Instrumented Expected Profitability Premiums*

Te-Feng Chen
School of Accounting and Finance, Hong Kong Polytechnic University
Email: tfchen@polyu.edu.hk

Ye Gong
School of Accounting and Finance, Hong Kong Polytechnic University
Email: ye.gong@polyu.edu.hk

K.C. John Wei
School of Accounting and Finance, Hong Kong Polytechnic University
Email: johnwei@ust.hk

Current draft: March 2023

Abstract

We use instrumented principal component analysis (IPCA) to estimate expected profitability from a conditional latent-factor model that depends on observable firm characteristics. The expected profitability predictors generated by the model are superior to existing profitability measures in forecasting future profitability outcomes and analyst forecast errors. Our estimates of expected profitability command a sizable return premium and largely subsume the profitability premium documented in the literature. Moreover, the expected profitability estimates in aggregate are related to future market returns and macroeconomic activities. An IPCA composite predictor aggregated from various expected profitability measures can effectively capture the expected profitability premium.

Keywords: Instrumented expectation; Expected profitability; Expected profitability premium; Instrumented principal component analysis (IPCA)

JEL Classification: G11; G12; G14; G15; G41

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* We thank Arben Kita, Dongmei Li, Jun Li (CICF discussant), Seth Pruitt, Harold Zhang, Linti Zhang (PBFEAM discussant), seminar participants at the Hong Kong Polytechnic University and National Taiwan University, and conference participants at the 2022 Conference on Pacific Basin Finance, Economics, Accounting, and Management (PBFEAM), the 2022 Asian Finance Association (Asian FA) conference, the 2022 China International Conference in Finance (CICF), and the Mini-workshop at National Central University. This paper won the Best Paper Award at the 2022 PBFEAM Conference. We acknowledge financial support from the Research Grants Council of the Hong Kong Special Administrative Region, China (GRF15506719). All remaining errors are our own.

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Abstract

We use instrumented principal component analysis (IPCA) to estimate expected profitability from a conditional latent-factor model that depends on observable firm characteristics. The expected profitability predictors generated by the model are superior to existing profitability measures in forecasting future profitability outcomes and analyst forecast errors. Our estimates of expected profitability command a sizable return premium and largely subsume the profitability premium documented in the literature. Moreover, the expected profitability estimates in aggregate are related to future market returns and macroeconomic activities. An IPCA composite predictor aggregated from various expected profitability measures can effectively capture the expected profitability premium.

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1. Introduction

Expected profitability affects asset prices. Based on a valuation model with clean-surplus accounting, Fama and French (2006) argue that a stock's price equals the present value of its expected future profitability. The model suggests that given book-to-market equity and expected investment, higher expected rates of profitability imply higher expected returns. However, Fama and French (2006, p. 507) find that "… the simple proxies for expected profitability and investment provided by lagged profitability, asset growth, …, and… produce better descriptions of average returns than the more complicated proxies from the first-stage profitability and asset growth regressions that summarize the information in these and other variables."[1] The objective of this study is to estimate expected profitability through a conditional latent-factor model that reflects timely information observable from firm characteristics. We then examine whether the expected profitability from this new approach can produce an even better description of expected returns than the simple proxies provided by lagged profitability measures studied in the literature.

Studies show that cross-sectional models can explain a large fraction of the variation in expected profitability across firms (e.g., Fama and French, 2000, 2006; Hou, van Dijk, and Zhang, 2012). To further account for time variation in latent factors and factor exposures, we construct predictors of expected profitability based on the state-of-the art instrumented principal components analysis (IPCA) developed by Kelly, Pruitt, and Su (2019) and Kelly, Moskowitz, and Pruitt (2021). Our instrumented expected profitability predictors derived using the IPCA technique have

[1] While Fama and French (2006) find that lagged earnings, as a simple proxy for expected profitability, provide weak evidence of the relation, Novy-Marx (2013) shows that lagged gross profit-to-assets is strongly related to future average returns. Ball, Gerakos, Linnainmaa, and Nikolaev (2015, 2016) find that operating profitability provides even better explanatory power. Chen, Sun, Wei, and Xie (2018) show that the profitability effect exists in global and developed markets, although it is less evident in emerging markets. The profitability effect motivates Fama and French (2015) to include a profitability factor in their five-factor model and Hou, Xue, and Zhang (2015) to include such a factor in their *q*-factor model. Therefore, while researchers extensively search for good proxies for expected profitability to study the profitability effect, they still end up using lagged profitability measures.

several advantages. First, the IPCA method provides a set of common profitability factors, which account for common variation in the cross-section of firm profitability. Second, the large cross-section of available firm characteristics, such as various kinds of profitability measures, components of firm profitability, and stock market performance measures, can reflect factor exposure in a timely way while imposing minimal survivorship requirements. Third, the expected profitability predictors, which are estimated from the timely instrumented factor exposures weighted by the conditional expected values of common profitability factors, together yield a powerful composite forecast statistic.

We recursively re-estimate the IPCA model and form the out-of-sample (OOS) expected profitability predictors using an expanding estimation window. We focus on the six measures of profitability commonly used in the literature: (i) return on equity (ROE), (ii) return on assets (ROA), (iii) gross profitability (GPA), from Novy-Marx (2013), (iv) operating profitability (OP), from Ball et al. (2015), (v) operating profitability (FFOP), from Fama and French (2015), and (vi) cash-based operating profitability (CbOP), after Ball et al. (2016). For each profitability measure, we estimate the IPCA model by projecting the current profitability observable at the end of June of each year *t* on firm characteristics observable at the end of June of year *t*-N (N > 0), with the estimation window starting from the first sample year. We then obtain our N-years-ahead expected profitability predictor, $\hat{e}_{N,t}^{IPCA}$ (where e_t denotes earnings or profitability), by applying the model coefficient estimates to firm characteristics observable at the end of June of year *t*.

We begin with one-year-ahead IPCA profitability predictors $\hat{e}_{Y1,t}^{IPCA}$. We first show that cross-sectional firm characteristics are useful instruments. The one-year-ahead IPCA profitability predictors generated by the model can capture most of the variation in future realized profitability outcomes (e_{t+1}), with very high average R^2 values, ranging from 43.44% to 87.30%. Our IPCA profitability predictors also deliver significant and incremental forecasting power for future profitability e_{t+1} compared with analysts' earnings forecasts ($\hat{e}_{Y1,t}^{IBES}$) among firms covered by the I/B/E/S analyst data. Hence, our IPCA profitability predictors are effective proxies for expected profitability.

To understand the persistence of the predictability of expected profitability, we extend our analysis from one-year-ahead to two-year-ahead expected profitability predictors $\hat{e}_{Y2,t-1}^{IPCA}$ estimated at year t-1. We find that the predictability remains sizable and significant over the two-year horizon. Moreover, the predictive power of the two-year-ahead IPCA profitability predictor $\hat{e}_{Y2,t-1}^{IPCA}$ remains statistically significant even after controlling for the one-year-ahead IPCA profitability predictor $\hat{e}_{Y1,t}^{IPCA}$. The results suggest that the realized future profitability outcomes are largely persistent and sticky to market expectations. Indeed, we find that $\hat{e}_{Y2,t-1}^{IPCA}$ and the revision of profitability expectations $\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$ are both significant predictors of future profitability.

We next formally test the sticky expectation models of Coibion and Gorodnichenko (2015) and Bouchaud et al. (2019) to better understand our instrumented expected profitability predictors. Based on their models, we measure expectation stickiness using the link between IPCA forecast errors $e_t - \hat{e}_{Y1,t}^{IPCA}$ and past IPCA forecast revisions $\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$. We find that IPCA profitability predictors exhibit a significant degree of expectation stickiness for ROE, ROA, GPA, and FFOP, but not for OP and CbOP. To further understand the properties of the IPCA profitability predictors for OP and CbOP, we examine the link between analyst forecast errors $e_{t+1} - \hat{e}_{Y1,t}^{IBES}$ and past forecast revisions of our IPCA predictors $\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$. We find that the forecast revisions of our IPCA predictors for OP and CbOP can significantly predict future analyst forecast errors. Therefore, the predictability of the IPCA profitability predictors for OP and CbOP appears to be the most timely and powerful.

Our IPCA estimated profitability commands a sizable return premium. The results of Fama–MacBeth (1973) regressions show that our IPCA profitability predictors explain the cross-section of expected returns at least as well as, and in some cases even better than, lagged profitability measures do. Moreover, IPCA profitability predictors can subsume the profitability effect based on lagged profitability measures when both are simultaneously included in the regression. We also find that the IPCA CbOP predictor can subsume the pricing effect for each of the six lagged profitability measures. Taken together, our results provide a validation of the valuation model proposed by Fama and French (2006) to explain the strongly positive relationship between expected profitability (instead of lagged profitability) and future stock returns.[2]

We then decompose the one-year-ahead IPCA profitability predictors $\hat{e}_{Y1,t}^{IPCA}$ into (i) the past two-year ahead expected profitability predictors $\hat{e}_{Y2,t-1}^{IPCA}$ and (ii) the expectation revisions of our IPCA predictors $\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$. The Fama–MacBeth (1973) regressions show that the expectation revisions $\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$ for all of the profitability measures also significantly predict future stock returns, whereas $\hat{e}_{Y2,t-1}^{IPCA}$ is significant for only two profitability measures, FFOP and CbOP; it is non-significant for the other four measures. Therefore, the expectation revision $\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$ accounts for a substantial amount of the return predictability for the one-year-ahead IPCA profitability predictors.

Whereas we show that various IPCA expected profitability predictors carry return premiums, we also show that an IPCA composite predictor aggregated from the six expected profitability measures can effectively capture the expected profitability premium. Once the IPCA composite

[2] After controlling for accruals, book-to-market equity, and investment, our IPCA profitability predictors can still subsume lagged profitability measures. Using the same predictive variables, we conduct another experiment for instrumented expected investment. We find that the performance of instrumented expected investment is similar to that of lagged investment in predicting future stock returns. Nevertheless, the outperformance of IPCA expected profitability over lagged profitability signals remains after controlling for both lagged and expected investments.

predictor is included, other lagged profitability or expected profitability measures are no longer significant in predicting the next-year stock returns. Our IPCA expected profitability measures are also better in predicting earnings announcement returns than are lagged profitability measures.

We then evaluate the reliability of the predictive power of our IPCA profitability predictors using the profitability factor $RMW(e_t)$ and the IPCA expected profitability factor $RMW\left(\hat{e}_{Y1,t}^{IPCA}\right)$ based on the six-portfolio methodology as in Fama and French (2015). We find that the IPCA expected profitability factor earns significant positive value-weighted returns. The IPCA expected ROA and CbOP factors still carry significant return premiums even after controlling for lagged profitability factors.

Using the partial least squares (PLS) approach (Kelly and Pruitt 2013), we compute the aggregate indices formed by IPCA common factors and the six equally weighted (EW) or value-weighted profitability measures. We show that the aggregate PLS index based on IPCA common factors better forecasts future market returns and future macroeconomic conditions than does the aggregate index based on EW or value-weighted profitability measures. In particular, the aggregate PLS index based on IPCA common factors can provide information content about future leading indicators. Therefore, the common factors generated from the IPCA expected profitability estimation are associated with the future investment opportunity set and macroeconomic activities. Moreover, the pricing of the expected profitability can be ascribed to a market risk premium.

Our study provides deeper insights into the role of expected profitability by examining the pricing of profitability over the six commonly used profitability measures. Ball et al. (2016) suggest that CbOP outperforms other profitability measures in predicting the cross-section of average returns and that adding a CbOP factor to an investment strategy can increase the Sharpe ratio. Regarding choosing profitability factors, Fama and French (2018) show that the CbOP profitability factor dominates the OP profitability factor in generating a higher Sharpe ratio for the six-factor model they examine. Consistent with their findings, we show that the IPCA expected CbOP, which is an ex-ante expectation of future CbOP, is a more powerful predictor of future stock returns.

Our approach to estimating expected profitability based on the IPCA technique developed by Kelly et al. (2019) complements the cross-sectional earnings models in Fama and French (2000, 2006) and Hou et al. (2012) in two ways. First, we show that the 36 firm characteristics used in Freyberger, Neuhierl, and Weber (2020) are useful predictors of future stock returns (e.g., Kelly et al., 2019; Kelly et al., 2021) and are also powerful predictors of future profitability outcomes. Second, we construct the expected profitability predictors over a broader set of six profitability measures compared to their focus exclusively on earnings forecasts. Our study also complements a recent study by Kelly et al. (2021), who find that their IPCA expected return predictor (which is an ex-ante measure of expected return) can effectively explain the momentum return predictability (which is based on a noisy measure of past one-year returns). Further, we find that the IPCA expected return predictor cannot fully explain the profitability effect or the expected profitability effect, suggesting that adding the IPCA expected profitability predictor can provide incremental explanatory power for future stock returns.

The rest of the paper is organized as follows. In Section 2, we discuss the data, the measures of profitability, and the IPCA model. In Section 3, we report the results of testing the predictability of our IPCA profitability predictors for future realized profitability. In Section 4, we use Fama–MacBeth regressions to examine whether our IPCA profitability predictors can predict future stock returns. In Section 5, we examine whether the aggregate IPCA profitability can predict market returns and macroeconomic activities. Section 6 concludes the paper.

2. Data, Measures of Profitability, and IPCA Model

In this section, we discuss our sample selection, measures of profitability, IPCA model, and expected profitability predictors.

2.1. Sample selection

We use all common stocks of firms trading on NYSE, Amex, and Nasdaq with a share code of 10 or 11 from June 1963 to December 2019. We obtain monthly stock data from the Center for Research in Security Prices (CRSP) and financial statement data from Compustat. Annual fundamental variables are measured at the fiscal year end in calendar year *t*-1 and used to predict future outcomes from June of year *t* to May of year *t*+1. We exclude firm-year observations with missing or negative book-to-market ratios. To deal with outliers, we winsorize continuous variables at the 1% and 99% levels. For each estimation, we further restrict our sample stocks to those with non-missing profitability measures and accruals and those with a closing price exceeding $5. To avoid survivorship bias, we restrict the sample conditioned on observable information associated with explanatory variables. We obtain consensus analyst earnings forecasts and the corresponding actual shares outstanding from the Institutional Brokers' Estimate System (I/B/E/S) unadjusted summary files starting from June 1985 to June 2019. We use median consensus earnings per share (EPS) forecasts with the forecast period indicator equal to 1 and 2.

2.2. Profitability measures

We construct six profitability measures and adopt the following notation for expository purposes. ROE denotes return on equity and is measured as income before extraordinary items (Compustat item IB) scaled by book equity. ROA is return on assets and is computed as income before extraordinary items scaled by total assets (AT). GPA is gross profitability-to-assets, after

Novy-Marx (2013), and is measured as revenues (REVT) minus cost of goods sold (COGS), scaled by total assets. OP represents operating profitability, after Ball et al. (2015), and is calculated as revenues (REVT) minus cost of goods sold (COGS) and selling, general, and administrative expenses (XSGA), plus research and development expenditures (XRD), scaled by total assets. FFOP denotes operating profitability, after Fama and French (2015) and is calculated as revenues (REVT) minus cost of goods sold (COGS), interest expense (XINT), and selling, general, and administrative expenses (XSGA), scaled by book equity. CbOP is cash-based operating profitability, after Ball et al. (2016), and is computed as OP − Δ(Accounts receivable (RECT)) − Δ(Inventory (INVT)) − Δ(Prepaid expenses (XPP)) + Δ(Deferred revenue (DRC+ DRLT)) + Δ(Trade accounts payable (AP)) + Δ(Accrued expenses (XACC)) over total assets, where Δ denotes the year-to-year change. Book equity is computed in the same way as in Fama and French (1993).

2.3. IPCA model

For each profitability measure, we use the IPCA developed by Kelly et al. (2019) based on a generic conditional factor model with latent factors f_{t+1}, and time-varying factor loadings $\beta_{i,t}$, which establishes a link between firm characteristics and expected profitability in the following formulation:

$$e_{i,t+1} = \underbrace{\left(z'_{i,t}\Gamma_\beta\right)}_{\beta'_{i,t}} f_{t+1} + \epsilon_{i,t+1}, \tag{1}$$

where $e_{i,t+1}$ denotes a profitability measure of firm i at time t+1, $\beta'_{i,t}$ is the time-varying factor loadings instrumented by $z'_{i,t}\Gamma_\beta$, the mapping from a potentially large number of characteristics to a small number of risk factor exposures, in which $z'_{i,t}$ is an $L \times 1$ instrument vector (L = number of firm characteristics including a constant) and Γ_β is the matrix mapping L characteristics to K (K

= 5) latent factors. We use 40 observable firm characteristics, which are derived from the data on 36 firm characteristics used in Freyberger et al. (2020), augmented with the four profitability measures of interest to us (ROE and ROA are already included in the FNW36 dataset) as the instruments $z'_{i,t}$. The instrumented variables are transformed into z-scores: each characteristic is rescaled so that in each month, the cross-sectional average value is 0 and the standard deviation is 1.[3] These 40 firm characteristics can be classified into six categories: (i) profitability-related characteristics, such as capital turnover (CTO) and price-to-cost margin (PCM); (ii) intangibles, such as operating accruals (OA) and operating leverage (OL); (iii) past return characteristics, such as long-term reversal (Cum_Return_36_13) and intermediate momentum (Cum_Return_12_7); (iv) value characteristics, such as earnings-to-price (E2P) and sales-to-price (S2P); (v) investment characteristics, such as net operating assets (NOA) and leverage (LEV); and (vi) trading frictions, such as market beta (BETA) and total assets (AT). The detailed definitions of all variables are listed in Appendix Table A1.

The novelty of our approach, compared with prior studies (e.g., Kelly et al., 2019; Kelly et al. 2021), is that we explore the IPCA model to predict profitability and study its return predictability. The IPCA approach extends the cross-sectional earnings forecast approach (e.g., Hou et al., 2012) in several ways. First, we investigate a broader set of firm characteristics as the explanatory variables and a more comprehensive list of profitability measures as the dependent variables. Moreover, while we evaluate a large number of characteristics as instruments, our model is built on a parsimonious parameter structure of five common factors. The lower dimension can extract the most informative predictive content related to variation in future profitability and at the same time reduce noise. Finally, we conduct the out-of-sample (OOS) model estimates on a

[3] Compared to the rank-scores used in Kelly et al. (2020), the choice of z-scores can preserve the relative magnitude across characteristics, which largely maintains the comparability between the resulting predictors and others.

recursive basis as illustrated below.

2.4. Expected profitability predictors

Our first predictor of expected profitability is based on the IPCA framework from Eq. (1):

$$E_t[e_{i,t+1}] = \beta'_{i,t}\lambda_t = \mathrm{vec}(\Gamma_\beta)'(\lambda_t \otimes z_{i,t}) \qquad (2)$$
$$\lambda_t = E_t[f_{t+1}],$$

where $\otimes$ is the Kronecker product operator and $\mathrm{vec}(\Gamma_\beta)$ is the vectorization of Γ_β, which is a $KL \times 1$ vector. The term $\lambda_t \otimes z_{i,t}$ denotes the $KL \times 1$ vector of each expected factor interacted with each characteristic in time *t*. For each firm *i* in year *t*, we initially use characteristics from the beginning up until year *t*-1 to estimate Γ_β coefficients and factor f_t in year *t*-1 and $\hat{\lambda}_t = \frac{1}{t}\sum_{\tau=1}^{t} f_\tau$. We next interact $\hat{\lambda}_t$ with characteristics in year *t* to estimate the expectation for profitability in year *t*+1. Fig. 1 depicts the estimation procedure described above. We begin with annual data from June 1963 to June 1968 as our initial estimation window to forecast the profitability in June 1969. Note that the model is recursively re-estimated for each subsequent year without using any information beyond year *t*.

[Insert Fig. 1 here]

The second competing predictor we consider is the lagged profitability e_t. Fama and French (2006) show that lagged profitability, compared to size and other accounting fundamentals, has stronger predictive power for future profitability. Hence, we use ROE, ROA, GPA, OP, FFOP, and CbOP observable in June of year *t* as profitability signals (labeled as lagged profitability). Third, we use analyst forecast EPS to measure the analyst forecast profitability, denoted as $\hat{e}_{Y1,t}^{IBES}$, by computing the median consensus EPS forecasts (forecast period indicator = 1) in June of year *t* times the shares outstanding (IBES actpsumu item: SHOUT) divided by book equity for ROE and FFOP or by total assets for ROA, GPA, OP, and CbOP. In other words, $\hat{e}_{Y1,t}^{IBES}$ is the expected

ROE when using profitability measures for ROE and FFOP, and the expected ROA when using ROA, GPA, OP and CbOP.

3. Predicting Future Profitability

In this section, we first discuss the results of the Fama–MacBeth regression of firm characteristics to predict future profitability. We then use the IPCA to extract common profitability factors and compare the performance of the IPCA instrumented profitability predictors with that of lagged profitability measures.

3.1. Predicting future profitability using firm characteristics

We start by showing that various firm characteristics can predict future profitability. Fairfield et al. (2003) indicate that operating accruals are strongly related to the variation in future net operating assets. Fama and French (2006) suggest that profitability is highly persistent and as a result, lagged profitability can capture substantial variation in future profitability. To explore the predictive power of firm characteristics, we use the Fama–MacBeth (1973) regression of each profitability measure in June of year t+1 on 40 firm characteristics as of June of year t. We focus on our six measures of profitability.

Table 1 exhibits the performance of each firm characteristic for forecasting the selected profitability. We find that the profitability measures are highly autocorrelated. Each of the six lagged profitability measures can significantly forecast its own future profitability. Turning to other characteristics, momentum has significant and persistent predictability for future profitability. Earnings-to-price (in the value category) has a significant negative association with future profitability, which is consistent with Novy-Marx's (2013) argument that profitability is the other side of value. In the category of trading frictions, price relative to the 52-week high and idiosyncratic volatility are significant. Although other characteristics can provide predictive information for future profitability, their marginal predictive power is limited.

[Insert Table 1 here]

In the next section, we use the IPCA method to extract the most informative signal from the combination of firm characteristics in a parsimonious parameter structure to estimate the expected profitability.

3.2. Extracting common profitability factors

We estimate the IPCA factor model with five common factors (i.e., $K = 5$) for each of the six profitability measures. To help interpret these common factors, Fig. 2 provides the graphical illustration, in which each column delineates the estimated Γ_β coefficients of individual characteristics on the k-th ($k = 1$ to 5) factor across different profitability measures. Factor 1 is primarily dominated by profitability persistence. Each measure of profitability is highly correlated to its own past profitability and others' past profitability. In addition, earnings to price and book-to-market (both are value characteristics) make a negative contribution. Because value is the other side of profitability (Novy-Max, 2013), this finding also supports the notion of Factor 1 as the profitability persistence. Turning to Factor 2, we find that the coefficients with sizable magnitude switch gradually from the profitability measures to variables related to the fundamental components of profitability, such as sales-to-lagged assets (CTO), operating income after depreciation over sales (PM), SG&A-to-market (SGA2M), gross profits-to-sales (PCM), and operating leverage (OL) measured as the sum of cost of goods sold and SG&A. Therefore, Factor 2 can be interpreted as the profitability components. Factor 3 is the combination of different profitability measures and profitability components. FFOP and SG&A-to-market (SGA2M) make sizable contributions to Γ_β coefficients for ROE. While GPA and FFOP contribute to Γ_β

coefficients for CbOP, CTO and OL also make significant contributions. Both Factors 4 and 5 are mixtures of firm characteristics.

[Insert Fig. 2 here]

3.3. Performance of profitability forecasters

We conduct Fama–MacBeth regressions for each profitability measure as of June of year *t*+1 (e_{t+1}) on each profitability predictor as of June of year *t*. Table 2 reports the results of the regressions. As shown in panel A, we find that the coefficient on each $\hat{e}_{Y1,t}^{IPCA}$ is statistically significant and economically large, with *t*-statistics of 13.35, 13.78, 76.39, 25.78, 16.98, and 25.15 corresponding to ROE, ROA, GPA, OP, FFOP, and CbOP, respectively. The averages of R^2 are all larger than 40%, implying that $\hat{e}_{Y1,t}^{IPCA}$ captures substantial variations in future profitability. Panel B further illustrates that the coefficient on each IPCA expected profitability is mostly unchanged and remains highly significant when the lagged earnings signal e_t is included, suggesting that $\hat{e}_{Y1,t}^{IPCA}$ is more informative about future profitability than is lagged earnings e_t. In addition, the averages of bivariate regression R^2 are close to those of univariate regression R^2 presented in panel A, suggesting that lagged profitability measures have limited incremental predictive power relative to IPCA profitability predictors.

[Insert Table 2 here]

We next assess the predictability performance generated by different predictors by running regressions of future profitability (e_{t+1}) on $\hat{e}_{Y1,t}^{IPCA}$, $\hat{e}_{Y1,t}^{IBES}$, and e_t. Panel C shows that the coefficients on all of the IPCA expected profitability predictors and analyst forecasts remain highly significant, whereas the lagged profitability measures ROA, GPA, and OP have no predictive power for future profitability. Moreover, the *t*-statistics of the regression coefficients on the IPCA expected profitability predictors are all substantially larger than those on analyst forecasts, except for ROA.

Overall, the IPCA expected profitability measures have stronger predictive power for future realized profitability measures than do the lagged profitability measures or analyst forecasts.

3.4. Performance of two-year-ahead expected profitability

Bouchaud et al. (2019) find that the profitability effect can result from analyst expectation stickiness and profitability persistence. Inspired by their proposition, we estimate the revision of profitability expectations and investigate their information content. For one-year-ahead future profitability in year *t*+1, we extend our analysis to two-year-ahead expected profitability predictors $\hat{e}_{Y2,t-1}^{IPCA}$ formed in year *t*-1. In panel A of Table 3, we regress each realized profitability measure as of June of year *t*+1 on $\hat{e}_{Y2,t-1}^{IPCA}$. We find that the coefficients on $\hat{e}_{Y2,t-1}^{IPCA}$ are all statistically significant and economically large, indicating the strong predictive power of two-year-ahead IPCA expected profitability. Panel B further includes lagged profitability (e_t) and reveals that the coefficients on $\hat{e}_{Y2,t-1}^{IPCA}$ all continue to be positive and highly significant, but their magnitude is substantially reduced. Panel C shows that even when controlling for one-year IPCA predictor $\hat{e}_{Y1,t}^{IPCA}$, the lagged two-year predictor $\hat{e}_{Y2,t-1}^{IPCA}$ still provides strong predictive information with *t*-statistics larger than 3. This fact implies that IPCA expected profitability or future realized profitability is sticky. In panel D, we compare the predictability of $\hat{e}_{Y2,t-1}^{IPCA}$ and IPCA expected profitability revisions ($\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$). The results suggest that IPCA expected profitability revisions likewise have predictive content for future profitability, with *t*-statistics ranging from 15.28 to 18.96, and the magnitudes of the regression coefficients are comparable to those of $\hat{e}_{Y2,t-1}^{IPCA}$.

[Insert Table 3 here]

Altogether, we find strong evidence that the predictability of IPCA profitability predictors remains sizable and highly significant over the horizon of two years, suggesting that reported future profitability outcomes are largely persistent and sticky to market expectations.

3.5. Stickiness test: the nature of IPCA expected profitability

We formally follow the approach used in the study of analyst forecast errors by Bouchaud et al. (2019) to test whether IPCA expected profitability is sticky, as follows:

$$Ue_{i,t+1}^{IPCA} \text{ or } Ue_{i,t+1}^{IBES} = \alpha_0 + \alpha_1\left(\hat{e}_{Y1,i,t}^{IPCA} - \hat{e}_{Y2,i,t-1}^{IPCA}\right) + \alpha_2 \Delta e_{i,t} + \epsilon_{i,t+1}, \quad (3)$$

where $Ue_{i,t+1}^{IPCA}$ is the difference between the realized profitability at time *t*+1 and the expectation at time *t* (i.e., $e_{i,t+1} - \hat{e}_{Y1,i,t}^{IPCA}$); $\hat{e}_{Y1,i,t}^{IPCA} - \hat{e}_{Y2,i,t-1}^{IPCA}$ is the revision in expectations based on our IPCA expected profitability; and $\Delta e_{i,t}$ is the changes in realized profitability from year *t*-1 to year *t* (i.e., $e_{i,t} - e_{i,t-1}$). The positive coefficient of α_1 measures the degree of expectation stickiness, whereas a negative coefficient of α_2 captures the presence of extrapolative bias.

We begin with using unexpected profitability (Ue_{t+1}^{IPCA}) as the dependent variable in Eq. (3). As shown in panel A of Table 4, we find that except for OP and CbOP, the expectation revisions based on IPCA expected profitability are positively associated with future unexpected profitability. This finding indicates the presence of stickiness for IPCA expected profitability in general, except for OP and CbOP. The coefficients on the change in the realized profitability measure ($\Delta e_{i,t}$) for ROA, GPA, and CbOP are significant and negative, suggesting that expectations for these profitability measures are extrapolative.

[Insert Table 4 here]

We next use analyst forecast error (Ue_{t+1}^{IBES}), which is the difference between e_{t+1} and $\hat{e}_{Y1,t}^{IBES}$, as the dependent variable. $Ue_{i,t+1}^{IBES}$ is unexpected ROE based on analyst earnings forecasts for ROE and FFOP and is unexpected ROA for ROA, GPA, OP and CbOP. $\hat{e}_{Y1,i,t}^{IBES} - \hat{e}_{Y2,i,t-1}^{IBES}$ is the corresponding forecast revision based on analyst forecasts, where $\hat{e}_{Y2,t-1}^{IBES}$ is the two-year-ahead analyst earnings forecast (forecast period indicator = 2) as of June of year t-1. The period of the subsample including I/B/E/S data is from June 1985 to June 2019 due to the availability of I/B/E/S data. Panel B of Table 4 shows that the coefficients on IPCA expectation revisions for profitability measures OP and CbOP are statistically significant, with t-statistics of 7.65 and 2.78, respectively. For the change in lagged realized profitability, similar to Bouchaud et al. (2019), we find that future analyst forecast errors are not significantly associated with changes in lagged realized ROE or ROA. For the other profitability measures, we find evidence of extrapolative bias associated with changes in lagged realized GPA, OP, and CbOP, with significant negative t-statistics of -4.17, -2.52, and -2.27, respectively. Overall, the findings suggest that the revision of IPCA expected profitability has forecasting power for future analyst forecast errors but not for revisions of analyst earnings forecasts.

So (2013) shows that analyst forecast errors are predictable due to analysts' private information or incentives to bias their forecasts, and in this case the characteristic approach can provide an unbiased predictor of future earnings. Following So's (2013) approach, we investigate the association between future analyst forecast errors ($e_{t+1} - \hat{e}_{Y1,t}^{IBES}$) and IPCA forecast optimism, which is computed as the difference between IPCA expected profitability and the expectation based on analyst forecasts ($\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y1,t}^{IBES}$). Panel C of Table 4 shows that all of the coefficients on ($\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y1,t}^{IBES}$) are positive and significant, with t-statistics ranging from 2.42 to 11.71, suggesting that IPCA expected profitability is indeed an unbiased predictor of future profitability.

In summary, the IPCA expected profitability predictors for ROE, ROA, GPA, and FFOP demonstrate some degree of expectation stickiness. In contrast, while the expected profitability predictors for OP and CbOP are not sticky, their expectation revisions can help predict future analyst forecast errors. Moreover, future analyst forecast errors are predictable and are related to

IPCA forecast optimism relative to analyst forecasts, suggesting that IPCA expected profitability predictors are relatively unbiased.

4. Predicting Future Stock Returns

We show above that IPCA expected profitability predictors $\hat{e}_{Y1,t}^{IPCA}$ can effectively forecast future profitability. We now investigate whether expected profitability measures estimated by IPCA generate more powerful return predictability than lagged profitability measures. We use expected profitability measures estimated as of June of year *t* to predict future monthly excess returns ($r_{i,t+1} - r_{f,t+1}$) from July of year *t* to June of year *t*+1. We run Fama–MacBeth regressions of future stock returns on each IPCA expected profitability measure with controls of accruals, firm size ($log(ME)$), book-to-market equity ($log(B/M)$), investment, past one-month return ($r_{-1,0}$), and past two-to-twelve-month return ($r_{-12,-2}$).

4.1. The return predictability of IPCA expected profitability

Panel A of Table 5 shows that the coefficients on the IPCA expected profitability measures are all statistically significant, with *t*-statistics ranging from 4.54 for ROE to 8.55 for CbOP. The evidence suggests that IPCA expected profitability measures have strong predictive power to capture variation in future stock returns. The results shown in panel B of Table 5 are consistent with the literature showing that lagged profitability measures can also predict future returns, although their magnitudes are substantially smaller than those of the IPCA expected profitability predictors.

[Insert Table 5 here]

4.2. Which proxy for expected profitability better explains future stock returns?

We now examine which proxy for expected profitability better explains future stock returns.

Table 6 shows the results of Fama–MacBeth regressions of future stock returns on IPCA expected profitability predictors $\hat{e}_{Y1,t}^{IPCA}$, while controlling for lagged profitability measures e_t, and analyst forecast earnings $\hat{e}_{Y1,t}^{IBES}$. In panel A, we perform a bivariate analysis including lagged profitability e_t and IPCA expected profitability $\hat{e}_{Y1,t}^{IPCA}$. The coefficients on lagged ROE, ROA, OP, FFOP, and CbOP become non-significant or turn negative, with *t*-statistics of -0.52, -1.78, -1.43, -2.03, and 1.03, respectively. In contrast, the coefficients on the corresponding IPCA expected profitability are all economically large and statistically significant. The coefficients on IPCA expected GPA and lagged GPA both become non-significant, suggesting that they provide similar information content for future stock returns. Hence, IPCA expected profitability measures generally have greater explanatory power for future stock returns, and the expected profitability premiums largely subsume the profitability premiums studied in the literature.

[Insert Table 6 here]

We next control for analyst forecasts $\hat{e}_{Y1,t}^{IBES}$ and examine the predictive power of IPCA expected profitability measures. Studies (e.g., Frankel and Lee, 1998; Easton, 2004) show that analyst forecasts, which can be used to estimate firms' intrinsic value, are useful predictors for cross-sectional stock returns. Panel B of Table 6 shows that all of the IPCA expected profitability predictors except GPA significantly predict future stock returns and largely subsume the predictive power of both lagged profitability measures and analyst earnings forecasts. Specifically, the coefficients on e_t and $\hat{e}_{Y1,t}^{IBES}$ are all non-significant or become significant and negative.[4]

[4] Ball et al. (2016) show that CbOP is a superior predictor of future stock performance among profitability measures commonly used in the literature. We extend their analysis using IPCA expected CbOP. Appendix Table A2 reveals that after controlling for $\hat{e}_{Y1,t}^{IPCA}$ of CbOP, which is significantly and positively priced in all cases, the coefficients on lagged profitability measures of ROE, ROA, OP, and FFOP switch their signs to negative, whereas analyst earnings forecasts become non-significant. Two competing lagged profitability measures, GPA and CbOP, also become non-significant (*t*-stat = 1.27 and 0.64, respectively). Therefore, IPCA expected CbOP has the best explanatory power for the profitability premium.

In panel C of Table 6, we disentangle the correlation of lagged profitability and expected profitability by examining their changes, Δe_t and $\Delta\hat{e}_{Y1,t}^{IPCA}$. We find that changes in IPCA expected profitability for all measures subsume the effects of changes in lagged profitability measures on future stock returns. The result is consistent with our finding that IPCA expected profitability performs the best among these predictors in explaining the profitability premium.

4.3. The return predictability of revisions in IPCA expected profitability

We decompose the one-year-ahead IPCA expected profitability $\hat{e}_{Y1,t}^{IPCA}$ into two components, as follows, and then examine which component better explains future returns:

$$\hat{e}_{Y1,t}^{IPCA} = (\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}) + \hat{e}_{Y2,t-1}^{IPCA}, \quad (4)$$

where $\hat{e}_{Y2,t-1}^{IPCA}$ is two-year-ahead IPCA expected profitability and $\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$ is revisions in IPCA expected profitability. We run Fama–MacBeth regressions of stock returns on these two components to explore which one accounts more for expected profitability premiums. The results shown in panel A of Table 7 indicate that expectation revisions in IPCA expected profitability measures all have stronger return predictability than $\hat{e}_{Y2,t-1}^{IPCA}$. In panel B, when lagged profitability measures ($e_{i,t}$) are included as an additional explanatory variable, most of the $\hat{e}_{Y2,t-1}^{IPCA}$ coefficients become non-significant (except for FFOP and CbOP). In contrast, the coefficients on expectation revisions in IPCA expected profitability measures ($\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$) remain significant (except for GPA), whereas the coefficients on $e_{i,t}$ are all non-significant. The results indicate that the risk premiums associated with IPCA expected profitability are largely derived from revisions in expectation.

[Insert Table 7 here]

4.4. The return predictability of IPCA composite expected profitability

We show above that IPCA expected profitability predictors based on various profitability measures have significant predictive power for future excess returns individually. In this section, we investigate whether there exists a composite predictor that can more effectively capture the expected profitability premium than each individual profitability measure. For this purpose, we apply the IPCA technique to form an expected annual excess return predictor $\hat{r}_{\hat{e}6,t}^{IPCA}$, solely based on our six IPCA expected profitability measures ($\hat{e}_{Y1,t}^{IPCA}$). Similar to the procedure we use for IPCA expected profitability estimation, the construction of $\hat{r}_{\hat{e}6,t}^{IPCA}$ with K = 5 begins with a five-year initial window. The first $\hat{e}_{Y1,t}^{IPCA}$ is available as of June of 1968, whereas the first $\hat{r}_{\hat{e}6,t}^{IPCA}$ is available as of June of 1973.

Panel A (panel B) of Table 8 shows that $\hat{r}_{\hat{e}6,t}^{IPCA}$ significantly predicts future annual stock returns from July of year *t* to June of year *t*+1 and subsumes all lagged profitability measures (all IPCA expected profitability predictors). For comparison, we construct an EW average IPCA expected profitability predictor $Avg\hat{e}_{Y1,t}^{IPCA}$ based on the z-scores of the six IPCA expected profitability predictors $\hat{e}_{Y1,t}^{IPCA}$. Panel C of Table 8 shows that $Avg\hat{e}_{Y1,t}^{IPCA}$ also significantly predicts future annual stock returns and subsumes all of the lagged profitability measures. Panel D of Table 8 reveals that $Avg\hat{e}_{Y1,t}^{IPCA}$ does not outperform IPCA expected FFOP in predicting future annual returns, suggesting that the EW average of IPCA profitability predictors is not a sufficient predictor for the FFOP profitability premium.[5]

[5] We also evaluate the performance of expected profitability predictors based on earnings announcement returns. We measure the cumulative abnormal return (CAR_t) as the four-day cumulative daily abnormal returns around each quarterly earnings announcement date (Compustat item RDQ). That is, $CAR_t = \sum_{d=-2}^{d=1}(r_{i,d} - r_{m,d})$, where $r_{i,d}$ is firm *i*'s daily return on day d and $r_{m,d}$ is the market daily return on day d relative to the announcement date 0. We then sum up the CARs from July of year *t* to June of year *t*+1 as the one-year-ahead annual earnings announcement CARs. Appendix Table A3 presents the results of Fama–MacBeth regressions of the one-year-ahead annual earnings announcement CARs on profitability measures. Panel A shows the results from bivariate regressions. We find that $\hat{e}_{Y1,t}^{IPCA}$ for ROE, ROA, OP, FFOP, and CbOP can significantly predict future earnings announcement CARs, while the lagged profitability measures cannot. Similar to the findings reported in Table 6, the coefficients on both IPCA expected GPA and lagged GPA are non-significant, due to their correlated nature. Panel B show that the composite

[Insert Table 8 here]

Overall, the findings in Table 8 indicate that the composite IPCA return predictor $\hat{r}_{\hat{e}6,t}^{IPCA}$ based solely on the six IPCA expected profitability predictors can effectively capture the expected profitability premium.

4.5. Robustness checks: Controlling for IPCA expected return predictors

Kelly et al. (2019) and Kelly et al. (2021) find that the IPCA expected return predictor can explain substantial variation in stock returns. For comparison, we follow Kelly et al. (2021) to form the monthly excess return predictor $\hat{r}_t^{IPCA}$ based on the 36 characteristics from Freyberger et al. (2020) or the 40 characteristics used in our study. We conduct Fama–MacBeth regressions of the next month's excess stock returns on lagged profitability (e_t) and IPCA expected profitability ($\hat{e}_{Y1,t}^{IPCA}$), while controlling for the IPCA expected return predictor based on 36 characteristics ($\hat{r}_{FNW36,t}^{IPCA}$) or 40 characteristics ($\hat{r}_{40,t}^{IPCA}$). Panels A and B of Table 9 show that neither $\hat{r}_{FNW36,t}^{IPCA}$ nor $\hat{r}_{40,t}^{IPCA}$ can fully explain the profitability effect provided by GPA, OP, FFOP, and CbOP. Likewise, Panel C of Table 9 reports that the regression coefficients on $\hat{e}_{Y1,t}^{IPCA}$ for GPA, OP, FFOP, and CbOP remain statistically significant with *t*-statistics of 2.38, 1.96, 1.95, and 4.51, respectively. This finding implies that the IPCA expected return predictor ($\hat{r}_{FNW36,t}^{IPCA}$ or $\hat{r}_{40,t}^{IPCA}$) is insufficient to explain the expected profitability premiums.

[Insert Table 9 here]

Taken together, Tables 8 and 9 reveal that IPCA expected return predictors cannot sufficiently explain profitability effects or expected profitability effects, suggesting that adding

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IPCA expected return predictor based on the six IPCA expected profitability predictors $\hat{r}_{\hat{e}6,t}^{IPCA}$ significantly predicts future earnings announcement CARs and subsumes all lagged profitability measures. Panel C reveals that $\hat{r}_{\hat{e}6,t}^{IPCA}$ also subsumes all IPCA profitability predictors. Overall, the findings strongly indicate that the composite return predictor $\hat{r}_{\hat{e}6,t}^{IPCA}$ based solely on the six IPCA expected profitability predictors is the most powerful profitability measure, which can effectively capture the earnings announcement CARs.

IPCA expected profitability predictors can provide incremental explanatory power for the cross-section of future stock returns. Moreover, the findings indicate that the composite return predictor $\hat{r}_{\hat{e}6,t}^{IPCA}$ based solely on the six IPCA expected profitability predictors can effectively capture the expected profitability premium.

4.6. Performance of IPCA expected profitability factors

We next perform portfolio analysis to provide a potentially more robust method of assessing return predictive ability without imposing parametric assumptions as in Fama–MacBeth regressions. Following Fama and French (2015), we construct the profitability factor $RMW(e_t)$ and the IPCA expected profitability factor $RMW\left(\hat{e}_{Y1,t}^{IPCA}\right)$ based on six value-weighted portfolios sorted by firm size and the realized profitability measure e_t or each of the IPCA expected profitability measures $\hat{e}_{Y1,t}^{IPCA}$. For each factor, we first sort stocks by size into small and big using monthly updated NYSE breakpoints, and we separately sort stocks by lagged profitability measures or IPCA expected profitability measures into weak, medium, and robust. We then compute the profitability factor $RMW(e_t)$ or the IPCA expected profitability factor $RMW\left(\hat{e}_{Y1,t}^{IPCA}\right)$ as the difference between the average of the robust portfolios and the average of the weak portfolios. The sample period runs from 1968 to 2019 because the first available value of IPCA expected profitability is from 1968.

Panel A of Table 10 reveals that the IPCA expected profitability factors command a higher value-weighted return spread than the corresponding profitability factors do. Except for the IPCA expected ROE factor, all of the $RMW\left(\hat{e}_{Y1,t}^{IPCA}\right)$ factors generate significant average monthly returns, with magnitudes ranging from 0.195% (t-stat = 1.91) for the IPCA expected ROA factor to 0.434% (t-stat = 6.15) for the IPCA expected CbOP factor, whereas the lagged-profitability factors for GPA, OP, FFOP, and CbOP have significant but lower average monthly returns. This finding is consistent with the evidence shown in Appendix Table A2 that IPCA expected CbOP generates the strongest explanatory power for the expected profitability premium. We further conduct a spanning regression of the $RMW\left(\hat{e}_{Y1,t}^{IPCA}\right)$ factor on the $RMW(e_t)$ factor. Panel B of Table 10 reveals that the alphas for value-weighted return spreads formed on IPCA expected ROE (α = 0.138%; t-stat = 2.09), ROA (α = 0.131%; t-stat = 2.15), and CbOP factor (α = 0.075%; t-stat = 1.94) remain statistically significant after adjusting for the corresponding profitability factors.

[Insert Table 10 here]

We also construct the IPCA composite expected profitability factor $RMW(\hat{r}_{\hat{e}6,t}^{IPCA})$ based on six portfolios formed on size and $\hat{r}_{\hat{e}6,t}^{IPCA}$. As reported in Panel C of Table 10, the $RMW(\hat{r}_{\hat{e}6,t}^{IPCA})$ factor generates a significant value-weighted return spread, with a monthly average value of 0.302% (t-stat = 3.37). The return spread remains significant after adjusting for the FF3, FF4, FF5, FF6, or HXZ factor models, with magnitudes ranging from 0.163% per month (t-stat = 2.50) to 0.377% (t-stat = 4.75). Overall, the findings indicate that the composite return predictor $\hat{r}_{\hat{e}6,t}^{IPCA}$ based solely on the six IPCA expected profitability predictors can effectively capture the expected profitability premium.

Altogether, the significant return spreads associated with IPCA expected profitability factors strongly indicate the existence of expected profitability premiums.

5. Predicting Market Returns and Macroeconomic Variables

Chen, Roll, and Ross (1986) find that the risk premiums in cross-sectional stock returns are related to macro variables. Ball, Sadka, and Sadka (2009) show that profitability has a strong linkage to real business conditions. We investigate whether our IPCA expected profitability measures have information content about future stock market conditions and macroeconomic activities.

To capture the time-varying effect of common factors for predicting market returns and economic activities, we follow Kelly and Pruitt (2013) in using the partial least squares (PLS) approach to estimate the aggregate index formed by IPCA factors. In the first step, we conduct a *time-series* regression of each IPCA expected profitability measure *j*'s *k*-th factor ($f_{j,k,t}^{IPCA}$) at time t on the future market return (MKT_{t+1}) or each macroeconomic variable at time *t*+1 ($MacroVar_{t+1}$):

$$f_{j,k,t}^{IPCA} = \hat{\phi}_{j,k,0} + \hat{\phi}_{j,k} MKT_{t+1}\ (or\ MacroVar_{t+1}) + e_{j,k,t}, \quad (5)$$

where $\hat{\phi}_{j,k}$ is the factor estimated loading of $f_{j,k,t}^{IPCA}$ on the market return or macroeconomic variable. In the second step, we run a *cross-sectional* regression of $f_{j,k,t}^{IPCA}$ on $\hat{\phi}_{j,k}$:

$$f_{j,k,t}^{IPCA} = \hat{c}_t + \hat{F}_{factor,t}^{PLS} \hat{\phi}_{j,k} + w_{j,k,t}, \quad (6)$$

where the estimated factor loading $\hat{\phi}_{j,k}$ estimated from Eq. (5) serves as the explanatory variable, while the latent factor $\hat{F}_{factor,t}^{PLS}$ is the slope coefficient for the regression estimated at each time point. The third step is to run the predictive regression as follows:

$$MKT_{t+1}\ or\ MacroVar_{t+1} = \beta_0 + \beta_1 \hat{F}_{factor,t}^{PLS} + \epsilon_{t+1}. \quad (7)$$

We implement the above three steps with our sample. The aggregate latent factors (or indexes) formed by EW ($\hat{F}_{EW(e),t}^{PLS}$) and value-weighted ($\hat{F}_{VW(e),t}^{PLS}$) profitability measures are obtained by the same procedure. For the macroeconomic variables, because IPCA predictors provide the predictive content for future stock returns, we focus on the leading indicators: term spread, credit spread, growth in the OECD composite leading indicator (OECD CLI), growth in the OECD business confidence index (OECD BCI), and growth in the OECD consumer confidence index (OECD CCI).

Panel A of Table 11 reveals that the aggregate index formed by IPCA common factors has significant predictive power for the future market return and all of other leading macroeconomic indicators. The coefficients are all significant and positive, with *t*-statistics ranging from 2.57 to 5.95. In panels B and C, although $\hat{F}^{PLS}_{EW(e),t}$ and $\hat{F}^{PLS}_{VW(e),t}$ can also significantly forecast the future market return, term spreads, and credit spreads, they cannot provide useful information about other future leading indicators. Therefore, these findings support the notion that the common factors generated from the IPCA expected profitability measures can be better used to forecast stock market performance and macroeconomic leading indicators than the existing profitability measures.

[Insert Table 11 here]

A natural question is whether all of the IPCA common factors are instrumental in predicting market returns and macroeconomic activities. We therefore apply the same PLS procedure to estimate five aggregate indices. Each index is formed by all of the IPCA expected profitability measures' first to fifth factors $f^{IPCA}_{k,t}$ (k = 1, …, 5). Appendix Table A4 shows that the aggregate index with only the first common factor is insufficient to forecast future market returns and OECD leading indicators unless it is augmented with the second and the third factors. The value of R^2 increases as more factors are considered and reaches its highest values when all of the five IPCA common factors are used. Moreover, aggregating all of the five IPCA common factors generates the strongest predictive power for future market returns and all of the leading macroeconomic variables.

Kogan, Li, and Zhang (2022) show that the aggregate profitability shocks constitute a positive gross profitability premium as more profitable firms, in which variable costs constitute a lower fraction of revenue, benefit less from the operating hedge and therefor have higher exposure of profits to aggregate profitability shocks. We follow Kogan, Li, and Zhang (2022) to estimate the aggregate profitability shock, computed from the logarithmic difference of aggregate gross profits based on NBER-CES Manufacturing Industry Database, in which the gross profit is measured by the total value of shipments minus the sum of variable costs for materials, energy, and production worker wages and deflate it by the Consumer Price Index. As reported in Table A5, we find that the aggregate profitability shock is significantly related to the Factor 1 of the IPCA common factors for GPA, OP, and CbOP, and it is also related to the Factor 2 or the Factor 3 of the IPCA common factors for ROE, ROA, and FFOP. Overall, the results indicate that our IPCA common factors can reflect the systematic profitability factor.

6. Conclusion

In this paper, we estimate expected profitability through a conditional latent-factor model based on a state-of-the art instrumented principal component analysis (IPCA) technique developed by Kelly, Pruitt, and Su (2019), using a cross-section of stocks for the period 1963–2019. The IPCA model accounts for common variations in the cross-section of firm profitability and timely updates the factor exposures and conditional expected values of common profitability factors. The model delivers powerful proxies for expected profitability. The instrumented expected profitability predictors are superior to lagged profitability measures and consensus analyst earnings forecasts in terms of predicting future profitability and future stock returns. These findings are consistent with the prediction of the valuation model advocated by Fama and French (2006, p. 492) that "Controlling for B_t/M_t and expected growth in book equity due to reinvestment of earnings, more profitable firms—specifically, firms with higher expected earnings relative to current book equity—have higher expected returns."

Moreover, the instrumented profitability predictors can subsume the profitability effect of the lagged profitability measures once both are simultaneously considered. We also show that the predictive power of our instrumented expected profitability predictors is persistent, and that the revisions in expectations can provide useful information content about future profitability, future analyst earnings forecast errors, and future stock returns. In a bottom-up analysis, we also find strong evidence that the aggregate IPCA expected profitability can predict aggregate future market returns and macroeconomic activity variables. Our study sheds light on the ability of expected profitability to predict future profitability and stock returns in the cross-section and, even more interestingly, to predict macroeconomic activities in the aggregate.

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Table 1. Predicting future profitability using firm characteristics

This table displays the Fama–MacBeth regressions of each profitability measure at June of year *t*+1 (e_{t+1}) on firm characteristics as of June of year *t*. We focus on the six measures of profitability commonly used in the literature: return on equity (ROE), return on assets (ROA), gross profitability (GPA) from Novy-Marx (2013), operating profitability (OP) from Ball et al. (2015), operating profitability (FFOP) from Fama and French (2015), and cash-based operating profitability (CbOP) from Ball et al. (2016). The *t*-statistics are based on the robust Newey and West (1987) method. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The sample period is from June 1963 to June 2019.

Characteristics	Dependent variable: Future profitability (e_{t+1})					
	ROE	ROA	GPA	OP	FFOP	CbOP
Return on equity (ROE)	3.040***	-0.027	-0.543***	0.242**	0.096	-0.704**
Return on assets (ROA)	6.478***	6.629***	0.583***	-0.998***	4.012***	0.173
Novy-Marx GPA (GPA)	-0.337	2.800***	25.215***	2.736***	0.908***	2.615***
Ball OP (OP)	-2.397***	-0.436	-1.190***	8.583***	0.367	7.267***
FF OP (FFOP)	17.077***	3.806***	-1.399***	1.673***	23.296***	2.447***
Cash-based OP (CbOP)	0.678	0.853***	-0.419*	1.392***	0.566	2.057***
Capital turnover	0.202	1.332***	1.530***	-1.098***	1.514***	-2.619***
Sales-to-assets	0.027	-0.060	-0.039	0.084	-0.026	0.171
Profit margin	2.729***	1.338***	-0.495	3.431***	0.924	3.932***
Return on NOA	0.015	0.189	-0.024	0.102	0.195	0.126
GP-to-book equity	2.100**	-1.137***	0.182	-0.653***	2.450***	-0.974***
SGA-to-market	-1.530***	-1.373***	1.103***	-1.233***	-1.534***	-0.558**
Capital intensity	-2.016***	-0.747***	0.255***	0.924***	1.681***	1.716***
Fixed costs-to-sales	0.498	-0.762	-0.296	1.201***	-1.378**	1.665***
Price-to-cost-margin	-0.837**	-0.652***	0.181	-1.927***	-0.394	-1.923***
Accruals	-0.046	-0.046	-0.310***	0.145	-0.763**	-0.110
Operating leverage	0.127	-1.983***	-0.931**	0.230	-1.258**	0.872**
Long-term reversal	0.704***	0.444***	-0.182***	0.322***	0.280**	-0.121
Short-term reversal	0.332**	0.033	0.056	0.227***	0.246	0.195**
Momentum	3.123***	1.153***	0.854***	2.039***	3.122***	1.352***
Intermed. mom	-0.213	0.196*	-0.220**	-0.297***	-0.682***	-0.514***

Table 1 – continued

Characteristics	Dependent variable: Future profitability (e_{t+1})					
	ROE	ROA	GPA	OP	FFOP	CbOP
Earnings-to-price	-4.576***	-1.980***	-1.790***	-0.892***	-2.691***	-1.357***
Book-to-market	1.461***	-0.353***	-1.155***	-0.706***	-2.585***	-0.785***
Tobin's Q	-0.184	-0.664***	0.046	0.673***	0.162	0.417**
Assets-to-market	-5.086**	-0.194	-0.530**	1.630***	2.650***	-0.079
PPE-chg-to-Assets-chg	0.130	-0.258***	-0.060	-0.041	-0.623***	0.171
Cash-flow-to-book	2.547**	-0.281*	0.419***	0.020	-1.841**	-0.031
Cash-to-short-term-inv.	-1.408***	-1.116***	0.431***	-0.667***	-2.330***	-0.195
Sales-to-price	-0.196	0.862***	-0.117	0.461***	0.630***	0.989***
Net operating assets	-1.732***	-0.793***	0.610***	-0.234*	-0.473*	-0.320
Investment	0.872***	0.417	0.105	-0.814***	0.020	-0.691**
Leverage	-0.029	-0.463***	-0.083*	-0.177**	-0.112	-0.215*
Market beta	0.150	0.111	0.107	0.330***	-0.414**	0.370**
Market cap.	2.201***	0.821	-1.215***	3.429***	-0.899	0.297
Turnover	-0.017	-0.036	-0.041	0.359***	-0.067	0.016
Price rel. 52wk high	2.736***	1.734***	1.240***	1.374***	3.173***	1.251***
IVol	-1.209***	-0.653***	-0.236**	-0.615***	-1.209***	-0.509***
Unexplained volume	-0.010	-0.004	-0.114**	-0.085*	0.158	-0.021
Bid-ask spread	-0.161	0.027	-0.100	0.108	-0.064	0.171
Total assets	-2.617***	-0.937	1.352***	-3.842***	2.159***	0.462
Constant	1.826	0.928	32.815***	14.042***	15.350***	11.223***
Adj. R^2	58.60%	64.86%	88.29%	68.52%	59.68%	49.29%

Table 2. Predicting future profitability using IPCA earnings predictors

Panel A reports the Fama–MacBeth regression results for each profitability measure as of June of year *t*+1 (e_{t+1}) on each IPCA expected profitability ($\hat{e}_{Y1,t}^{IPCA}$). Each $\hat{e}_{Y1,t}^{IPCA}$ is the combination of 40 firm characteristics as of June of year *t* by running IPCA to predict each conditional expected profitability as of June of year *t*+1. Panel B reveals the bivariate Fama–MacBeth regression results for each profitability measure as of June of year *t*+1 on $\hat{e}_{Y1,t}^{IPCA}$ controlling for lagged profitability (e_t) in June of year *t*. Panel C reports the results of the profitability predictive regressions with the inclusion of $\hat{e}_{Y1,t}^{IPCA}$, $\hat{e}_{Y1,t}^{IBES}$, and e_t. $\hat{e}_{Y1,t}^{IBES}$ is the analyst earnings forecast, which is the median consensus EPS forecasts (forecast period indicator = 1) as of June of year *t* times shares outstanding (I/B/E/S items) divided by book equity for ROE and FFOP and scaled by total assets for ROA, GPA, OP, and CbOP. Robust Newey and West (1987) *t*-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1963 to June 2019. The period of the subsample including the I/B/E/S data is from June 1985 to June 2019.

Variable	Dependent variable: Future profitability (e_{t+1})					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel A: IPCA expected profitability						
$\hat{e}_{Y1,t}^{IPCA}$	1.676	1.596	1.082	1.141	1.529	1.189
	(13.35)	(13.78)	(76.39)	(25.78)	(16.98)	(25.15)
Constant	-0.121	-0.063	-0.068	-0.053	-0.176	-0.027
	(-5.20)	(-5.36)	(-6.05)	(-5.63)	(-5.85)	(-2.93)
R^2	50.67%	57.94%	87.30%	63.01%	53.97%	43.44%
Obs.	122,128	125,013	125,034	125,006	125,034	125,006
Panel B: IPCA expected profitability versus lagged profitability						
$\hat{e}_{Y1,t}^{IPCA}$	1.566	1.442	0.931	1.038	1.317	1.078
	(14.06)	(15.10)	(16.90)	(20.62)	(16.75)	(26.45)
e_t	0.054	0.066	0.130	0.069	0.120	0.067
	(2.99)	(3.04)	(2.83)	(3.34)	(3.67)	(4.74)
Constant	-0.112	-0.055	-0.055	-0.044	-0.149	-0.021
	(-5.22)	(-5.36)	(-5.37)	(-5.37)	(-5.67)	(-2.62)
R^2	51.27%	58.47%	87.40%	63.50%	54.57%	43.79%
Obs.	122,128	125,013	125,034	125,006	125,034	125,006
Panel C: IPCA expected profitability, analyst earnings forecast, and lagged profitability						
$\hat{e}_{Y1,t}^{IPCA}$	1.240	0.853	1.107	0.990	1.374	0.862
	(10.27)	(8.20)	(13.71)	(14.47)	(13.13)	(16.06)
$\hat{e}_{Y1,t}^{IBES}$	0.257	0.569	0.085	0.272	0.043	0.207
	(6.48)	(9.62)	(6.14)	(9.18)	(2.90)	(8.74)
e_t	0.062	0.013	-0.036	-0.022	0.147	0.100
	(3.09)	(1.29)	(-0.51)	(-0.88)	(3.82)	(6.17)
Constant	-0.116	-0.055	-0.092	-0.038	-0.182	-0.005
	(-7.24)	(-8.58)	(-9.81)	(-3.75)	(-6.97)	(-0.49)
R^2	59.33%	69.24%	85.76%	69.05%	55.75%	50.11%
Obs.	61,927	64,078	64,086	64,078	64,086	64,078

Table 3. Performance of two-year ahead expected profitability

Panel A reports the Fama–MacBeth regression results for each future profitability measure as of June of year *t*+1 on two-year ahead IPCA expected profitability predictor $\hat{e}^{IPCA}_{Y2,t-1}$ estimated in year *t*-1. Panel B shows the results of regressions on $\hat{e}^{IPCA}_{Y2,t-1}$ and lagged profitability (e_t). Panel C reports the results of regressions on $\hat{e}^{IPCA}_{Y2,t-1}$, $\hat{e}^{IPCA}_{Y1,t}$, and e_t. Panel D repeats Panel C by replacing expected profitability ($\hat{e}^{IPCA}_{Y1,t}$) with expectation revisions ($\hat{e}^{IPCA}_{Y1,t} - \hat{e}^{IPCA}_{Y2,t-1}$). Robust Newey and West (1987) *t*-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1963 to June 2019.

Variable	Dependent variable: Future profitability (e_{t+1})					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel A: 2-year-ahead expected profitability						
$\hat{e}^{IPCA}_{Y2,t-1}$	1.573	1.545	1.086	1.119	1.446	1.194
	(12.66)	(13.42)	(73.80)	(25.51)	(15.82)	(19.47)
Constant	-0.088	-0.051	-0.066	-0.040	-0.134	-0.025
	(-4.33)	(-4.72)	(-5.85)	(-4.42)	(-4.81)	(-2.12)
R^2	28.79%	40.02%	79.90%	44.86%	36.67%	33.38%
Obs.	109,598	111,716	111,728	111,712	111,728	111,712
Panel B: 2-year-ahead expected profitability versus lagged profitability						
$\hat{e}^{IPCA}_{Y2,t-1}$	0.760	0.618	0.192	0.333	0.494	0.696
	(7.57)	(7.83)	(15.17)	(14.56)	(6.29)	(15.61)
e_t	0.424	0.522	0.782	0.578	0.595	0.356
	(20.07)	(28.93)	(74.14)	(40.56)	(24.35)	(18.67)
Constant	-0.037	-0.019	0.000	0.008	-0.037	-0.005
	(-2.66)	(-3.01)	(-0.12)	(1.98)	(-2.14)	(-0.63)
R^2	37.87%	51.99%	87.82%	57.77%	50.53%	41.05%
Obs.	109,598	111,716	111,728	111,712	111,728	111,712
Panel C: 2-year-ahead expected profitability, 1-year-ahead expected profitability, and lagged profitability						
$\hat{e}^{IPCA}_{Y2,t-1}$	0.186	0.301	0.114	0.117	0.270	0.230
	(3.71)	(4.20)	(6.96)	(3.62)	(4.99)	(7.55)
$\hat{e}^{IPCA}_{Y1,t}$	1.409	1.190	0.896	0.942	1.147	1.033
	(17.35)	(18.96)	(16.44)	(15.28)	(16.85)	(18.51)
e_t	0.089	0.135	0.079	0.126	0.133	0.069
	(3.96)	(4.42)	(1.82)	(4.37)	(3.30)	(4.10)
Constant	-0.117	-0.060	-0.068	-0.058	-0.175	-0.049
	(-5.41)	(-5.65)	(-6.15)	(-5.93)	(-6.01)	(-3.65)
R^2	51.33%	59.74%	88.42%	66.38%	55.36%	46.90%
Obs.	109,598	111,716	111,728	111,712	111,728	111,712

Table 3 – continued

Variable	Dependent variable: Future profitability (e_{t+1})					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel D: 2-year-ahead expected profitability, expectation revisions, and lagged profitability						
$\hat{e}^{IPCA}_{Y2,t-1}$	1.595	1.491	1.010	1.058	1.418	1.263
	(13.48)	(14.85)	(18.70)	(21.02)	(15.30)	(17.98)
$\hat{e}^{IPCA}_{Y1,t} - \hat{e}^{IPCA}_{Y2,t-1}$	1.409	1.190	0.896	0.942	1.147	1.033
	(17.35)	(18.96)	(16.44)	(15.28)	(16.85)	(18.51)
e_t	0.089	0.135	0.079	0.126	0.133	0.069
	(3.96)	(4.42)	(1.82)	(4.37)	(3.30)	(4.10)
Constant	-0.117	-0.060	-0.068	-0.058	-0.175	-0.049
	(-5.41)	(-5.65)	(-6.15)	(-5.93)	(-6.01)	(-3.65)
R^2	51.33%	59.74%	88.42%	66.38%	55.36%	46.90%
Obs.	109,598	111,716	111,728	111,712	111,728	111,712

Table 4. Are profitability expectations sticky?

Panel A reports the Fama–MacBeth regression results of unexpected profitability (Ue_{t+1}^{IPCA}) as of June of year t+1 on expectation revisions ($\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$) and changes in realized profitability (Δe_t) in June of year t. Ue_{t+1}^{IPCA} is the difference between future realized profitability e_{t+1} and IPCA expected profitability $\hat{e}_{Y1,t}^{IPCA}$ (i.e., $e_{t+1} - \hat{e}_{Y1,t}^{IPCA}$). Panel B reports the Fama–MacBeth regression results of analyst forecast errors (Ue_{t+1}^{IBES}) in June of year t+1 on expectation revisions ($\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$), analyst forecast revisions ($\hat{e}_{Y1,t}^{IBES} - \hat{e}_{Y2,t-1}^{IBES}$), and changes in realized profitability (Δe_t) in June of year t. Ue_{t+1}^{IBES} is the difference between e_{t+1} and $\hat{e}_{Y1,t}^{IBES}$ (i.e., $e_{t+1} - \hat{e}_{Y1,t}^{IBES}$). The forecast revision is the difference between $\hat{e}_{Y1,t}^{IBES}$ and $\hat{e}_{Y2,t-1}^{IBES}$, which is the median consensus EPS forecasts (forecast period indicator = 2) as of June of year t-1 times shares outstanding (I/B/E/S items) divided by book equity for ROE and FFOP and divided by assets for ROA, GPA, OP, and CbOP. Panel C reports the Fama–MacBeth regression results of analyst forecast errors as of June of year t+1 on IPCA forecast optimism relative to analyst forecasts, which is the difference between $\hat{e}_{Y1,t}^{IPCA}$ and $\hat{e}_{Y1,t}^{IBES}$ as of June of year t. Robust Newey and West (1987) t-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1963 to June 2019. The period of the subsample with the inclusion of I/B/E/S data is from June 1985 to June 2019.

Variable	Dependent variable: Unexpected profitability ($Ue_{t+1}^{IPCA} = e_{t+1} - \hat{e}_{Y2,t-1}^{IPCA}$)					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel A: Expectation revisions versus changes in realized profitability						
$\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$	0.367	0.205	0.204	0.004	0.156	0.083
	(5.39)	(3.75)	(3.79)	(0.07)	(2.37)	(1.41)
Δe_t	0.000	-0.036	-0.202	-0.003	0.008	-0.046
	(-0.04)	(-1.96)	(-6.05)	(-0.25)	(0.37)	(-4.17)
Constant	-0.039	-0.025	-0.037	-0.024	-0.044	0.003
	(-4.60)	(-5.59)	(-3.33)	(-4.61)	(-5.04)	(0.57)
R^2	3.22%	3.30%	1.69%	2.33%	2.04%	1.34%
Obs.	109,604	111,722	111,734	111,718	111,734	111,718

Variable	Dependent variable: Analyst forecast errors ($Ue_{t+1}^{IBES} = e_{t+1} - \hat{e}_{Y1,t}^{IBES}$)					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel B: Expectation revisions, analyst forecast revisions, and changes in realized profitability						
$\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y2,t-1}^{IPCA}$	1.487	-0.070	0.142	0.150	-0.061	0.125
	(1.22)	(-0.24)	(1.09)	(7.65)	(-0.37)	(2.78)
$\hat{e}_{Y1,t}^{IBES} - \hat{e}_{Y2,t-1}^{IBES}$	-0.403	0.414	0.419	0.412	-0.328	0.417
	(-1.98)	(1.11)	(1.13)	(1.11)	(-1.59)	(1.12)
Δe_t	-0.220	0.014	-0.214	-0.020	0.379	-0.035
	(-1.29)	(0.24)	(-4.17)	(-2.52)	(0.97)	(-2.27)
Constant	-0.083	-0.010	-0.011	-0.010	-0.064	-0.009
	(-2.81)	(-1.23)	(-1.27)	(-1.16)	(-3.47)	(-1.00)
R^2	23.59%	15.78%	15.38%	15.26%	17.64%	14.89%
Obs.	51,960	53,469	53,469	53,469	53,469	53,469
Panel C: IPCA forecast optimism and analyst forecast errors						
$\hat{e}_{Y1,t}^{IPCA} - \hat{e}_{Y1,t}^{IBES}$	0.630	0.359	0.121	0.250	0.691	0.253
	(11.71)	(6.94)	(2.42)	(4.49)	(10.21)	(4.57)
Constant	-0.038	-0.022	-0.062	-0.058	-0.133	-0.047
	(-4.74)	(-4.92)	(-3.13)	(-5.48)	(-8.85)	(-5.19)
R^2	48.92%	21.08%	9.81%	16.05%	59.15%	16.56%
Obs.	62,773	64,925	64,925	64,925	64,925	64,925

Table 5. Predicting future stock returns

Panels A and B show the Fama–MacBeth regression results of the next month's excess stock returns ($r_{i,t+1} - r_{f,t+1}$) on the current month's IPCA expected profitability and lagged profitability, respectively. All regressions control for accruals, firm size ($log(ME)$), book-to-market equity ($log(B/M)$), investment, past return performance calculated for the horizons of one month ($r_{-1,0}$) and 11 months from month -12 to -2($r_{-12,-2}$). Coefficients are multiplied by 100. Robust Newey and West (1987) t-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1963 to December 2019.

Variable	Dependent variable: Future excess returns ($r_{i,t+1} - r_{f,t+1}$)					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel A: IPCA expected profitability						
$\hat{e}^{IPCA}_{Y1,t}$	1.867	3.900	0.801	2.694	1.532	3.471
	(4.54)	(5.70)	(4.81)	(7.85)	(5.16)	(8.55)
Accruals	-0.776	-0.957	-0.822	-0.841	-0.670	-0.458
	(-3.17)	(-4.42)	(-3.83)	(-3.90)	(-3.01)	(-2.06)
$log(ME)$	-0.025	-0.025	0.009	-0.019	-0.027	-0.038
	(-0.83)	(-0.82)	(0.28)	(-0.59)	(-0.86)	(-1.19)
$log(B/M)$	0.272	0.285	0.276	0.369	0.275	0.289
	(3.59)	(3.84)	(3.89)	(4.97)	(3.87)	(4.08)
Investment	-0.349	-0.258	-0.282	-0.293	-0.306	-0.239
	(-4.83)	(-3.48)	(-3.84)	(-3.92)	(-4.23)	(-3.26)
$r_{-1,0}$	-3.719	-3.615	-3.657	-3.587	-3.636	-3.571
	(-8.39)	(-8.01)	(-8.07)	(-7.86)	(-8.09)	(-7.82)
$r_{-12,-2}$	0.604	0.624	0.678	0.612	0.642	0.680
	(3.48)	(3.59)	(3.96)	(3.58)	(3.74)	(3.98)
Constant	0.743	0.695	0.209	0.399	0.581	0.589
	(1.42)	(1.31)	(0.39)	(0.75)	(1.10)	(1.11)
R^2	4.66%	4.77%	4.70%	4.62%	4.77%	4.62%
Obs.	1,488,809	1,522,682	1,522,585	1,522,585	1,522,585	1,522,585

Table 5 – continued

Variable	Dependent variable: Future excess returns ($r_{i,t+1} - r_{f,t+1}$)					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel B: Lagged profitability						
e_t	0.825	1.932	0.724	1.769	0.756	1.726
	(5.21)	(4.89)	(5.14)	(8.67)	(5.59)	(9.29)
Accruals	-0.900	-1.033	-0.849	-1.006	-0.802	0.275
	(-3.65)	(-4.70)	(-3.95)	(-4.65)	(-3.66)	(1.08)
$log(ME)$	-0.016	-0.017	0.009	-0.020	-0.021	-0.020
	(-0.52)	(-0.53)	(0.28)	(-0.61)	(-0.65)	(-0.64)
$log(B/M)$	0.241	0.255	0.280	0.314	0.253	0.306
	(3.38)	(3.57)	(3.95)	(4.35)	(3.65)	(4.27)
Investment	-0.416	-0.359	-0.271	-0.449	-0.342	-0.318
	(-5.24)	(-4.19)	(-3.68)	(-5.22)	(-4.63)	(-4.25)
$r_{-1,0}$	-3.656	-3.590	-3.654	-3.568	-3.597	-3.564
	(-8.23)	(-7.97)	(-8.07)	(-7.82)	(-7.98)	(-7.82)
$r_{-12,-2}$	0.705	0.719	0.694	0.723	0.718	0.726
	(4.12)	(4.19)	(4.07)	(4.22)	(4.23)	(4.23)
Constant	0.737	0.714	0.262	0.587	0.701	0.661
	(1.41)	(1.36)	(0.49)	(1.11)	(1.33)	(1.25)
R^2	4.52%	4.67%	4.70%	4.58%	4.66%	4.56%
Obs.	1,488,809	1,522,682	1,522,585	1,522,585	1,522,585	1,522,585

Table 6. Which expected profitability is better in predicting future returns

This table reports the Fama–MacBeth regression results of the next month's excess stock returns ($r_{i,t+1} - r_{f,t+1}$) on IPCA expected profitability ($\hat{e}^{IPCA}_{Y1,t}$) controlling for the corresponding lagged profitability or changes in realized profitability. Panel A presents the results for the bivariate analysis including lagged profitability (e_t) and IPCA expected profitability ($\hat{e}^{IPCA}_{Y1,t}$). Panel B shows the results of regressions on each lagged profitability, IPCA expected profitability, and analyst earnings forecast ($\hat{e}^{IBES}_{Y1,t}$). Panel C displays the results of regressions on changes in realized profitability (Δe_t) and changes in the corresponding IPCA expected profitability ($\Delta\hat{e}^{IPCA}_{Y1,t}$). Coefficients are multiplied by 100. Robust Newey and West (1987) t-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1963 to December 2019. The period of the subsample with the inclusion of I/B/E/S data is from June 1985 to December 2019.

Variable	Dependent variable: Future excess returns ($r_{i,t+1} - r_{f,t+1}$)					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel A: IPCA expected profitability versus lagged profitability						
$\hat{e}^{IPCA}_{Y1,t}$	1.432	5.604	-1.006	2.723	3.097	2.916
	(2.05)	(3.44)	(-0.51)	(2.60)	(3.80)	(3.66)
e_t	-0.153	-1.567	1.578	-0.848	-0.894	0.328
	(-0.52)	(-1.78)	(0.95)	(-1.43)	(-2.03)	(1.03)
Constant	0.512	0.376	0.547	0.270	0.065	0.161
	(2.18)	(1.55)	(2.06)	(1.08)	(0.24)	(0.60)
R^2	1.03%	1.32%	0.93%	1.11%	1.32%	0.69%
Obs.	1,489,185	1,523,065	1,522,968	1,522,968	1,522,968	1,522,968
Panel B: IPCA expected profitability, analyst earnings forecast, and lagged profitability						
$\hat{e}^{IPCA}_{Y1,t}$	2.324	7.761	0.464	3.759	3.931	3.518
	(3.52)	(4.31)	(0.18)	(2.87)	(4.74)	(3.55)
$\hat{e}^{IBES}_{Y1,t}$	-0.112	-0.460	0.054	-0.256	-0.088	-0.440
	(-1.72)	(-1.49)	(0.17)	(-0.64)	(-1.72)	(-1.35)
e_t	-0.181	-1.517	0.391	-0.903	-1.140	0.249
	(-1.21)	(-2.72)	(0.18)	(-1.52)	(-3.57)	(0.64)
Constant	0.494	0.330	0.513	0.157	-0.004	0.165
	(1.74)	(1.13)	(1.46)	(0.50)	(-0.01)	(0.50)
R^2	1.12%	1.55%	1.42%	1.49%	1.55%	1.11%
Obs.	855,394	882,497	882,497	882,497	882,497	882,497

Variable	Dependent variable: Future excess returns ($r_{i,t+1} - r_{f,t+1}$)					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel C: Changes in IPCA expected profitability versus changes in realized profitability						
$\Delta\hat{e}^{IPCA}_{Y1,t}$	1.664	4.418	3.799	2.725	1.806	2.450
	(2.85)	(3.17)	(2.74)	(2.97)	(2.98)	(3.13)
Δe_t	-0.021	-0.448	-1.818	-0.431	-0.335	-0.180
	(-0.13)	(-0.94)	(-1.73)	(-1.13)	(-1.28)	(-1.00)
Constant	0.730	0.724	0.712	0.719	0.721	0.710
	(3.26)	(3.22)	(3.16)	(3.20)	(3.20)	(3.15)
R^2	0.61%	0.75%	0.53%	0.72%	0.62%	0.27%
Obs.	1,354,947	1,380,992	1,380,931	1,380,931	1,380,931	1,380,931

Table 7. The risk premium of profitability expectation revisions

Panel A reports Fama–MacBeth regression results of the next month's excess stock returns the current month's two-year-ahead IPCA expected profitability based on firm characteristics as of June of year t-1 ($\hat{e}^{IPCA}_{Y2,t-1}$) and expectation revisions ($\hat{e}^{IPCA}_{Y1,t} - \hat{e}^{IPCA}_{Y2,t-1}$). Panel B reports the Fama–MacBeth regression results of the next month's excess stock returns on lagged realized profitability, two-year-ahead IPCA expected profitability ($\hat{e}^{IPCA}_{Y2,t-1}$), and expectation revisions ($\hat{e}^{IPCA}_{Y1,t} - \hat{e}^{IPCA}_{Y2,t-1}$). Coefficients are multiplied by 100. Robust Newey and West (1987) t-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1963 to December 2019.

Variable	Dependent variable: Future excess returns ($r_{i,t+1} - r_{f,t+1}$)					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel A: Expectation revision versus two-year-ahead IPCA expected profitability						
$\hat{e}^{IPCA}_{Y1,t} - \hat{e}^{IPCA}_{Y2,t-1}$	1.874	4.580	2.137	2.576	1.910	5.124
	(3.20)	(3.91)	(6.71)	(3.51)	(5.13)	(7.80)
$\hat{e}^{IPCA}_{Y2,t-1}$	0.530	1.677	0.560	0.949	1.191	2.883
	(0.77)	(1.69)	(2.97)	(1.94)	(2.65)	(5.62)
Constant	0.759	0.706	0.567	0.602	0.500	0.345
	(3.17)	(2.96)	(2.51)	(2.57)	(1.92)	(1.33)
R^2	1.17%	1.19%	0.60%	1.00%	1.09%	0.61%
Obs.	1,338,000	1,363,978	1,363,930	1,363,930	1,363,930	1,363,930
Panel B: Expectation revision, two-year-ahead IPCA expected profitability, and lagged profitability						
$\hat{e}^{IPCA}_{Y1,t} - \hat{e}^{IPCA}_{Y2,t-1}$	1.490	4.777	1.217	2.144	2.676	4.755
	(1.92)	(2.53)	(0.58)	(1.80)	(3.08)	(5.24)
$\hat{e}^{IPCA}_{Y2,t-1}$	-0.096	1.867	-0.349	0.331	1.888	2.499
	(-0.10)	(1.04)	(-0.18)	(0.29)	(2.13)	(3.17)
e_t	0.392	0.025	0.872	0.476	-0.320	0.143
	(1.17)	(0.03)	(0.53)	(0.78)	(-0.72)	(0.41)
Constant	0.797	0.695	0.720	0.652	0.394	0.389
	(3.36)	(2.95)	(2.74)	(2.64)	(1.44)	(1.48)
R^2	1.38%	1.57%	1.08%	1.36%	1.58%	0.77%
Obs.	1,338,000	1,363,978	1,363,930	1,363,930	1,363,930	1,363,930

Table 8. IPCA composite expected profitability and future stock returns

Panels A and B report the Fama–MacBeth regression results of the annual excess returns from July of year *t* to June of year *t*+1 on the IPCA expected annual excess return predictor ($\hat{r}^{IPCA}_{\hat{e}6,t}$) controlling for lagged profitability (e_t) and IPCA expected profitability predictor ($\hat{e}^{IPCA}_{Y1,t}$), respectively. $\hat{r}^{IPCA}_{\hat{e}6,t}$ is the predicted excess return by combining the six IPCA expected profitability predictors $\hat{e}^{IPCA}_{Y1,t}$ as of June of year *t* by running IPCA to predict the annual excess returns from July of year *t* to June of year *t*+1. For comparison, we construct an equally weighted average of IPCA expected profitability predictors $Avg\hat{e}^{IPCA}_{Y1,t}$ based on the z-scores of our six IPCA expected profitability predictors $\hat{e}^{IPCA}_{Y1,t}$. Panels C and D report the Fama–MacBeth regression results of the annual excess returns from July of year *t* to June of year *t*+1 on $Avg\hat{e}^{IPCA}_{Y1,t}$ controlling for lagged profitability and IPCA expected profitability predictor, respectively. Robust Newey and West (1987) *t*-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1968 to June 2019.

Variable	Dependent variable: Future annual excess returns					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel A: IPCA expected excess return based on the six IPCA expected profitability measures versus lagged profitability						
$\hat{r}^{IPCA}_{\hat{e}6,t}$	1.006	1.045	1.074	1.045	1.128	0.885
	(5.03)	(4.67)	(4.45)	(4.64)	(4.35)	(4.07)
e_t	-0.009	-0.057	-0.010	-0.023	-0.009	0.041
	(-0.49)	(-0.97)	(-0.46)	(-0.59)	(-0.37)	(1.02)
Constant	0.015	0.019	0.009	0.018	0.006	0.016
	(0.53)	(0.61)	(0.30)	(0.60)	(0.21)	(0.59)
R^2	1.50%	1.62%	2.04%	1.95%	1.62%	1.83%
Obs.	115,990	115,990	115,990	115,990	115,990	115,990
Panel B: IPCA expected excess return based on the six IPCA expected profitability measures versus IPCA expected profitability						
$\hat{r}^{IPCA}_{\hat{e}6,t}$	0.961	0.898	1.039	0.970	0.903	0.838
	(3.98)	(3.50)	(4.51)	(3.81)	(3.61)	(2.98)
$\hat{e}^{IPCA}_{Y1,t}$	0.054	0.093	-0.003	0.034	0.055	0.098
	(0.84)	(0.79)	(-0.11)	(0.42)	(0.97)	(0.85)
Constant	0.011	0.020	0.009	0.013	0.004	0.014
	(0.35)	(0.62)	(0.30)	(0.41)	(0.14)	(0.44)
R^2	1.85%	1.98%	2.06%	2.42%	1.87%	2.14%
Obs.	115,990	115,990	115,990	115,990	115,990	115,990

Table 8 – continued

Variable	Dependent variable: Future annual excess returns					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel C: Average of the six IPCA expected profitability predictors versus lagged profitability measure						
$Avg\hat{e}_{Y1,t}^{IPCA}$	0.047	0.056	0.049	0.077	0.043	0.036
	(4.88)	(4.76)	(3.79)	(5.92)	(3.01)	(3.29)
e_t	-0.027	-0.164	-0.009	-0.177	0.007	0.043
	(-1.96)	(-2.08)	(-0.33)	(-3.52)	(0.31)	(0.95)
Constant	0.080	0.087	0.079	0.105	0.076	0.072
	(3.86)	(3.74)	(4.28)	(4.22)	(3.61)	(3.13)
R^2	1.15%	1.26%	1.35%	1.40%	1.55%	1.31%
Obs.	115,990	115,990	115,990	115,990	115,990	115,990
Panel D: Average of the six IPCA expected profitability predictors versus IPCA expected profitability predictor						
$Avg\hat{e}_{Y1,t}^{IPCA}$	0.041	0.056	0.046	0.101	0.022	0.018
	(3.10)	(2.99)	(3.82)	(4.00)	(1.23)	(0.87)
$\hat{e}_{Y1,t}^{IPCA}$	0.020	-0.244	0.001	-0.450	0.149	0.233
	(0.36)	(-1.16)	(0.02)	(-2.35)	(2.00)	(1.21)
Constant	0.076	0.096	0.076	0.160	0.041	0.047
	(3.50)	(3.34)	(4.17)	(3.68)	(1.70)	(1.20)
R^2	1.35%	1.29%	1.33%	2.45%	1.79%	1.56%
Obs.	115,990	115,990	115,990	115,990	115,990	115,990

Table 9. The expected profitability premium controlling for the IPCA expected return predictor

This table reports the Fama–MacBeth regression results of the one-month-ahead stock excess returns on lagged profitability (e_t) and IPCA expected profitability ($\hat{e}_{Y1,t}^{IPCA}$) controlling for IPCA expected monthly excess return predictor $\hat{r}_t^{IPCA}$ based on Freyberger et al.'s (2020) 36 firm characteristics (labeled as $\hat{r}_{FNW36,t}^{IPCA}$) or our 40 firm characteristics (labeled as $\hat{r}_{40,t}^{IPCA}$). The 40 observable firm characteristics are the 36 firm characteristics data used in Freyberger et al. (2020) augmented with our four profitability measures. Coefficients are multiplied by 100. Robust Newey and West (1987) *t*-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1963 to December 2019.

Variable	Dependent variable: Future excess returns					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel A: Lagged profitability versus IPCA expected excess return based on 36 firm characteristics						
e_t	0.209	0.452	0.403	0.738	0.393	1.070
	(1.37)	(1.37)	(2.68)	(3.40)	(2.66)	(6.20)
$\hat{r}_{FNW36,t}^{IPCA}$	0.682	0.683	0.685	0.683	0.684	0.662
	(13.79)	(13.48)	(12.78)	(12.92)	(13.07)	(12.54)
Constant	0.203	0.199	0.070	0.081	0.129	0.076
	(0.88)	(0.84)	(0.29)	(0.34)	(0.53)	(0.31)
R^2	1.41%	1.58%	1.46%	1.44%	1.50%	1.35%
Obs.	1,488,845	1,522,719	1,522,622	1,522,622	1,522,622	1,522,622
Panel B: Lagged profitability versus IPCA expected excess return based on 40 firm characteristics						
e_t	0.106	0.212	0.367	0.401	0.285	0.748
	(0.70)	(0.63)	(2.42)	(1.81)	(1.94)	(4.17)
$\hat{r}_{40,t}^{IPCA}$	0.693	0.695	0.696	0.688	0.695	0.668
	(14.15)	(13.88)	(13.08)	(13.14)	(13.41)	(12.66)
Constant	0.205	0.200	0.072	0.136	0.144	0.119
	(0.89)	(0.85)	(0.30)	(0.58)	(0.59)	(0.48)
R^2	1.40%	1.57%	1.46%	1.44%	1.49%	1.33%
Obs.	1,488,845	1,522,719	1,522,622	1,522,622	1,522,622	1,522,622
Panel C: IPCA expected profitability versus IPCA expected excess return based on 40 firm characteristics						
$\hat{e}_{Y1,t}^{IPCA}$	0.356	1.045	0.414	0.819	0.625	1.930
	(0.81)	(1.36)	(2.38)	(1.96)	(1.95)	(4.51)
$\hat{r}_{40,t}^{IPCA}$	0.684	0.681	0.698	0.684	0.683	0.661
	(13.91)	(13.51)	(13.08)	(12.86)	(13.55)	(13.01)
Constant	0.184	0.159	0.033	0.046	0.060	-0.057
	(0.76)	(0.64)	(0.14)	(0.19)	(0.23)	(-0.21)
R^2	1.61%	1.73%	1.46%	1.59%	1.67%	1.45%
Obs.	1,488,845	1,522,719	1,522,622	1,522,622	1,522,622	1,522,622

Table 10. Returns on the IPCA expected profitability factor

Panel A of this table reports the time-series average of value-weighted monthly return spreads (in percentage) of each profitability factor ($RMW(e_t)$) and the IPCA expected profitability factor ($RMW\left(\hat{e}_{Y1,t}^{IPCA}\right)$). For each factor, we first use monthly updated NYSE breakpoints to sort stocks by size into small (below the 50th NYSE percentile) and big (above the 50th NYSE percentile) and by lagged earnings e_t or IPCA expected profitability predictor $\hat{e}_{Y1,t}^{IPCA}$ into weak (below the 30th NYSE percentile) and robust (above the 70th NYSE percentile), and then compute $RMW(e_t)$ or $RMW\left(\hat{e}_{Y1,t}^{IPCA}\right)$ as the difference in the average excess returns between the portfolios of ($small\&robust + big\&robust$) and ($small\&weak + big\&weak$). Panel B reports the results from the spanning regressions. The dependent variable is the IPCA expected profitability factor $RMW\left(\hat{e}_{Y1,t}^{IPCA}\right)$ and the explanatory variable is the profitability factor $RMW(e_t)$. Panel C displays the time-series average value-weighted monthly return spreads of the IPCA profitability factor $RMW(\hat{r}_{\hat{e}6,t}^{IPCA})$. We then calculate its mean and risk-adjusted return with respect to the factor models of Fama-French (1993, 'FF3'), Carhart (1997, 'FF4'), Fama-French (2015, 'FF5'), FF5 alongside MOM ('FF6'), or Hou, Xue, and Zhang (2015, 'HXZ') from a time-series regression. Robust Newey and West (1987) t-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1968 to December 2019.

	ROE	ROA	GPA	OP	FFOP	CbOP
Panel A: Value-weighted return spreads of each profitability factor and IPCA profitability factor						
$RMW(e_t)$	0.031	0.065	0.266	0.215	0.250	0.394
	(0.37)	(0.78)	(2.86)	(2.82)	(2.79)	(6.15)
$RMW\left(\hat{e}_{Y1,t}^{IPCA}\right)$	0.169	0.195	0.269	0.264	0.293	0.434
	(1.62)	(1.91)	(2.85)	(2.86)	(2.83)	(6.15)
Panel B: Spanning regressions						
α	0.138	0.131	0.003	0.038	0.045	0.075
	(2.09)	(2.15)	(0.15)	(0.75)	(0.94)	(1.94)
$\beta(RMW(e_t))$	0.936	0.975	1.003	1.049	0.982	0.914
	(20.96)	(23.98)	(99.22)	(32.62)	(27.38)	(27.31)
R^2	55.16%	63.75%	97.43%	74.59%	75.26%	68.48%
Obs.	618	618	618	618	618	618
Panel C: Risk-adjusted returns for the IPCA profitability factor $RMW(\hat{r}_{\hat{e}6,t}^{IPCA})$						
	Excess return	α-FF3	α-FF4	α-FF5	α-FF6	α-HXZ
Mean	0.302	0.366	0.377	0.163	0.191	0.219
t-stat	(3.37)	(4.58)	(4.75)	(2.50)	(2.77)	(2.77)

Table 11. Predicting market returns and macroeconomic variables

This table reports the time-series regression results of market returns or each macroeconomic variable in year t+1 on the PLS index as of June of year t. We use Kelly and Pruitt's (2013) partial least squares (PLS) approach to estimate the aggregate index formed by IPCA factors ($\hat{F}^{PLS}_{factor,t}$), equally weighted profitability measures ($\hat{F}^{PLS}_{EW(e),t}$), or value-weighted profitability measures ($\hat{F}^{PLS}_{VW(e),t}$). We then run the predictive regressions. The dependent variable is the value-weighted market return in excess of the risk-free rate (MKT) from July of year t to June of year t+1, term spread, credit spread (spreads data from Amit Goyal's website), OECD composite leading indicator (OECD CLI), OECD business confidence index (OECD BCI), or OECD consumer confidence index (OECD CCI) from the OECD data for the United States. The growth rates in OECD data are measured by year-to-year logarithmic difference at the end of June. Robust Newey and West (1987) t-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1968 to June 2019.

Dependent variable	MKT	Term spread	Credit spread	OECD_CLI	OECD_BCI	OECD_CCI
Panel A: PLS index formed by the IPCA factors						
$\hat{F}^{PLS}_{factor,t}$	0.104	0.092	0.330	0.081	0.200	0.055
	(3.02)	(2.57)	(5.95)	(3.73)	(5.74)	(2.96)
Constant	0.037	0.020	-0.147	0.000	-0.006	0.000
	(1.58)	(8.11)	(-19.19)	(0.10)	(-4.38)	(0.22)
R^2	8.53%	7.40%	31.60%	6.23%	18.42%	3.59%
Obs.	51	51	51	51	51	51
Panel B: PLS index formed by equally weighted profitability measures						
$\hat{F}^{PLS}_{EW(e),t}$	0.067	0.075	0.247	0.017	0.008	0.047
	(1.87)	(2.19)	(3.84)	(1.35)	(1.44)	(1.83)
Constant	0.541	0.010	-0.294	0.027	0.011	0.029
	(2.05)	(2.19)	(-7.11)	(1.30)	(1.40)	(1.76)
R^2	4.84%	5.63%	23.21%	-0.30%	-1.20%	2.77%
Obs.	51	51	51	51	51	51
Panel C: PLS index formed by value-weighted profitability measures						
$\hat{F}^{PLS}_{VW(e),t}$	0.070	0.085	0.347	0.027	0.008	0.026
	(2.15)	(2.49)	(6.07)	(1.38)	(1.12)	(1.61)
Constant	0.021	0.052	-0.307	-0.012	-0.002	0.002
	(0.66)	(3.98)	(-10.21)	(-1.38)	(-1.05)	(1.10)
R^2	5.07%	6.67%	33.35%	0.68%	-1.26%	0.59%
Obs.	51	51	51	51	51	51

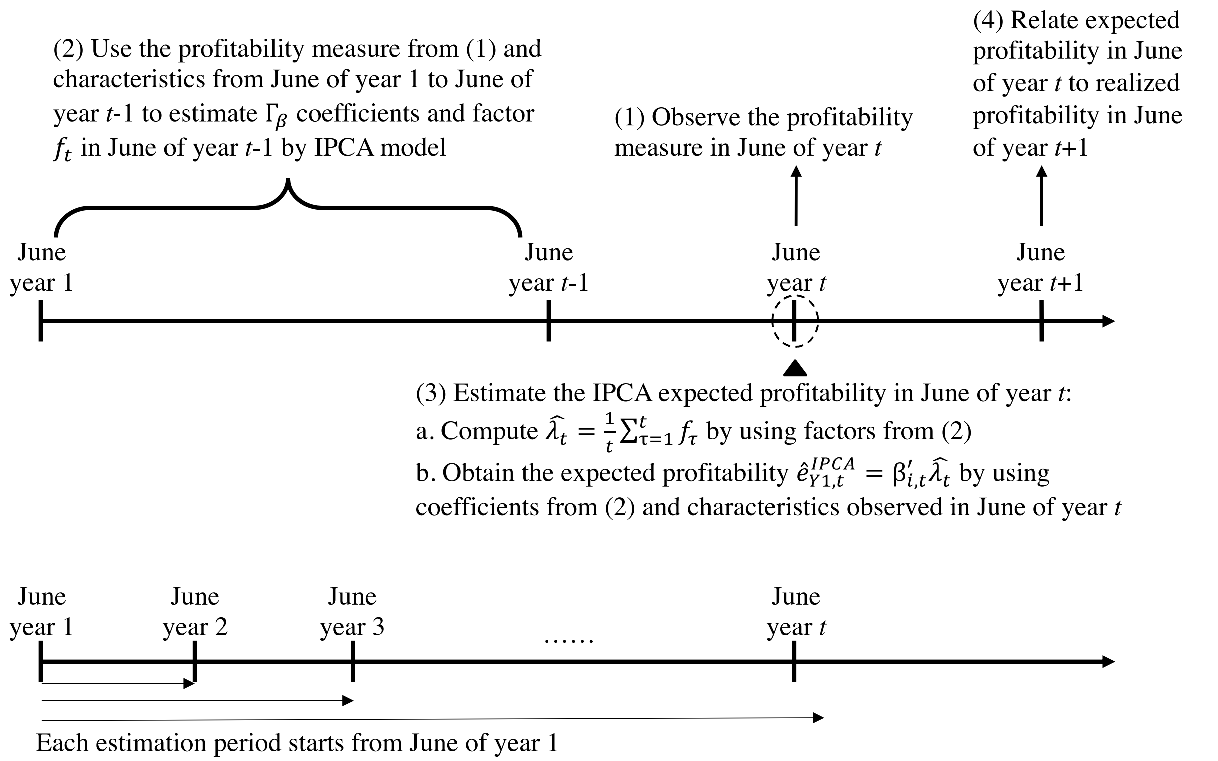

Fig. 1. Timeline of IPCA expected profitability estimation
The figure depicts the timeline of IPCA out-of-sample estimation. Starting from a 5-year initial window, the model is recursively re-estimated in each subsequent year by following this timeline.

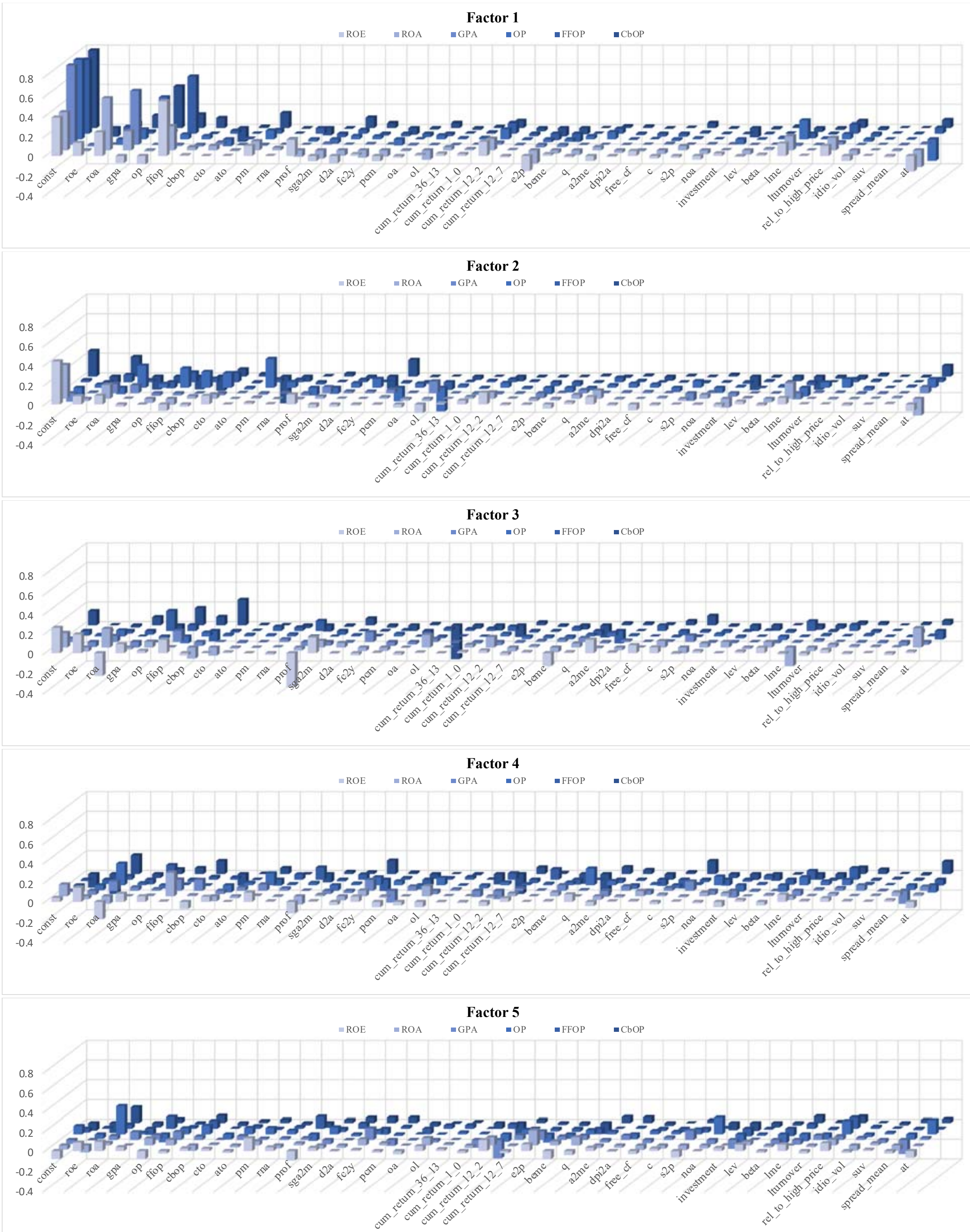

Fig. 2. Estimated Γ_β coefficients

The figure reports each column of individual characteristic's estimated Γ_β coefficient on the *k*-th factor across different profitability measures.

Appendix

Table A1. Variable definition

Expected profitability	Definition
$\hat{e}_{Y1,t}^{IPCA}$	One-year-ahead IPCA expected profitability measure based on firm characteristics at June of year *t* via Kelly et al.'s (2019, 2021) IPCA method
$\hat{e}_{Y2,t-1}^{IPCA}$	Two-year-ahead IPCA expected profitability measure based on firm characteristics at June of year *t*-1
e_t	Realized profitability at year *t*
$\hat{e}_{Y1,t}^{IBES}$	One-year-ahead analyst forecast profitability computed as the product of the median consensus EPS forecast (forecast period indicator = 1) at June of year *t* and shares outstanding scaled by book equity for ROE and FFOP or by total assets for ROA, GPA, OP, and CbOP
$\hat{e}_{Y2,t-1}^{IBES}$	Two-year-ahead analyst forecast profitability computed as the product of the median consensus EPS forecast (forecast period indicator = 2) at June of year *t*-1 and shares outstanding scaled by book equity for ROE and FFOP or by total assets for ROA, GPA, OP, and CbOP
Ue_{t+1}^{IPCA}	The difference between future realized profitability e_{t+1} and IPCA expected profitability $\hat{e}_{Y1,t}^{IPCA}$
Ue_{t+1}^{IBES}	The difference between future realized profitability e_{t+1} and analyst forecast profitability $\hat{e}_{Y1,t}^{IBES}$
$\hat{r}_{\hat{e}6,t}^{IPCA}$	IPCA expected annual excess return predictor based on six IPCA expected profitability predictors $\hat{e}_{Y1,t}^{IPCA}$ as of June of year *t*
$Avg\hat{e}_{Y1,t}^{IPCA}$	Equally weighted average IPCA expected profitability predictor based on the z-scores of six IPCA expected profitability predictors $\hat{e}_{Y1,t}^{IPCA}$ as of June of year *t*
$\hat{r}_{FNW36,t}^{IPCA}$	IPCA expected monthly excess return predictor $\hat{r}_t^{IPCA}$ based on Freyberger et al.'s (2020) 36 firm characteristics
$\hat{r}_{40,t}^{IPCA}$	IPCA expected monthly excess return predictor $\hat{r}_t^{IPCA}$ based 36 firm characteristics data used in Freyberger et al. (2020) augmented with our four profitability measures
$RMW\left(\hat{e}_{Y1,t}^{IPCA}\right)$	IPCA expected profitability factor based on six value-weighted portfolios sorted by firm size and the IPCA expected profitability measure $\hat{e}_{Y1,t}^{IPCA}$
$RMW(e_t)$	Profitability factor based on six value-weighted portfolios sorted by firm size and the profitability measure e_t
$RMW(\hat{r}_{\hat{e}6,t}^{IPCA})$	IPCA expected profitability factor based on six value-weighted portfolios sorted by firm size and IPCA expected annual excess return predictor $\hat{r}_{\hat{e}6,t}^{IPCA}$
$\hat{F}_{factor,t}^{PLS}$	Aggregate index formed by IPCA common factors via Kelly and Pruitt's (2013) partial least squares (PLS) approach
$\hat{F}_{EW(e),t}^{PLS}$	Aggregate index formed by equally weighted profitability measures via PLS
$\hat{F}_{VW(e),t}^{PLS}$	Aggregate index formed by value-weighted profitability measures via PLS

Table A1 – continued

Firm characteristics	Definition
ROE	Return on equity as income before extraordinary items scaled by book equity
ROA	Return on assets as income before extraordinary items scaled by total assets
GPA	Gross profitability-to-assets in Novy-Marx (2013) as revenues minus cost of goods sold scaled by total assets
OP	Operating profitability in Ball et al. (2015) as revenues minus cost of goods sold and selling, general, and administrative expenses plus R&D expenditures scaled by total assets
FFOP	Operating profitability in Fama and French (2015) as revenues minus cost of goods sold, interest expense, and selling, general, and administrative expenses scaled by book equity
CbOP	Cash-based operating profitability in Ball et al. (2016) as OP − Δ(Accounts receivable) − Δ(Inventory) − Δ(Prepaid expenses) + Δ(Deferred revenue) + Δ(Trade accounts payable) + Δ(Accrued expenses) scaled by total assets
CTO	Capital turnover as net sales over lagged total assets
ATO	Net sales over lagged net operating assets
PM	Profit margin as operating income after depreciation over net sales
RNA	Income before extraordinary items over net operating assets
PROF	Gross profitability over book equity
SGA2M	Selling, general and administrative expenses over the market capitalization of December *t*-1
D2A	Capital intensity as depreciation and amortization over total assets
FC2Y	The sum of selling, general, and administrative expenses, research and development expenses, and advertising expenses over net sales
PCM	Price-to-cost margin as the difference between net sales and costs of goods sold scaled by net sales
OA	Operating accruals as changes in non-cash working capital minus depreciation over lagged total assets
OL	Operating leverage as the sum of cost of goods sold and selling, general, and administrative expenses over total assets
Cum_Return_36_13	Long-term reversal as past return performance calculated at the horizon of 24 months from month -36 to -13
Cum_Return_1_0	Short-term reversal as past return performance calculated at the horizon of one month
Cum_Return_12_2	Momentum as past return performance calculated at the horizon of 11 months from month -12 to -2
Cum_Return_12_7	Intermediate momentum as past return performance calculated at the horizon of 6 months from month -12 to -7
E2P	Income before extraordinary items over the market capitalization of December *t*-1
BEME	Book equity over market equity
Q	Tobin's Q
A2ME	Total assets over the market capitalization of December *t*-1

Table A1 – continued

Firm characteristics	Definition
DPI2A	Changes in property, plants, and equipment and inventory over lagged total assets
FREE_CF	Cash flow over book equity
C	Cash and short-term investments over total assets
S2P	Net sales over the market capitalization of December *t*-1
NOA	Net operating assets as the difference between operating assets and operating liabilities scaled by lagged total assets
INVESTMENT	Investment as the percentage change in total assets
LEV	Leverage as the sum of long-term debt and debt in current liabilities to the sum of long-term debt, debt in current liabilities, and stockholders' equity
BETA	Market beta
LME	Log market capitalization
LTURNOVER	Turnover as the ratio of prior month's volume to shares outstanding
REL_TO_HIGH_PRICE	Stock price at the end of the prior month over the previous 52 week high price
IDIO_VOL	Idiosyncratic volatility
SUV	Standard unexplained volume
SPREAD_MEAN	Average daily bid-ask spread in the prior month
AT	Total assets

Table A2. Which expected profitability measure is better in predicting future returns: IPCA expected CbOP, analyst earnings forecast, or lagged profitability (supplement to Table 4)

This table reports the Fama–MacBeth regression results of the next month's excess stock returns ($r_{i,t+1} - r_{f,t+1}$) on IPCA expected cash-based operating profitability (CbOP) controlling for different analyst earnings forecasts and lagged profitability measures. Coefficients are multiplied by 100. Robust Newey and West (1987) *t*-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1963 to December 2019. The period of the subsample with the inclusion of I/B/E/S data is from June 1985 to December 2019.

Variable	Dependent variable: Future excess returns ($r_{i,t+1} - r_{f,t+1}$)					
	ROE	ROA	GPA	OP	FFOP	CbOP
$\hat{e}^{IPCA}_{Y1,t}$ for CbOP	3.942	4.197	3.497	6.236	3.941	3.518
	(6.05)	(5.20)	(4.45)	(5.02)	(4.82)	(3.55)
$\hat{e}^{IBES}_{Y1,t}$	-0.028	-0.226	-0.547	-0.216	-0.049	-0.440
	(-0.52)	(-0.84)	(-1.63)	(-0.64)	(-1.11)	(-1.35)
e_t	-0.093	-0.586	0.278	-1.259	-0.099	0.249
	(-0.61)	(-1.50)	(1.27)	(-2.33)	(-0.38)	(0.64)
Constant	0.120	0.104	0.114	-0.001	0.128	0.165
	(0.41)	(0.36)	(0.37)	(-0.00)	(0.42)	(0.50)
R^2	0.90%	1.23%	1.29%	1.49%	1.15%	1.11%
Obs.	855,394	882,497	882,497	882,497	882,497	882,497

Table A3. Predicting earnings announcement returns

Panels A and B of this table report the Fama–MacBeth regression results of the earnings announcement cumulative abnormal returns (CARs) from July of year t to June of year t+1 on lagged profitability (e_t), IPCA expected profitability ($\hat{e}^{IPCA}_{Y1,t}$), and IPCA expected excess return ($\hat{r}^{IPCA}_{\hat{e}6,t}$) measured as of June of year t. We measure the monthly CAR as the four-day cumulative daily abnormal returns around the quarterly earnings announcement date (Compustat item RDQ) and sum up the abnormal returns from July of year t to June of year t+1 as the one-year-ahead annual announcement returns. Robust Newey and West (1987) t-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1971 to June 2019.

Variable	Dependent variable: Future earnings announcement returns (annual CARs)					
	ROE	ROA	GPA	OP	FFOP	CbOP
Panel A: IPCA expected profitability versus lagged profitability						
$\hat{e}^{IPCA}_{Y1,t}$	0.035	0.140	0.081	0.046	0.098	0.070
	(2.34)	(3.43)	(1.11)	(1.92)	(5.81)	(2.33)
e_t	-0.023	-0.084	-0.050	-0.035	-0.048	-0.007
	(-1.64)	(-2.01)	(-0.71)	(-1.41)	(-3.06)	(-0.83)
Constant	0.006	0.003	-0.003	0.004	-0.007	-0.004
	(1.26)	(0.76)	(-0.78)	(0.99)	(-1.63)	(-1.05)
R^2	0.37%	0.38%	0.38%	0.31%	0.40%	0.28%
Obs.	111,963	114,868	114,867	114,867	114,867	114,867
Panel B: IPCA expected excess return based on the six IPCA expected profitability predictors versus lagged profitability measures						
$\hat{r}^{IPCA}_{\hat{e}6,t}$	0.339	0.367	0.352	0.383	0.409	0.371
	(6.53)	(7.67)	(7.03)	(7.70)	(6.61)	(7.02)
e_t	-0.025	-0.052	-0.003	-0.038	-0.021	-0.018
	(-1.71)	(-1.87)	(-0.53)	(-3.07)	(-2.95)	(-2.04)
Constant	-0.014	-0.014	-0.018	-0.011	-0.017	-0.015
	(-2.26)	(-2.14)	(-3.96)	(-1.71)	(-2.54)	(-2.98)
R^2	0.57%	0.55%	0.50%	0.62%	0.52%	0.51%
Obs.	108,998	108,998	108,998	108,998	108,998	108,998
Panel C: IPCA expected excess return based on the six IPCA expected profitability predictors versus IPCA expected profitability predictors						
$\hat{r}^{IPCA}_{\hat{e}6,t}$	0.358	0.364	0.344	0.390	0.408	0.456
	(5.25)	(6.31)	(7.10)	(7.25)	(5.89)	(7.92)
$\hat{e}^{IPCA}_{Y1,t}$	-0.044	-0.067	-0.001	-0.054	-0.034	-0.071
	(-2.33)	(-2.01)	(-0.10)	(-4.43)	(-2.79)	(-4.08)
Constant	-0.012	-0.012	-0.018	-0.009	-0.013	-0.012
	(-1.92)	(-2.03)	(-4.22)	(-1.49)	(-2.19)	(-2.04)
R^2	0.56%	0.55%	0.50%	0.58%	0.52%	0.53%
Obs.	108,998	108,998	108,998	108,998	108,998	108,998

Table A4. Predicting market returns and macroeconomic variables: the effect of the number of common factors

This table reports the time-series regression results of market returns or each macroeconomic variable in year t+1 on the PLS index ($\hat{F}^{PLS}_{factor,t}$) formed by different numbers of IPCA common factors (k =1, …, 5) included. We use Kelly and Pruitt's (2013) partial least squares (PLS) approach to estimate the aggregate index formed by all of the IPCA expected profitability predictors' first to k-th factors. We then run the predictive regressions. The dependent variable is the value-weighted market return in excess of the risk-free rate (MKT) from July of year t to June of year t+1, term spreads, credit spreads (both term and credit spreads data are from Amit Goyal's website), the OECD composite leading indicator (OECD CLI), OECD business confidence index (OECD BCI), or OECD consumer confidence index (OECD CCI) from OECD data for the United States. The growth rates in OECD data are measured by the year-to-year logarithmic difference at the end of June. Robust Newey and West (1987) t-statistics that account for autocorrelations are presented in parentheses. The sample period is from June 1968 to June 2019.

Dependent variable	MKT	Term spread	Credit spread	OECD_CLI	OECD_BCI	OECD_CCI
Panel A: k = 1						
$\hat{F}^{PLS}_{factor,t}$	0.029	0.069	0.226	0.013	0.010	0.019
	(1.34)	(1.93)	(5.19)	(1.44)	(1.03)	(1.58)
Constant	0.026	0.024	-0.184	-0.002	0.000	-0.002
	(0.70)	(8.33)	(-11.27)	(-1.18)	(-0.15)	(-1.07)
R^2	0.91%	5.04%	21.04%	-0.74%	-1.02%	-0.07%
Obs.	51	51	51	51	51	51
Panel B: k = 2						
$\hat{F}^{PLS}_{factor,t}$	0.033	0.056	0.327	0.019	0.114	0.018
	(1.47)	(1.81)	(5.81)	(2.11)	(2.53)	(1.61)
Constant	0.001	0.019	-0.155	0.001	-0.015	0.000
	(0.02)	(7.28)	(-18.61)	(0.66)	(-2.71)	(0.23)
R^2	1.37%	3.62%	31.35%	-0.12%	9.61%	-0.19%
Obs.	51	51	51	51	51	51
Panel C: k = 3						
$\hat{F}^{PLS}_{factor,t}$	0.060	0.067	0.329	0.034	0.103	0.031
	(1.71)	(2.02)	(5.82)	(2.88)	(3.77)	(2.19)
Constant	0.033	0.020	-0.147	0.000	-0.009	0.000
	(1.14)	(7.94)	(-19.26)	(-0.31)	(-4.12)	(-0.20)
R^2	4.08%	4.75%	31.56%	1.46%	8.47%	1.17%
Obs.	51	51	51	51	51	51
Panel D: k = 4						
$\hat{F}^{PLS}_{factor,t}$	0.075	0.089	0.328	0.057	0.163	0.041
	(2.08)	(2.49)	(5.91)	(3.32)	(4.00)	(2.46)
Constant	0.001	0.021	-0.144	-0.002	-0.010	-0.001
	(0.03)	(8.10)	(-19.12)	(-1.29)	(-4.12)	(-0.52)
R^2	5.56%	7.08%	31.47%	3.78%	14.62%	2.12%
Obs.	51	51	51	51	51	51

Table A4 – continued

Dependent Variable	MKT	Term spread	Credit spread	OECD_CLI	OECD _BCI	OECD _CCI
Panel E: *k* = 5						
$\hat{F}^{PLS}_{factor,t}$	0.104	0.092	0.330	0.081	0.200	0.055
	(3.02)	(2.57)	(5.95)	(3.73)	(5.74)	(2.96)
Constant	0.037	0.020	-0.147	0.000	-0.006	0.000
	(1.58)	(8.11)	(-19.19)	(0.10)	(-4.38)	(0.22)
R^2	8.53%	7.40%	31.60%	6.23%	18.42%	3.59%
Obs.	51	51	51	51	51	51

Table A5. Relation between aggregate profitability shock and common factors

This table reports the time-series regression results of the aggregate profitability shock on concurrent IPCA common factors. We follow Kogan, Li, and Zhang (2022) to estimate the aggregate profitability shock, computed from the logarithmic difference of aggregate gross profits based on NBER-CES Manufacturing Industry Database, in which the gross profit is measured by the total value of shipments minus the sum of variable costs for materials, energy, and production worker wages and deflate it by the Consumer Price Index. Robust Newey and West (1987) t-statistics that account for autocorrelations are presented in parentheses. The sample period is from 1968 to 2018.

Variable	Dependent variable: Aggregate profitability shock					
	ROE	ROA	GPA	OP	FFOP	CbOP
Factor 1	-0.148	-0.589	1.318	1.736	0.126	3.419
	(-2.00)	(-5.49)	(3.80)	(7.08)	(0.70)	(4.21)
Factor 2	0.073	0.215	0.089	0.102	0.024	0.571
	(1.25)	(2.03)	(0.81)	(1.00)	(0.23)	(3.91)
Factor 3	0.218	0.570	-0.364	0.093	0.195	0.721
	(1.94)	(2.43)	(-0.96)	(0.61)	(2.44)	(3.08)
Factor 4	-0.362	0.562	0.120	-0.643	0.330	-0.009
	(-3.22)	(1.82)	(0.40)	(-4.76)	(2.76)	(-0.05)
Factor 5	0.030	-0.003	-0.625	0.787	0.204	0.268
	(0.11)	(-0.01)	(-1.65)	(2.41)	(1.34)	(0.88)
Constant	0.143	0.156	-0.458	-0.240	0.055	-0.432
	(8.26)	(8.35)	(-3.13)	(-4.84)	(1.00)	(-3.37)
R^2	36.47%	28.32%	53.13%	73.47%	0.16%	36.71%
Obs.	50	50	50	50	50	50