle as measured by changes in industrial production, and a negative premium on changes in expected inflation and inflation surprises. Consistent with Chinco et. al. (2020) they find less support for the pricing of covariance with changes in consumption, despite its theoretical logic. However, in an experimental study, Asparouhova et al. (2016) report that subjects price assets in line with consumption betas as implied by the Lucas (1978) model. There is also some evidence that households in particular those with low wealth, consume more when unrealized capital gains on stock investments are higher (DiMaggio, Kermani, and Majlesi, 2020).

While the connection between forecasts and outcomes is interesting in its own right, in this paper we do not test that relationship. We confine our study to forecasted comovement – phenomena determined entirely within the mind of the survey respondents. We are interested in how their experiences and possibly their economic training may lead to joint predictions about market prices and the macroeconomy. Among other things, we document a sharp change in expectations about asset covariance with inflation.

The effect of inflation on the economy is one of the most widely studied topics in macroeconomics. Despite its economic importance, however, periods of high inflation have been relatively rare in modern economies and virtually always co-incident with other events such as war. Irving Fisher (1930) theorized a positive relationship between expected inflation and future bond prices – namely that expected inflation should be impounded in bond yields one-for-one. Fisher's theory itself may have been experientially motivated by the high U.S. inflation of the First World War (1914-1918) and the subsequent hyperinflation in Europe in the 1920's – a phenomenon that led to his coining of the term "money illusion." Fisher championed equities as a hedge against inflation based on the principle that most corporations had fixed nominal liabilities, assets that rose with price levels, and the capacity to pass on increases in input prices to consumers. His somewhat oblique test of the relationship between inflation and corporate profitability used a distributed lag to document a positive relationship between monthly inflation and employment (Fisher, 1926).

The positive relationship between expectations of inflation and employment documented by A.W. Phillips (1958) was codified as the Phillips curve. By some measures, the impact of inflation on the economy became one of the most important macro-economic questions of the 20th century, and critical to central bank policy. The stagflation of the 1970's challenged received wisdom and motivated more sophisticated models of expectations. The economics profession discovered inflation as a risk. Fama and Schwert (1977) found that stocks did indeed react adversely to expected and unexpected inflation, and Fama (1981) argued that this was due to a risk channel from inflation shocks to expected returns. As with Fisher's earlier post-WWI hyperinflation experience, post-1973 inflation shocks engendered a new theoretical framework. A large literature – too voluminous to cite in detail, but well-described in Lee (2009), has since sought to explain the stark contrast in the pre-1970/post-1970 empirical relationship between inflation and the stock market. One should expect that the corpus of influential articles on inflation and the economy in general, and perhaps inflation and the stock market in particular, to be part of the "experience set" of a professional macroeconomist, and thus potentially a factor in determining their opinion about the directionality of the comovement.

II.3 Dispersion of beliefs

II.3 Livingston Survey

Over its long history, the Livingston Survey has provided rich material for econometric studies.[1] It has been used extensively to test the prediction ability of experts, and the formation of inflation expectations. Of these, Gultekin (1983) and Pearce (1984) are most relevant to our analysis. Gultekin (1983) finds that the forecasted co-movement between stock returns and inflation among the Livingston survey respondents was positive and higher than historically documented. Pearce (1984) also examines the relationship between stock market forecasts, inflation and industrial production and finds that the relationship had already begun to differ from that documented by Gultekin (1983). In this paper we extend this analysis and find that forecast co-movement have indeed changed considerably. We show that a significant break-point in forecasts occurred in the early 1980's. We test whether this break was related to the experience effect, as opposed to a simple innovation in aggregate opinion.

II.3.1 Livingston Survey Background & Literature

Initiated by journalist Joseph Livingston in 1946, the survey is currently maintained by the Federal Reserve Bank (FRB) of Philadelphia. While it is now only one of several panel surveys of macro-economic conditions, it remains one of the few that has queried respondents about the stock market and macroeconomic variables over an extended period. It thus provides more than 70 years of direct professional economist expectations. This is particularly valuable as it covers the last, sustained period of high inflation in the United States.

The survey was conducted by mail on a semi-annual basis, and asked participants to forecast the level of a variety of macro-economic measures over the subsequent two calendar quarters and the next four quarters. Before 1952 it requested forecasts for Industrial Production (starting in 1946 S1), the Consumer Price Index (1946 S1), Average Weekly Earnings in Manufacturing (1949 S1) and Nominal GDP (1946 S1).[2] From June 1952 the survey asked for forecasts of the S&P

[1] A running list of studies using the Livingston survey data is available at https://www.philadelphiafed.org/surveys-and-data/regional-economic-analysis/academic-bibliography.

[2] S1 refers to the first semester June report, and S2 refers to the end-one-year December report.

Index level at the six-month and twelve-month horizons. Not all respondents made predictions about all variables – including the stock market variable.

Later additions to the Livingston Survey included Retail Sales and Food Services (1959 S2), Civilian Unemployment Rate (1961 S1), Auto Sales (1966 S2), Total Private Housing Starts (1969 S2), Corporate Profits After Tax (1971 S1), Producer Price Index for Finished Goods (1978 S2), the Prime Interest Rate (1981 S1) and U.S. Treasury bond and bill rates (1992 S1). When the Philadelphia Fed assumed the survey in 1991, it discontinued some series and replaced them, however for the series of interest to this paper it is possible to construct reasonably continuous observations.

Details about the survey are documented on the Philadelphia Fed's website. One important concern is the need to splice pre-1991 data to post-1991 data in order to obtain a long time series.[3] Another important detail is that the precise date of each forecaster's response is not known with certainty. The surveys were mailed to the respondents before the end of the second and fourth quarters of each year and were filled at an unknown date that could have varied by weeks. The summaries were compiled by Livingston and his successors and reported shortly after December and June of each year.

For most variables the uncertainty about the date at which the survey was completed is relatively unimportant. However because stock indexes are volatile, this adds potentially significant noise to the calculation of the expected capital gain over the next six months and next twelve-month periods. The precise level of the stock market when each economist made his/her forecast is unknown. Consequently, a common practice by researchers has been to use the forecast of the six-month-out six-month forecast, constructed from the ratio of the twelve-month to the six-month forecast levels. Where appropriate, this adjustment reduces a potential errors-in-variables issue. This correction will be highlighted further below. Figure 1 excerpts the forecast for December, 2021 to show the nature of the mean prediction and how it is reported.

[3] This caveat applies to the S&P index forecast. We acknowledge that the Philadelphia FED posts the historical S&P index forecasts from June 1952 to June 1990 separately from their *official* Livingston Survey data set, due to the inconsistency in base years and the S&P index to be forecasted as described by the survey originator, Joseph Livingston. See https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/livingston-historical-data.

II.3.2 Livingston Respondents

The number of participants in the survey has varied over time. As of 2021, it has included 467 respondents -- about 50 per survey for much of its history. The number of respondents declined to about 25 in later years. Figure 2 shows the tenure of each participant as a point. The horizontal axis represents the first semester in which the participant made a forecast of some variable, the vertical axis represents the last semester the participant made a forecast of any variable. Not all participants made a forecast of all variables in each survey. Some of the tenures were long. For example, about 15 of the pre-1960 entrants were still in the sample in 1980. Participants were promised anonymity by Livingston and we have respected that promise by not using additional information to attempt to identify them.

Figure 3 summarizes the 12-month forecasts of the S&P capital appreciation by the Livingston survey participants over time. Each column represents the count of the positive and negative forecasts by the participants. The height of the column above 0 is the count of positive forecasts, the depth below 0 is the count of negative forecasts. Before the 21st century, the frequency of negative forecasts was surprisingly high. Until 1960, forecasts of growth and decline were about equal in number. From the year 2000 onwards, negative forecasts were less common. There were negative spikes following the 1987 crash and throughout the mid-to-late 1990's before the Tech bubble burst.

It is important to point out that S&P forecasts are about the price level at future dates, not necessarily about cumulative return, which would include re-invested dividends. The respondents predict only index level increases. For the survey's early years before the Philadelphia Fed took it over in 1991, they were asked to predict a major S&P index at the time, which was not necessarily specified as the S&P 500 index.[4]

III Estimation

We form variables by calculating the individual forecast percentage changes in each based on the predicted future level. For example, the expected capital appreciation of the S&P at semester t over the next semester t+1 is

[4] Specifically, the respondents were asked to forecast the price level of either the Standard and Poor's 365, 420, 425, or just the "Standard and Poor's Industrials" before June 1990.

$$\Delta SP^e_{i,t,6} = \frac{SP^e_{i,t,t+1}}{SP^b_t} - 1$$

Where SP^b_t is the "base" value of the S&P when the forecast for the next six-month period is made by respondent i. The notation *e* indicates it is a forecast and *b* indicates a base value. An estimate of the base value believed to be relevant to the forecast is reported by the Livingston Survey, however it is not known with certainty. The 12-month forecast uses the two-period forecast, *t*+2, and is formed similarly (replacing *t*+1 with *t*+2 in the equation). The *t*+1 to *t*+2 ahead forecast is formed as:

$$\Delta SP^e_{i,t,t+1:t+2} = \frac{SP^e_{i,t,t+2}}{SP^e_{i,t,t+1}} - 1,$$

This has the advantage of not relying on an estimated base value, but one specified by the forecaster him/herself. It is thus not subject to error due to an unknown base price because the date of the survey response is not precisely known.

III.1 Univariate and Multivariate Aggregate Tests

In the first set of tests, we estimate the relationship between the forecast market growth as measured by the median predicted S&P capital appreciation, and median forecasted changes in macroeconomic variables: Industrial Production [IP], Gross Domestic Product [GDP], Retail Sales [RS] and the Consumer Price Index [CPI]. We perform these over the period June, 1952 through December, 2021. We are not able to proxy for the yield curve variable in Chen, Roll and Ross (1986) because the Livingston Survey did not include questions about short and long-term government interest rates until 1992, and we are not able to proxy for default risk because the survey has never included a question about risky debt.

Table I reports univariate regressions using forecasts at two horizons: the next 12 months (columns labeled as "BP-12M") and the six-month period beginning six months from the survey (columns "6M-12M").[5] Note that all of coefficients are positive and significant except for the

[5] As noted above, this month 6-12 variable is constructed from two forecasts and does not rely on certainty about the level of the variable at the time the survey was filled out by the respondent, which potentially suffers from an errors-in-variables problem.

one on Retail Sales, and the magnitudes are larger for the 6-12 month horizon – possibly because it is free from the base value uncertainty. GDP and IP are plausible metrics for the business cycle, and RS is a plausible metric for consumption. The 6M-12M forecasted return comoves with the GDP forecast almost on a one-to-one basis; the slope coefficient is very close to 1 and the intercept is small and insignificant. A coefficient of 1 or more on inflation is consistent with the Fisher hypothesis that nominal asset prices are expected to increase in parity with the CPI. The only result incompatible with the findings of Chen, Roll and Ross is the positive sign on inflation, although in our specification we do not decompose inflation in changes in expected inflation and inflation surprises.

Table II estimates multi-variate regressions. The first two columns use the full sample. In both the 12 month and 6-12 month specifications, the coefficients on production and inflation are positive and significant at the 95th percentile or above. The coefficient of 1.437 on inflation for the 6-12 month forecast is greater than 1. The remaining columns of the table report the same regression using pre- and post-1980 time periods. The pre-1980 coefficients on industrial production and inflation are positive and significant for both forecast horizons. The post-1980 regressions show a positive and significant loading only on industrial production for the 6-to-12-month horizon. The negative and insignificant coefficient on GDP pre-1980 may be due to its correlation to IP.

Taken together, the results of the univariate and multivariate tests are consistent with the hypothesis that professional economists believed that asset prices covary positively with measures of the business cycle and that their views on inflation as an adverse factor have changed over time. In the next section we document these changes.

III.2 Actual vs. Predicted Relationships in Aggregate Forecasts

In this section, we examine the changing relationship between stock market forecasts and macro-economic forecasts in more detail and compare them to the actual statistical relationship that prevailed. We calculate the rolling univariate betas of market forecasts for 20-year backward-looking rolling windows. We do the same using actual, realized data corresponding to the forecasted time period.[6] We take a 20-year interval because this accords with a reasonable professional assumption about Livingston Survey participants' prior personal experience with the economy. Figure 4 represents the rolling betas for two series. The series in blue is the estimated $\hat{\beta}_t^e$ from the regressions:

$$\Delta SP_{\bar{\imath},t,6}^{e} = \alpha + \beta_t \Delta IP_{\bar{\imath},t,6}^{e} + \varepsilon_t \text{ for intervals t-40 to t.} \tag{1}$$

The series in black is the estimated $\hat{\beta}_t^a$ using realized data over the forecasted six-month intervals. 40 periods is a 20-year interval.

$$\Delta SP_{t,6}^{a} = \alpha + \beta_t \Delta IP_{t,6}^{a} + \varepsilon_t \text{ for intervals t-40 to t.} \tag{2}$$

Where *a* indicates actual values, and *e* indicates forecasts. Two-standard deviation confidence intervals for $\hat{\beta}_t^a$ are also shown in dashed lines. Panel A uses the full sample, while Panel B excludes a single period, December 2008 (and perform the regressions with 39 observations when it enters the rolling window), to mitigate the effect of the world financial crisis.

Note that the actual betas begin earlier. Monthly industrial production measures were available from the 1920's onward. In fact, they were used by Irving Fisher in his landmark study. Thus, we can approximate the knowledge of an econometrician in 1947 who estimated the past relationship between the return of the S&P over six-month intervals with the percentage change in levels of industrial production over six-month intervals. $\hat{\beta}_{1947}^a$ is about one, with a fairly tight confidence interval, suggesting that 20 years of observations is sufficient to have generated a reliably non-zero forecast at that time. Of course, we cannot know whether the economists in our sample used the same econometrics methods that we use today.

$\hat{\beta}_t^e$ – the coefficient from the forecasted growth in stock prices and inflation does not begin until the mid-1960's due to the survey's availability and our requirement of forty observations, however, we see that the estimated co-movement in forecasts accord well with the actual co-movement over the prior 20 years. In fact, the estimated values lie comfortably within the

[6] Actual S&P 500 returns are obtained from Robert Shiller's website, which chains together the Cowles stock market index data with S&P data. Macroeconomic variables are obtained from the St. Louis Federal Reserve website, FRED.

confidence interval of the actual values until 2010, after which they lie below. We have not corrected for potential influential outliers, such as the market movements during the 2008 crisis and the subsequent Great Recession. Actual data is likely to reflect the sustained effects of extreme shocks. As a result, beta series derived from forecasts are likely to have lower volatility.

Panel A of Figure 5 shows the rolling relationship between six-month inflation and six-month market returns using a similar convention i.e. forecasts in blue and the actual in black using the full sample. Both of these series also extend back for considerably longer than the Livingston Survey. Of note is that the actual beta of the market on inflation was mostly positive until the 1950's entered the rolling window and the 1930's exited. Then followed a 30-year interval in which the estimated relation between stocks and inflation was dramatically and reliably negative. The estimates only turned persistently positive in the late 2000's, perhaps due to the 2008 financial crisis. Indeed if we exclude a single period, December 2008, the actual betas are still negative as Panel B shows.

What stands out is the counter-factual nature of the forecast inflation beta (in blue) at the beginning of the series.[7] Through the 1970's this backward-looking measure lay well above the confidence band of the actual betas estimated over the prior period. What explains this persistent deviation from empirical evidence? If the difference is due to the experience effect, then we would expect the sample of forecasters in 1952 to comprise economists whose opinion was strongly influenced (perhaps exclusively influenced) by their experience (or training) in the 1930's and 1940's, when inflation betas were regularly – although not statistically -- positive.

A challenge to tests about forecasted co-movement thus far is that the variables are constructed from the median forecast of respondents with varying experiences of the economy, and in various industry roles. In the next section we exploit these differences in panel to test whether experience, as proxied by the date of first appearance in the Livingston Survey, explains differences in co-movement forecasts.

III.3 Panel Tests & Breakpoints

Our test using panel data groups respondents by the decade in which they first participated in the Livingston Survey. Individual Livingston Survey forecasts of 12-month S&P stock index

[7] Note that, in this figure, for the first five years of the estimated series, rolling betas use fewer than 40 observations.

growth are regressed on their forecasts of the 12-month growth of industrial production, GDP and inflation. We interact the decade indicator (k, with pre-1950 as the baseline) with inflation.

$$\Delta SP^{e}_{i,t,12} = \alpha + I_{i\in k}\,\alpha_k + \beta_{\Delta IP}\Delta IP^{e}_{i,t,12} + \beta_{\Delta GDP}\Delta GDP^{e}_{i,t,12} + (\beta_{\Delta CPI} + I_{i\in k}\,\beta_{k,\Delta CPI})\Delta CPI^{e}_{i,t,12} + \varepsilon_{i,t} \quad (3)$$

The $I_{i\in k}$ term is an interaction, with the pre-1950 cohort as the contrast. The random effect specification $\alpha_{i\epsilon k}$ allows for different cohort means, which we expect from Figure 3. The data provide for an unbalanced panel of 4,136 observations for 467 economists over 71 years, and includes year fixed effects. Both fixed and random-effect model estimates are reported in Table III. In panel estimates, both *Δ*IP and *Δ*GDP are positive and significant. In both specifications, the interaction term for *ΔCPI* is negative and significant for the 1980 and 1990 cohorts. This result is robust to using the month 6-12 forecasts.

The panel data also allow for a Chow test of a regime change. In the first specification we estimate the most likely break dates based on the error variance in the specification above. The Chow test statistic is reported in Figure 6: the value is maximized when the break is at the 12-month forecast made in the first semester of 1981, although high values occur for several semesters in the first half of the 1980's. Taken together, the results suggest that the pre-1980 cohorts may have had different "models" than the post-1980 cohorts.

III.4 Cohort Models with Overlapping Time Periods

In this section we examine the differences in prediction models for economists who entered the survey before vs. after (and including) 1980. We confine the estimates to a common 20-year window: June 1980 – December 1999. This is useful because, in that interval, economists whose tenure overlapped shared a common information set. We estimate panel regressions on these two subsets and test for differences in the coefficients on four variables: industrial production, GDP, inflation and changes in manufacturing wages. Table IV reports the results for univariate regressions using 12-month forecasts (Panel A) and 6-12 month forecasts (Panel B). The variables are all significant over the common time period for the pre-1980 cohort in each panel. For the post-1980 cohort, the only variable that significantly explains the forecasted returns regardless of the horizon is industrial production. GDP and manufacturing wages lose significance in Panel B. Interestingly, in each panel the coefficient on inflation changes sign between the two cohorts; over the same forecast interval, the inflation coefficients are positive and significant for the pre-1980 cohort, while they are negative and significant for the post-1980 cohort. The difference in the inflation coefficients in the last column, computed as the pre-1980 coefficient minus the post-1980 coefficient, is positive and significant in both panels. This is the only variable that changes sign between the cohorts in a significant manner regardless of the forecast horizon. These results are consistent with the structural change in forecasting model around 1981 being driven by cohort differences in beliefs about the relationship between inflation and asset prices.

IV. Conclusion

In this paper we study the time-series properties of expected comovement between macroeconomic variables and the stock market. We use semi-annual responses in the Livingston Survey over the period 1952-2021 to infer covariance expectations. We find that economists predict a positive association between asset prices and the business cycle, as measured variously by industrial production and gross domestic (national) product. We identify a regime switch in beliefs about the relation between inflation and asset prices, which was widely recognized and studied at the time. Beliefs about inflation appear to have been sticky and biased, ex-post. The forecasted inflation beta estimated over the prior 40 semesters was significantly higher than actual up to 1980, and then significantly lower than actual after 2003. This is consistent with some form of inertia in belief formation – perhaps based of salient past relationships. Using a panel specification we test for regime switches in macroeconomic models. These point to a significant change around 1980.

We exploit the well-documented experience effect to test for cohort differences in covariance beliefs by the Livingston forecasters. We find that cohorts formed by decade of entry into the Survey diverge significantly in the sign of their forecast co-movement between the market and inflation. In order to hold constant the prevailing macroeconomic context for forecasts we estimated cohort differences over a common time period: 1980 – 2000. We divided participants into those who first appeared in the Survey in 1980 or earlier vs. those who first appeared after 1980. The pre-1980 cohort maintained a forecast of positive covariance between inflation and the market, while the post 1980 cohort predicted a negative relationship over the same time period.

Cohort differences are potentially relevant to asset pricing. Dispersion of opinion is a measure of aggregate uncertainty. In the APT, for example, expected returns are a linear function of forward-looking or at least stationary covariances with pervasive macroeconomic factors that are sources of risk and sources of return; the latter via an associated risk premium. Hence disagreement about covariances can lead to disagreement about expected returns.

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THE

LIVINGSTON SURVEY

Release Date: December 17, 2021

DECEMBER 2021

Forecasters Revise Down Real GDP Growth for Second Half of 2021; Revise Up Growth for First Half of 2022

The 20 participants in the December *Livingston Survey* nearly halved their forecasts for real GDP growth in the second half of 2021 compared with their projections in the June 2021 survey. The forecasters, who are surveyed by the Federal Reserve Bank of Philadelphia twice a year, expect an increase of 3.8 percent (annualized) in real GDP during the second half of 2021. They project 3.9 percent growth (annualized) over the first half of 2022. The forecasters peg growth at an annual rate of 3.5 percent in the second half of 2022.

The forecasters predict a lower unemployment rate compared with their expectations in June 2021. In the upcoming year, they see the unemployment rate steadily decreasing from 4.4 percent in December 2021 to 3.8 percent in December 2022.

	Growth Rate of Real GDP (%)			*Unemployment Rate (%)*	
	Previous	*New*		*Previous*	*New*
Half-year data:					
2021 Q2 to 2021 Q4	6.7	3.8	December 2021	4.7	4.4
2021 Q4 to 2022 Q2	3.7	3.9	June 2022	4.4	4.0
2022 Q2 to 2022 Q4	N.A.	3.5	December 2022	N.A.	3.8

Forecasters Raise Their Expectations for Stock Prices

The panel projects that stock prices, as measured by the S&P 500 Index, will increase steadily from the end of 2021 to the end of 2023. The panel sees stock prices at 4694.6 at the end of December 2021, 4809.7 at the end of June 2022, and 4840.0 at the end of December 2022. These projections are higher than those of the previous survey of six months ago. In addition, the panel expects stock prices to reach 5000.0 by the end of 2023.

	Stock Prices (end of period) S&P 500 Index	
	Previous	*New*
Dec. 31, 2021	4292.2	4694.6
Jun. 30, 2022	4382.8	4809.7
Dec. 30, 2022	4474.3	4840.0
Dec. 29, 2023	N.A.	5000.0

Figure 1: Sample from Livingston Survey for June, 2021

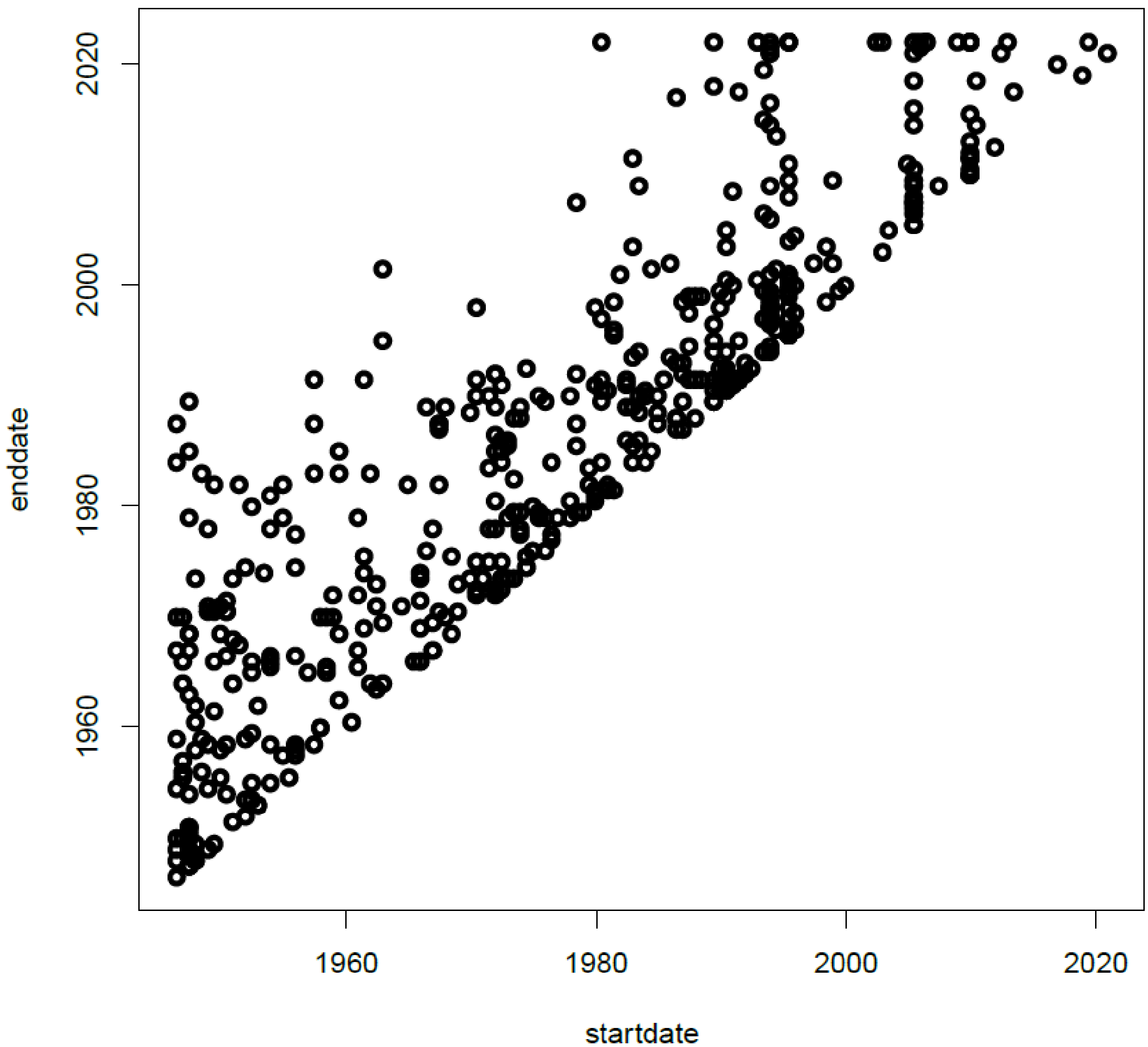


Figure 2: Plot of the start and end of each of the 467 survey participants in the sample. The semester of entry into the panel is on the horizontal axis, the last semester the participant responded to any question in the survey is on the vertical axis.

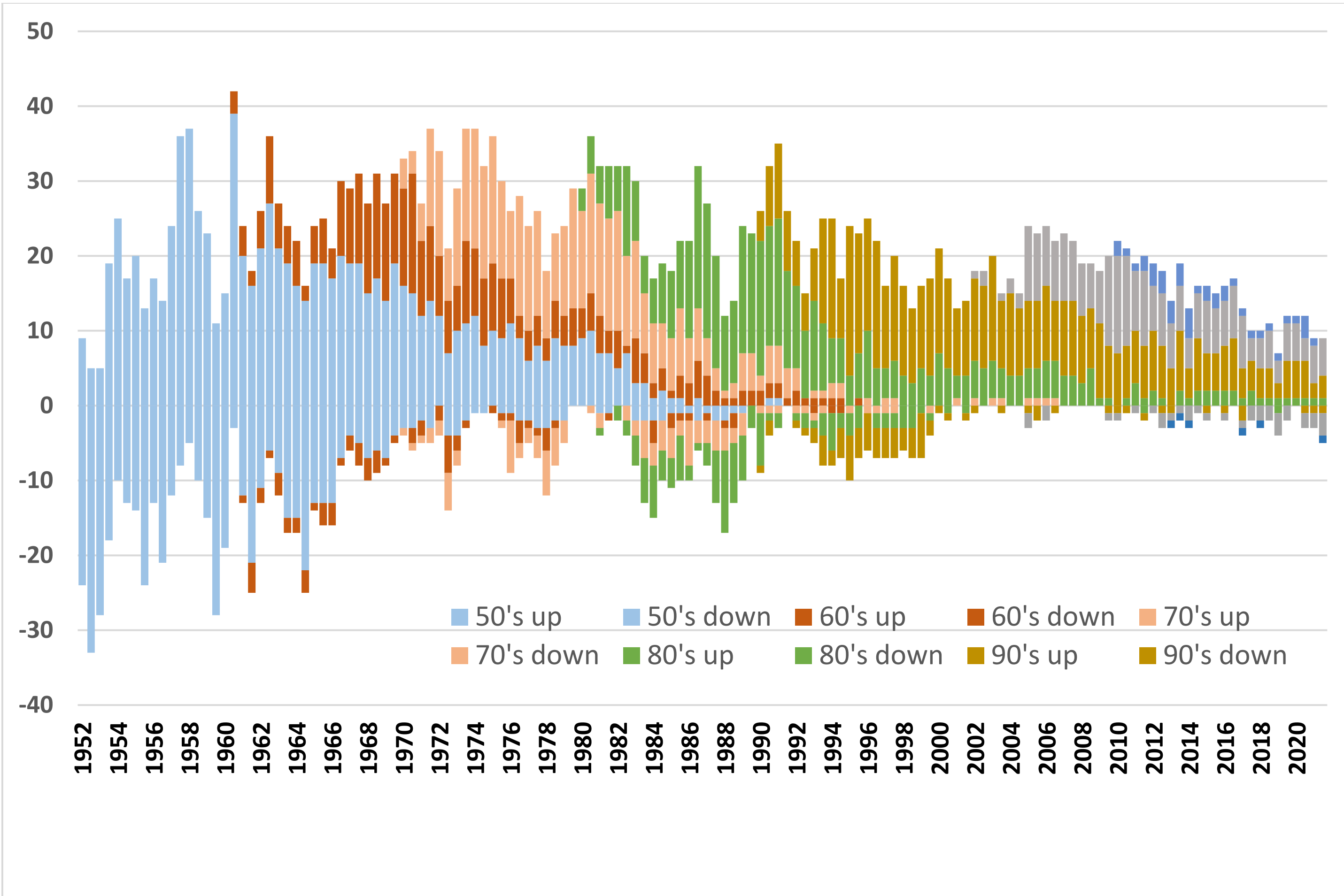
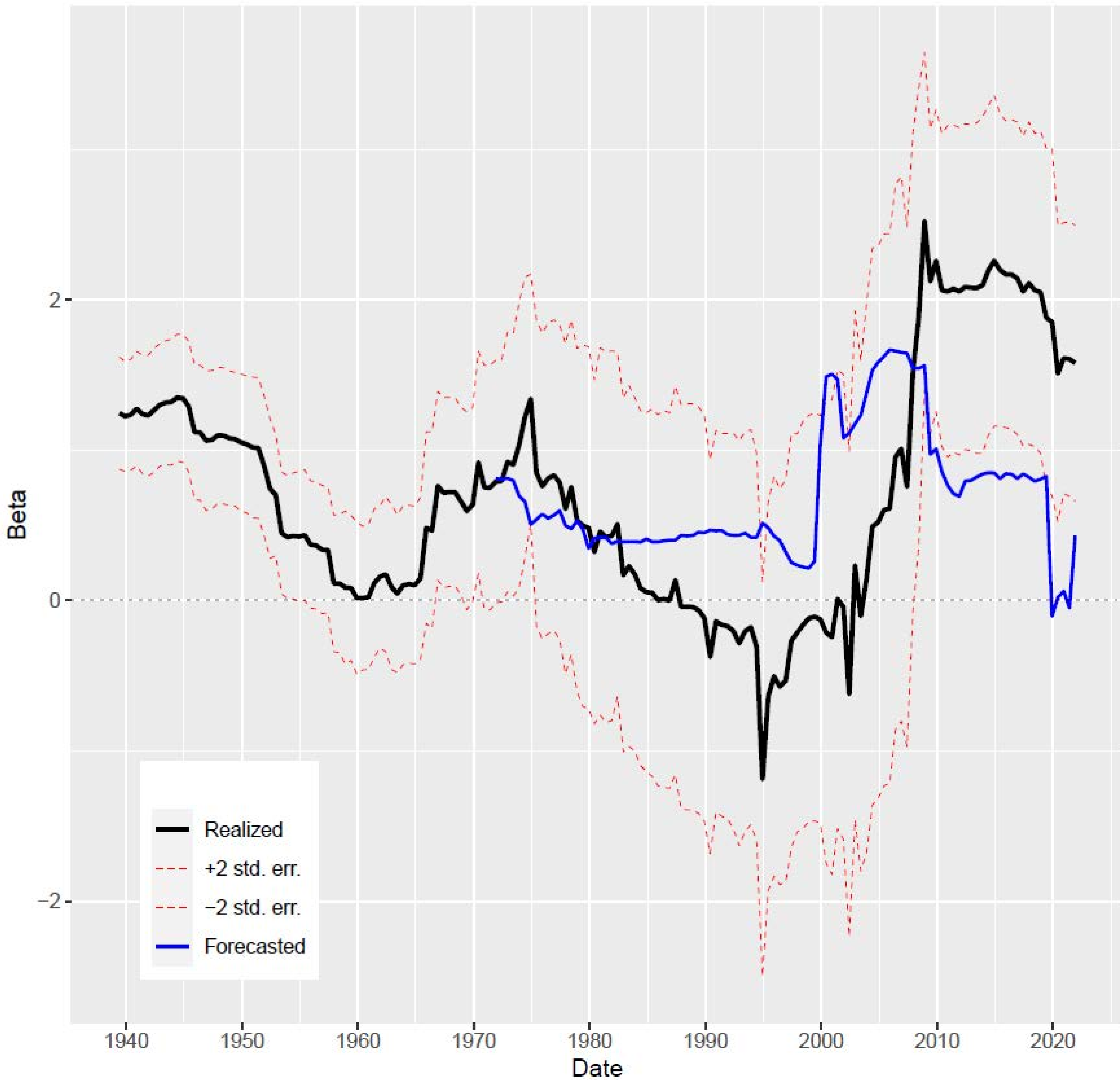
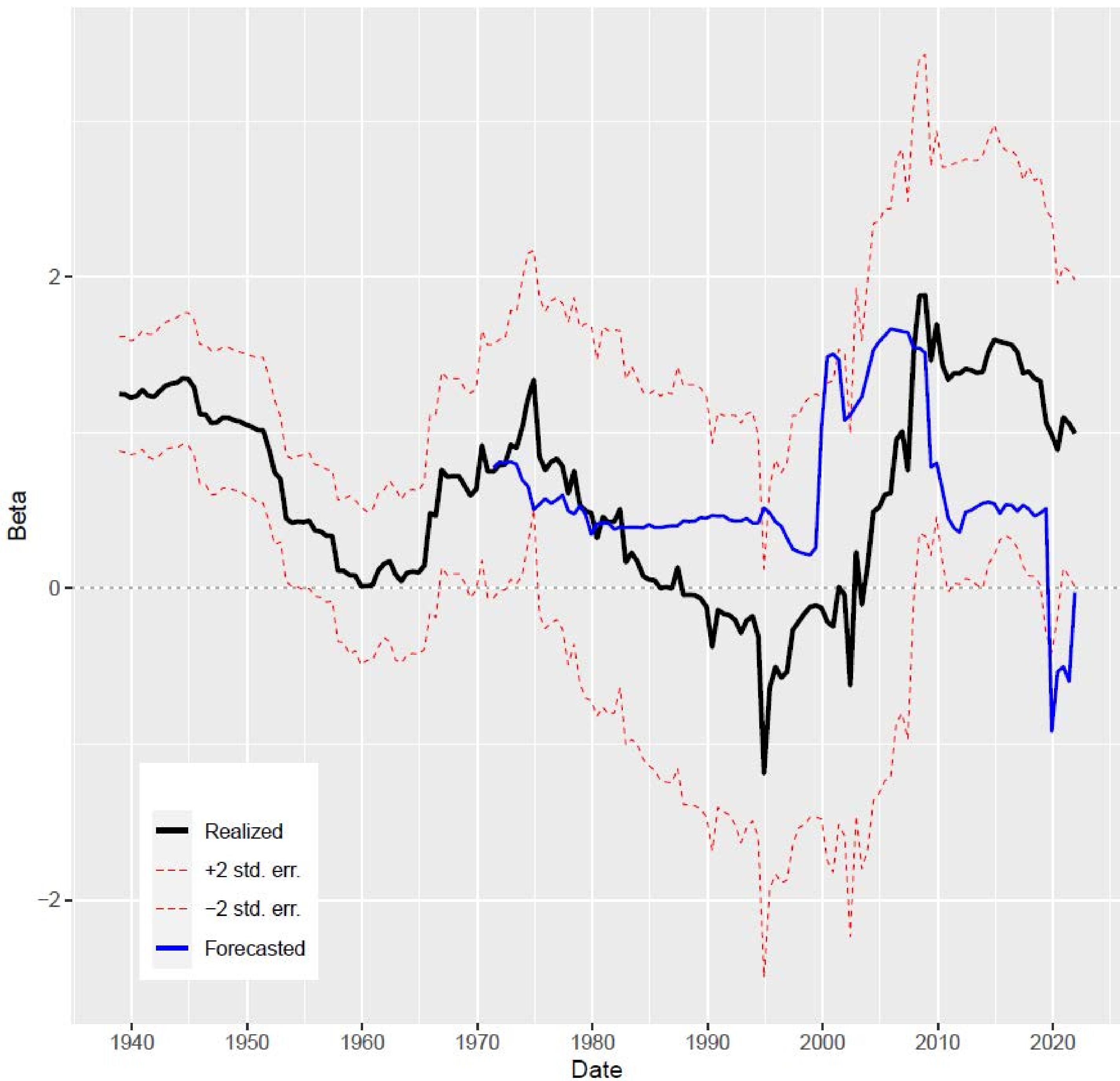


Figure 3: Count of positive and negative 12-month forecasts by year and age cohort



Panel A: Full sample

Figure 4: Rolling Betas of Actual & Forecasted SP growth on IP growth

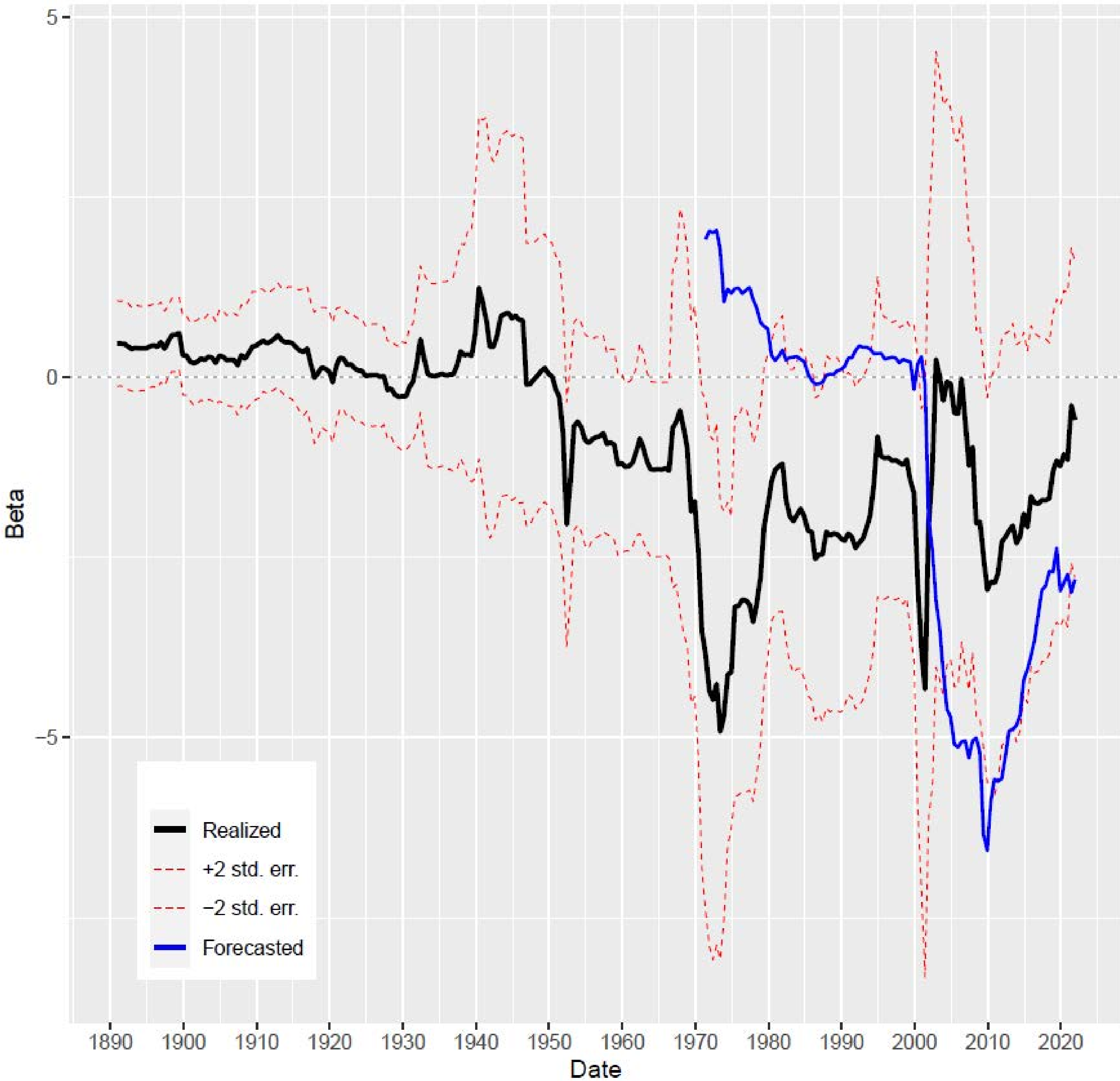


Panel B: Excluding the financial crisis (December 2008)

Figure 5 (continued): Rolling Betas of Actual & Forecasted SP growth on IP growth

Panel A: Full sample

Figure 6: Rolling Betas of Actual & Forecasted SP growth on CPI growth



Panel B: Excluding the financial crisis (December 2008)

Figure 7 (continued) : Rolling Betas of Actual & Forecasted SP growth on CPI growth

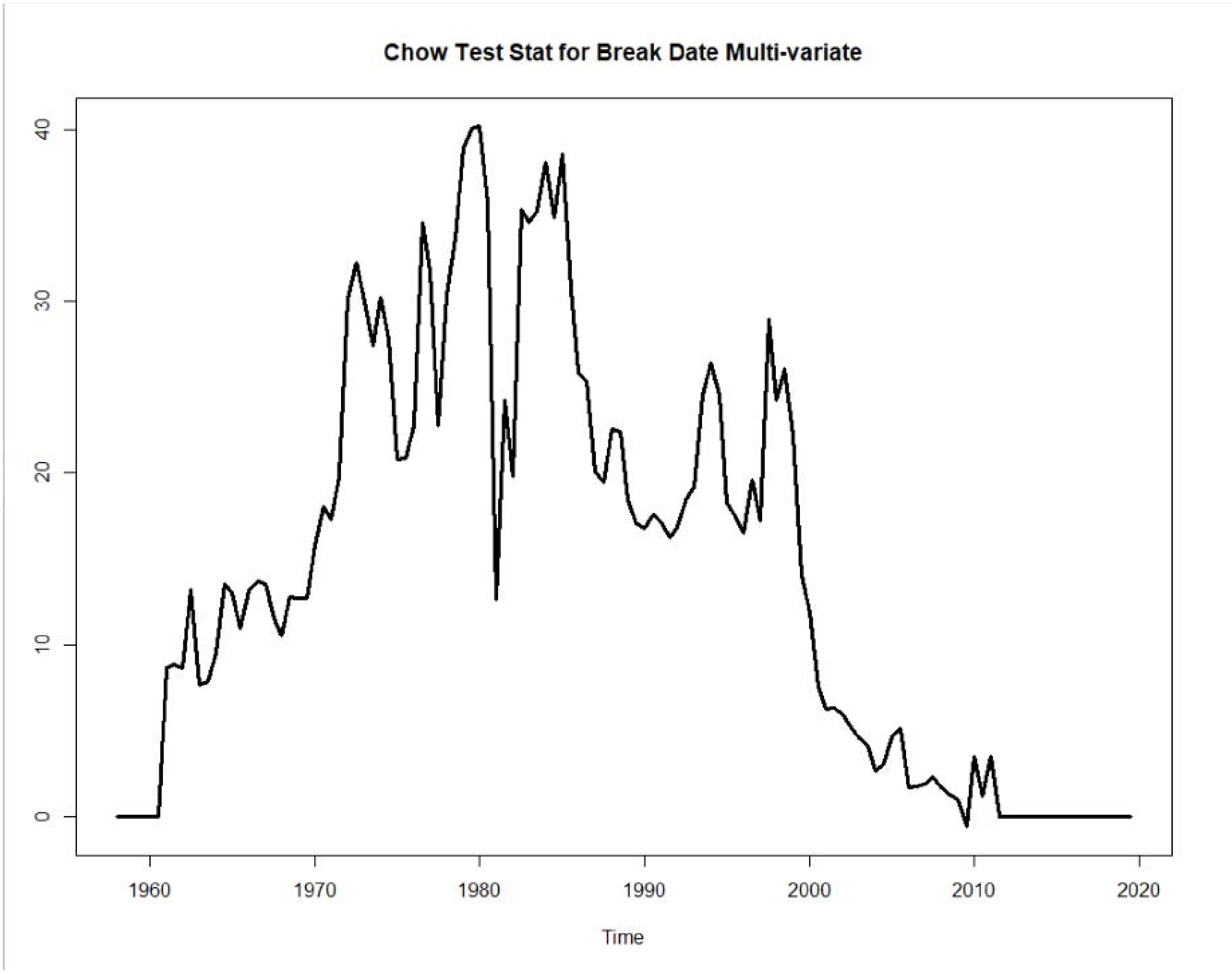


Figure 8: Chow test for single regime switch: Panel regression of 12-month S&P forecasts on forecasts of industrial production, GDP and inflation

Table I: Simple Regressions of Forecasted Stock Returns on Forecasted Macroeconomic Growth. This table reports the result from simple regressions of the forecasted stock return on the growth rate of a forecasted macroeconomic variable from the Livingston Survey. The dependent variable is the median forecasted return on the S&P Industrials index with horizons shown in the column label, where "BP-12M" denotes the 12 month period from the base period and "6M-12M" the future six-month period starting in six month. The independent variable is the median of either the Gross Domestic Product (GDP), Industrial Production (IP), Consumer Price Index (CPI), or retail sales (RS), with a constant. The t-statistics are shown in parentheses. The sample is semi-annual from June 1952 to December 2021 (140 observations), except for the last two models where it runs from December 1959 to December 2021 (125 observations) due to the availability of retail sales forecasts. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: Forecasted S&P Return							
	BP-12M	6M-12M	BP-12M	6M-12M	BP-12M	6M-12M	BP-12M	6M-12M
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP, BP-12M	0.630***							
	(5.103)							
GDP, 6M-12M		1.066***						
		(8.617)						
IP, BP-12M			0.657***					
			(4.359)					
IP, 6M-12M				1.321***				
				(8.471)				
CPI, BP-12M					0.730***			
					(4.268)			
CPI, 6M-12M						1.263***		
						(7.462)		
RS, BP-12M							0.178	
							(1.237)	
RS, 6M-12M								0.825***
								(5.097)
Constant	0.019*	-0.001	0.038***	0.006*	0.038***	0.010***	0.060***	0.009*
	(1.933)	(-0.242)	(5.230)	(1.754)	(5.295)	(3.259)	(5.678)	(1.705)
Observations	140	140	140	140	140	140	125	125
Adjusted R^2	0.153	0.345	0.115	0.337	0.110	0.282	0.004	0.168

Table II: Multiple Regression of Forecasted Stock Return on Forecasted Macroeconomic Growth. This table reports the result from multiple regressions of forecasted stock return on the growth rates of forecasted macroeconomic variables from the Livingston Survey. The dependent variable is the median forecasted return on the S&P Industrials index with horizons shown in the column label, where "BP-12M" denotes the 12 month period from the base period and "6M-12M" the future six-month period starting in six month. The independent variables are the medians of the Industrial Production (IP), Gross Domestic Product (GDP), and Consumer Price Index (CPI), with a constant. The t-statistics are shown in parentheses. The full sample is semi-annual from June 1952 to December 2021 (140 observations), which is divided into two sub-samples before and after 1980 in the last four specifications. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: Forecasted S&P Return					
	BP-12M	6M-12M	BP-12M, pre-1980	6M-12M, pre-1980	BP-12M, post-1980	6M-12M, post-1980
	(1)	(2)	(3)	(4)	(5)	(6)
IP, BP-12M	0.682***		0.992***		0.521	
	(3.162)		(4.367)		(1.618)	
GDP, BP-12M	-0.148		-0.829**		0.233	
	(-0.505)		(-2.458)		(0.611)	
CPI, BP-12M	0.814**		2.119***		-0.558	
	(2.416)		(5.680)		(-1.212)	
IP, 6M-12M		1.274***		1.261***		1.701***
		(4.605)		(3.641)		(3.339)
GDP, 6M-12M		-0.668		-1.029		-0.672
		(-1.388)		(-1.641)		(-0.820)
CPI, 6M-12M		1.437***		2.352***		0.504
		(2.892)		(3.423)		(0.654)
Constant	0.019**	0.004	0.005	-0.001	0.055***	0.013*
	(2.016)	(0.870)	(0.623)	(-0.181)	(3.127)	(1.963)
Observations	140	140	56	56	84	84
Adjusted R^2	0.201	0.425	0.716	0.591	0.045	0.227

Table III: Multiple Panel Regression of Forecasted Stock Return on Forecasted Macroeconomic Growth. This table reports the result from multiple panel regressions of the forecasted stock return on the growth rates of forecasted macroeconomic variables using forecasts by individual economists in the Livingston Survey. The dependent variable is the forecasted return on the S&P Industrials index for the next 12 months. The independent variables are the forecasted growth rates of the Industrial Production (IP), Gross Domestic Product (GDP), Consumer Price Index (CPI) for the corresponding period, decade cohort dummies, and the interaction terms of the cohort dummies and CPI, with a constant added in the regression. The t-statistics are reported below the estimated coefficients. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable: Forecasted S&P Return			
	Fixed Effects Panel		Random Effects Panel	
	Coefficient	t-statistic	Coefficient	t-statistic
IP	0.684***	13.074	0.738***	14.684
GDP	0.332***	4.454	0.395***	5.544
CPI	0.188	1.217	0.147	1.004
1950's cohort			0.006	0.631
1960's cohort			0.035***	2.696
1970's cohort			0.025	1.607
1980's cohort			0.095***	4.985
1990's cohort			0.093***	4.615
2000's cohort			0.076***	3.577
2010's cohort			0.017	0.374
1950's cohort*CPI	0.080	0.493	0.076	0.492
1960's cohort*CPI	-0.349*	-1.728	-0.381**	-2.021
1970's cohort*CPI	-0.163	-0.801	-0.204	-1.056
1980's cohort*CPI	-1.277***	-4.345	-1.306***	-4.771
1990's cohort*CPI	-1.233***	-2.809	-1.270***	-3.181
2000's cohort*CPI	-0.432	-0.907	-0.385	-0.865
2010's cohort*CPI	2.746	1.437	2.699	1.644
Constant			0.004	0.264
Observations	4,136		4,136	
Adjusted R^2	0.203		0.295	

Table IV: ***Pre and Post 1980 Cohorts Co-movement forecasts over a common time period: 1980-2000***
This table reports panel regressions of forecasted S&P index growth on forecasted macroeconomic variable growth. The dependent variable is the forecasted growth of the S&P Industrials index for either the next 12 months period (Panel A) or the future six-month period starting in six months (Panel B). The independent variables are the forecast growth rates of Industrial Production (IP), Gross Domestic Product (GDP), Average Weekly Earnings (WMFG), or Consumer Price Index (CPI). Post-1980 is the cohort who joined the survey before (after) 1980. *t*-statistics are reported below the estimated coefficients. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Forecasted Twelve-month Return

	Dependent Variable: Forecasted S&P Return								
	Pre-1980				Post-1980				Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
IP	0.625***				0.765***				-0.140
	(5.835)				(6.883)				(-0.908)
GDP		0.701***				0.690***			0.011
		(5.360)				(5.766)			(0.064)
WMFG			0.705***				0.753***		-0.048
			(4.883)				(5.236)		(-0.236)
CPI				0.367**				-0.317	0.683***
				(2.336)				(-1.590)	(2.695)
Constant	0.041***	-0.007	0.025*	0.036**	0.015**	-0.006	0.015*	0.059***	
	(3.716)	(-0.434)	(1.791)	(2.317)	(2.532)	(-0.555)	(1.768)	(5.877)	
Observations	446	445	367	439	807	818	622	819	
Adjusted R^2	0.081	0.071	0.075	0.022	0.058	0.046	0.045	0.009	

Panel B: Forecasted Future Six Month Return Starting in Six Months

	Dependent Variable: Forecasted S&P Return								
	Pre-1980				Post-1980				Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
IP	0.801***				0.790***				0.010
	(6.833)				(5.859)				(0.058)
GDP		0.906***				0.215			0.691***
		(5.476)				(1.488)			(3.147)
WMFG			1.435***				0.030		1.405***
			(6.958)				(0.573)		(6.610)
CPI				1.184***				-0.441*	1.625***
				(5.201)				(-1.875)	(4.966)
Constant	0.018***	-0.005	-0.009	-0.003	0.010***	0.018***	0.022***	0.032***	
	(3.019)	(-0.539)	(-1.089)	(-0.366)	(3.254)	(3.465)	(6.647)	(6.057)	
Observations	444	443	367	436	802	811	621	814	
Adjusted R^2	0.103	0.068	0.127	0.063	0.046	0.012	0.004	0.012	