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Are Indian Stock Returns Predictable?

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ABSTRACT

In this paper we show that Indian stock returns, based on industry portfolios, portfolios sorted on book-to-market, and on size, are predictable. While we discover that this predictability holds both in in-sample and out-of-sample tests, predictability is not homogenous. Some predictors are important than others and some industries and portfolios of stocks are more predictable and, therefore, more profitable than others. We also discover that a mean combination forecast approach delivers significant out-of-sample performance. Our results survive a battery of robustness tests.

Keywords: *Stock Returns; Predictability; Profits; Sectors; Rational asset pricing; India.*

I. Introduction

There is a significant interest in stock return predictability. The attraction of this subject has both practical and theoretical implications as reflected in the literature, which has taken two strands. One strand of these studies takes issue with the theoretical/econometric concerns involved in testing for stock return predictability (see, *inter alia*, Stambaugh, 1999; Lanne, 2002; Lewellen, 2004; Campbell and Yogo, 2006; and Westerlund and Narayan, 2012, 2014) while the other strand of studies focuses on the practical (or rather the economic significance) aspect of stock return predictability (see, *inter alia*, Fama and French, 1988; Lamont, 1998; Welch and Goyal, 2008; Rapach *et al*., 2010). On this latter strand of studies, the key point of contention is regarding the in-sample versus out-of-sample evidence for predictability. It is here where the tension rests; see Spiegel (2008) and Rapach and Zhou (2013) for a review of recent literature. This tension can be summarised as follows. While Welch and Goyal (2008) find that many popular predictors fail to deliver consistent out-of-sample predictability despite strong evidence of in-sample predictability, Campbell and Thompson (2008) propose and show that imposing theoretically motivated restrictions on forecasting regressions substantially improves out-of-sample return predictability. Moreover, Rapach *et al*. (2010) argue that a simple mean combination forecast of all economic variables delivers significant out-of-sample gains.

Our paper belongs to this second strand of studies. We undertake an extensive empirical investigation of stock return predictability for India. Our empirical plan is based on four approaches. First, we form three sets of component portfolios. What this means is that in addition to having the aggregate market return portfolio, using the 1515 stocks for which time-series monthly data are available for the period 1992:07-2014:06, we form 10 industry portfolios, 10 portfolios sorted on book-to-market, and 10 portfolios sorted on market capitalization (size). The outcome is that we have 31 time-series of returns. We do this

following the recent studies which have started using a wide range of portfolios sorted on firm characteristics and industry classifications (see Rapach *et al*., 2011; Jiang *et al*., 2011; Kong *et al*., 2011; Rapach and Zhou, 2013; Rapach *et al*., 2014) to test for return predictability. Second, we test for stock return predictability using an in-sample predictability test proposed by Westerlund and Narayan (2012, 2014) and employ a wide range of evaluation metrics to judge out-of-sample forecasting performance. Third, having ascertained statistical evidence of predictability, we explore economic explanations for this predictability. In the final step, we consider whether our key results hold when we exclude the sample of data corresponding to the global financial crisis and whether results are contingent on the choice of out-of-sample periods.

Our analyses unveils a number of interesting findings. In-sample results reveal that economic variables, such as book-to-market (BM) ratio, dividend-price (DP) ratio, dividend yield (DY), dividend payout (DE) ratio, and earnings-price (EP) ratio predict aggregate market excess returns. At the industry-level, DE, EP and DP predict returns consistently. Cash flow-to-price (CFP) ratio and stock variance (SVAR) have very limited content to predict returns of aggregate market and its components. The results in terms of the importance of predictors are broadly consistent when subjected to book-to-market and size based portfolios although not all components of portfolios are predictable. By comparison while the out-of-sample tests also reveal similar evidence of return predictability, the role of predictors is different from those found when using the in-sample tests. For example, DE, which is a popular predictor in in-sample tests, is amongst the weakest predictors in out-of-sample tests.

Second, given the differences in predictability using individual predictors, we compute out-of-sample forecasts based on a mean combination forecast approach proposed by Rapach *et al*. (2010). The main advantage of this approach is that because it simply takes the average of forecasts obtained using each predictor, it incorporates more information while reducing

forecast volatility. We find that the combination forecasts pick up economically meaningful changes in all the eight economic variables and significantly improve the out-of-sample forecasting performance relative to individual predictive regression models. The combination forecast yields a significant out-of-sample R^2 of 4.65% for the aggregate market. The combination forecasts also reveal significant predictability for 20 components (seven industries, seven size and six book-to-market portfolios) of the market. However, the extent of predictability differs across the components. Economic significance results for a mean variance investor also reveal significant variations in profits and utility gains. On this basis, we conclude that while investing in the market leads to a monthly return of 0.64%, all but three industries (basic materials, industrials, and oil and gas) offer higher profits compared to the market. Similarly, we notice that four of the book-to-market sorted portfolios and three of the size sorted portfolios offer investors higher profits than those from the market.

Third, we attempt to provide economic explanations for differences in return predictability across the components. We find that industry return predictability is more evident during expansions while book-to-market and size portfolios return predictability is more evident during recessions. We also decompose out-of-sample component predictability into rational and alpha predictability using a conditional asset-pricing model based on the CAPM model. Our results suggest that the out-of-sample predictability based on eight economic variables is almost entirely attributable to rational out-of-sample predictability and that alpha predictability plays a role only in the health care industry. We examine the importance of information frictions emphasized by Hong *et al*. (2007) for the Indian equity market. They posit that it is costly to obtain information for certain industries and therefore information flows gradually across the broader equity market. Consistent with this, we find that both industry concentration and industry size are negatively and significantly related to the degree of return predictability across industries.

Finally, we focus on the robustness of our findings. We do so along several lines by showing that: (i) in-sample predictability holds when we consider a sample of data that excludes the 2007 global financial crisis; (ii) our main findings hold when we change the choice of the out-of-sample forecast period; and (iii) the results on profitability hold when we consider a low risk and a high risk aversion for investors.

Our findings contribute to several strands of the literature. Consider first the voluminous studies on stock return predictability mainly for the US market. One thing clear from these studies is that the US stock returns are predictable. A second feature of these studies is that BM turns out to be the most popular predictor of returns. We contribute by showing that upon using a wide range of predictors, the Indian stock returns are also predictable, but in in-sample tests DE, EP and DP are the most successful predictors of returns. In our empirical analysis, BM only provides limited evidence. While like the US story, the Indian stock market is also predictable, the role of predictors is different both in in-sample and out-of-sample evaluations. Therefore, the success of trading strategies from forecasting models is likely to be different. As a result, the success of trading strategies needs to be evaluated, and we do. The key implication of these findings is that while financial ratio predictors are important not only for predicting US stock returns but also for Indian stock returns, (a) not all predictors predict returns, (b) some predictors are more powerful while others are dormant, and (c) the importance of predictors is industry and firm characteristic specific.

Our second finding relates to the profitability of the Indian stock market. Specifically, we connect with existing evidence on profitability of the Indian market. On this there are not many studies though. In fact, this aspect of research on the Indian stock market is at a nascent stage. Of the existing studies, the focus has been on the aggregate market and the sectors of the market (see Narayan, Narayan, and Prabheesh, 2014 and Narayan, Ahmed, Sharma, and Prabheesh, 2014). These studies show that the Indian stock market is profitable. While the

existing evidence of profitability is based on momentum trading strategies applied to sectors, we add to this evidence through an extensive time-series predictability of not only the aggregate market portfolio returns but also its industry components and various portfolios formed on the basis of book-to-market and size. Overall, our empirical analysis provides robust evidence that the Indian stock market is profitable. The key implication is that financial ratio predictors are not only important for developed stock markets but also for emerging markets such as India.

Our third finding that combination forecasts provide evidence for predictability connects with the relatively small body of the empirical literature which shows the relevance of combination forecasts. Specifically, our finding here on India corroborates those obtained for the USA (Kong *et al.*, 2009; Rapach *et al*., 2010) and China (Jiang *et al.*, 2011). The key implication is that combination forecasts work well in out-of-sample forecasting evaluations and, therefore, should be part of the toolkit in future studies.

The balance of the paper progresses as follows. In section II, we discuss the in-sample predictability test. Section III is about the out-of-sample forecasting evaluations. Economic explanations for predictability are provided in Section IV and additional results that reflect the robustness of our findings are discussed in Section V. The final section provides some concluding remarks.

II. In-Sample predictability Tests

A. Estimation Approach

We employ the Westerlund and Narayan (2012, 2014, hereafter "WN") feasible quasi generalised least squares (FQGLS) based estimator for in-sample predictability tests. This method takes into account the persistency, endogeneity and heteroskedasticity features of the data. These features, as we will soon show, characterise our data set. We then evaluate the out-

of-sample forecasting performance using a range of evaluation metrics, which we will discuss in the next section.

A typical stock return predictive regression model has the following form:

$$r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t} \tag{1}$$

Here, r_t is the return on the portfolio in excess of the risk-free rate, and x_t is a potential predictor variable. In our case r_t is one of the thirty one time-series of portfolio excess returns, and x_t is one of the eight economic variables, which we will discuss soon. The error term is characterised by a zero mean and variance $\sigma^2_{\varepsilon_{r,t}}$.The null hypothesis of no predictability is $H_0: \beta = 0$. A discussion on the main issues faced in estimating Equation (1) is imperative and we spend some space on this. Assume the predictor in Equation (1) follows a first-order autoregressive (AR (1)) process, as below:

$$x_t = \mu(1-\rho) + \rho x_{t-1} + \varepsilon_{x,t} \tag{2}$$

where, $|\rho| \leq 1$. It is reasonable to assume that the correlation between $\varepsilon_{r,t}$ and $\varepsilon_{x,t}$ is negative. For example, if x_t is dividend-price ratio, then an increase in the stock price will lower dividends and raise returns. If so, the null hypothesis of no predictability will be biased due to an endogenous predictor variable. Second, let us not ignore the fact that the predictor variable is also likely to be persistent given that the literature has shown that financial ratio variables have an AR(1) coefficient which is close to one. Third, we know that the financial time-series data (particularly high frequency data) are characterised by heteroskedasticity (see Fama, 1965; and French *et al*., 1987). Therefore, an endogenous and persistent predictor variable and a heteroskedastic predictive regression model need to be addressed in estimating Equation (1). To capture the endogenous effects, we follow WN and model the error terms as below:

$$\varepsilon_{r,t} = \gamma \varepsilon_{x,t} + \eta_t \tag{3}$$

where $\varepsilon_{x,t}$ and η_t are mean zero and uncorrelated with each other. The variances of $\varepsilon_{r,t}$, $\varepsilon_{x,t}$ and η_t are denoted by $\sigma^2_{\varepsilon_{r,t}}$, $\sigma^2_{\varepsilon_{x,t}}$ and $\sigma^2_{\eta_t}$, respectively. The idea is to make Equation (1)

conditional on $\varepsilon_{x,t}$ by substituting from Equations (2) and (3), thereby removing the effect of endogeneity.

$$r_t = \theta + \beta x_{t-1} + \gamma(\, x_t - \rho x_{t-1}) + \eta_t \tag{4}$$

where $\theta = \alpha - \gamma\mu(1-\rho)$. However, Equation (4) is not really feasible as ρ is unknown, and Lewellen (2004) therefore suggests replacing the ρ with a guess ρ_0 . The feasible version of Equation (4) can be written as below:

$$r_t = \theta + \beta^{adj} x_{t-1} + \gamma(\, x_t - \rho_0 x_{t-1}) + \eta_t \tag{5}$$

where $\beta^{adj} = \beta - \gamma(\rho - \rho_0)$ can be interpreted as the limit of the bias-adjusted OLS estimator of Lewellen (2004). WN assume that $\rho = 1 + \frac{c}{T}$, where $c \leq 0$ is a drift parameter that measures the degree of persistency in x_t.

One final issue with the data is heteroskedasticity. In ordinary least squares regression, the variances of errors are typically assumed to be constant over time. This assumption does not fit well as stock returns are known to be heteroskedastic. WN propose modelling heteroskedasticity using the following variance equation for η_t:

$$var(\eta_t | I_{t-1}) = \sigma_{\eta_t}^2 = \psi_0 + \sum_{k=1}^{q} \psi_k \, \eta_{t-k}^2 \tag{6}$$

where I_t is the information available at time t. In order to ensure that $\sigma_{\eta_t}^2$ is positive, WN assume that $\psi_0 > 0, \psi_1, \ldots, \psi_q \geq 0$ and $\sum_{k=1}^{q} \psi_k < 1$. They also apply a simple ARCH model assumption to $var\left(\varepsilon_{x,t} \middle| I_{t-1}\right) = \sigma_{\varepsilon_{x,t}}^2$. The FQGLS estimator captures the ARCH structure in the errors by weighting all the data by $1/\sigma_{\eta_t}$. The FQGLS-based t-statistic for testing $\beta = 0$ takes the following form:

$$t_{FQGLS} = \frac{\sum_{t=q_m+2}^{T} \pi_t^2 x_{t-1}^d r_t^d}{\sqrt{\sum_{t=q_m+2}^{T} \pi_t^2 \left(x_{t-1}^d\right)^2}} \tag{7}$$

Here, $\pi_t = 1/\sigma_{\eta_t}$ is the FQGLS weight, and $x_t^d = x_t - \sum_{s=2}^{T} x_s/T$ with a similar definition of r_t^d, where T is the sample size, and $q = \max\{q_x, q_{r,x}\}$. We also estimate the sub-sample based FQGLS test statistic, which can be viewed as a special kind of bootstrapping for the reason that it works best when the predictor variable is persistent, as shown in the Monte Carlo simulations conducted and reported in WN (2014).

B. Data

We use a monthly data set obtained from Datastream to examine return predictability for the Indian aggregate market portfolio and its components that include 10 industries, 10 book-to-market and 10 size sorted portfolios. To ensure that we have a reasonable number of firm-level observations, the sample period after computation of all the financial ratios and portfolio returns begins in July 1992 and ends in June 2014. Table I provides the name, datatype and definition of the Datastream variables that we use. To reduce the errors in data downloaded from Datastream, we apply the following screening procedures, as suggested by Ince and Porter (2006), Hou *et al.* (2011) and Karolyi and Wu (2014)[1].

- We require each firm's home country and the exchange code to be clearly identified in the database. We use the Datastream variable GEOGN to remove any firm incorporated outside India and the variable EXMNEM to exclude any firm not traded on the NSE.
- We use the Datastream variable ISIN to exclude any duplicate firms from our sample.
- We include dead stocks in the sample to limit the effect of survivorship bias. For both dead and active stocks, we confirm their effective ending months according to two criterion: (i) consecutive constant closing price records (P) from the month until the end of the period, June 2014; and, (ii) zero trading volume (VO) from the month until the

[1] Unlike Karolyi and Wu (2014), we do not exclude financial firms from the study. However, we exclude stocks with special features and include equities only. We drop stocks with name including "PFS", "PREF", or "PRF" as these terms represent preferred stocks.

end of the period. A stock with same month as its starting month and ending month is excluded from the sample.

- Any stock return above 300% that is reversed within one month is set to missing. Specifically, if ret_t or ret_{t-1} is greater than 300%, and if $(1 + ret_t) \times (1 + ret_{t-1}) - 1 \leq 50\%$, then both ret_t and ret_{t-1} are set to missing. Additionally, we treat as missing the monthly returns that fall out of the 0.1% and 99.9% percentile ranges. We also exclude stocks with less than 12 monthly returns from our sample.
- Lastly, the included firms are required to have at least one firm-year observation for five financial variables - market value of equity, book value per share, cash flow per share, dividends per share, and earnings per share.

INSERT TABLE I

We end up with 1515 stocks in our sample. The aggregate market portfolio is the value-weighted return of all the stocks in our sample. For the industry portfolios, we use the Datastream variable INDM2 to classify the firms into 10 industries as per the Industry Classification Benchmark. These industries are basic materials, consumer goods, consumer services, financials, health care, industrials, oil and gas, technology, telecommunications and utilities. The industry portfolio returns are computed as value-weighted returns of all the stocks in each industry. The accounting data (all the per share data) from Datastream are available on company's fiscal year-end basis. Following Karolyi and Wu (2014), we match the financial statement data (book value per share, cash flow per share, earnings per share and dividend per share) for fiscal year-end in year $t - 1$ with monthly returns from July of year t to June of year $t + 1$. This ensures that the accounting data is known to the investors before the returns. The monthly returns on the 10 book-to-market decile portfolios, denoted by BM1, …, BM10 in ascending order, are constructed every year using the book-to-market value at the end of each June. The book-to-market value for June of year $t + 1$ is computed by dividing the book value

for fiscal year-end in year $t-1$ by the market value of June of year $t+1$. The monthly returns on the 10 size decile portfolios, in ascending order denoted by S1, …, S10 are formed every year using the market capitalization at the end of each June. The size portfolios for July of year t to June of year $t+1$ include all the firms for which we have market capitalization data for June of year t. The portfolio returns data begin in July 1992 and end in June 2014.

We consider a total of eight economic/financial variables as potential predictors of excess returns for aggregate market portfolio and its components portfolios[2]. To compute the financial ratios, we ensure that the accounting data (book value per share, cash flow per share, earnings per share and dividend per share) for fiscal year-end in year $t-1$ are used to compute the ratios for the July of year t to June of year $t+1$. The eight predictors considered are: book-to-market ratio (hereafter "BM"), dividend-payout ratio (hereafter "DE"), dividend-price ratio (hereafter "DP"), dividend-yield (hereafter "DY"), earnings-price ratio (hereafter "EP"), cash flow-to-price ratio (hereafter "CFP"), inflation ("INF" hereafter) and stock variance ("SVAR" hereafter). Table II provides details on the construction of all the eight predictors. The dependent variable is always the excess returns computed using the weighted average call money rate for India. The call rate is downloaded from the Reserve Bank of India database[3].

INSERT TABLE II

Table III reports the summary statistics for excess returns for the aggregate market portfolio and its component portfolios that include industry, size and book-to-market sorted portfolios, as well as the eight economic variables, for the period 1992:07-2014:06. Panel A shows that average monthly industry excess returns range from -0.62% for consumer services to 0.84% for technology sector with standard deviations of 11.66% and 13.76%, respectively. Panels B and C show that returns are higher and more volatile for high book-to-market

[2] The eight predictors used here are a subset of 14 predictors used by Welch and Goyal (2008). We do not have data for the remaining predictors for India.
[3] The data is available at www.rbi.org.in.

portfolios and for small size portfolios. The main implication of these descriptive statistics is that the market, its industry components, and the various portfolios sorted on the basis of book-to-market and size are heterogeneous. The resulting question addressed in the remaining sections is: Are predictability and profitability also heterogeneous?

INSERT TABLE III

C. Preliminary Statistical Features of the Data

Our main objective in this section is to gauge to what extent our predictive regression model is characterised by persistent and endogenous predictors and, to what extent, if at all, our model suffers from heteroskedasticity.

We begin with a test of the null hypothesis of a unit root in variables relating to the aggregate market and each of the 10 industries in our sample. The results are reported in Table IV. The unit root test is based on the familiar augmented Dickey-Fuller (1981) time-series regression model and is implemented by including only the intercept term. We use the Schwarz information criterion and a maximum of eight lags to obtain the optimal lag length. The test statistic, together with its p-value, is reported for each of the variables. The optimal lag length is reported in square brackets. The unit root null is rejected for returns of the market and for each of the ten industries, rendering returns, as expected, to be strongly stationary. When we consider the economic variables predicting the aggregate market portfolio, the unit root null is rejected for seven variables: INF and SVAR at the 1% significance level; DP, DY and EP at the 5% level; and DE and CFP at the 10% significance level. For eight of the ten industries, the unit root null hypothesis is rejected for CFP at either 1%, 5% or 10% significance levels indicating that CFP is strongly stationary. For economic variable EP (DE), the unit root null is rejected for six (four) industries; while, for variables BM, DP and DY, the unit root null is rejected for five industries. For consumer services and health care industries, the unit root null

is rejected for all eight economic variables; while, for the financial industry, the unit root null is rejected only for INF and SVAR. This indicates mixed evidence of integration of predictor variables at the industry-level. Similar results are obtained when we test the null hypothesis of a unit root in predictor variables for book-to-market and size sorted portfolios; results are not reported here to conserve space but are available upon request.[4]. Here, CFP is strongly stationary for all book-to-market and size portfolios.

INSERT TABLE IV

However, since the rejection of the unit root null does not imply that the variables are not persistent, we report in Table V the AR(1) coefficient for each of the variables. What we notice immediately is that for all the predictors, except SVAR, the coefficient is close to one. This is a sign that most of the variables are highly persistent.

INSERT TABLE V

In Table VI, we report the results for autocorrelations associated with the square of each variable. We notice that while for all the predictors, the autocorrelations are significant, for returns the *p*-values tend to increase with more distant lags. Presence of ARCH can be implied from autocorrelation in squared variables. This evidence suggests strong ARCH effects in both the predictors and the returns. Similar results (not reported here) are obtained for both the predictors and returns of the book-to-market and size sorted portfolios.

INSERT TABLE VI

We undertake further tests of ARCH effects by filtering each series and running an autoregressive regression model with twelve lags. We then apply the Lagrange Multiplier test to examine the null hypothesis of 'no ARCH' in the filtered series. The results are presented in Table VII. When we consider the return series, the null hypothesis of 'no ARCH' is rejected for six industries (basic materials, consumer services, financials, health care, technology and

[4] Hereafter, whenever we refer to results that are not reported, these are available from the authors upon request.

telecommunications) at the 1% significance level. A strong presence of ARCH effect is seen in predictor variables INF, BM and CFP. This is followed by predictor variables, DE, DP and EP, where the null of 'no ARCH' is rejected for five industries at lag twelve. Similar patterns are seen for the predictors of book-to-market and size portfolios (not reported, but available). Overall, the ARCH test implies that both the returns and the predictors are characterised by ARCH, and this needs to be accounted for in testing the stock return predictability.

INSERT TABLE VII

Finally, we test for the extent of endogeneity in the predictive regression models. The results, based on Equation (3), are reported in Table VIII. We report the coefficient on γ, the t-test statistic associated with the null hypothesis that $\gamma = 0$, and the resulting p-value. The predictors BM, DP, EP, CFP and SVAR are all endogenous. The null hypothesis that $\gamma = 0$ is rejected mostly at the 1% significance level for these predictors, both at the market and industry levels. In addition, for health care industry, predictors DE and INF are endogenous; for basic industrials, predictors DY and INF are endogenous. For the book-to-market and size sorted portfolios, a similar dominance of endogeneity is seen for predictor variables BM, DP, EP, CFP and SVAR (not reported, but available).

INSERT TABLE VIII

The main message emerging from the preliminary analysis of the data is that most of the predictor variables are persistent, endogenous, and characterised by the presence of strong ARCH effects. These issues need to be accounted for in the predictive regression model. This motivates us to use the WN procedure for in-sample predictability tests.

D. In-sample Predictability Test Results

In this section, we examine in-sample evidence of stock return predictability. We begin with the WN test, for which we report the 95% confidence interval for β based on both the

asymptotic FQGLS t-test as well as the sub-sample FQGLS t-test. We give greater weight to results based on the sub-sample test for the reason that it works best when the predictor variable is persistent, as shown in the Monte Carlo simulations conducted and reported in Westerlund and Narayan (2014). The interpretation is simple; when the confidence interval includes the value zero, we cannot reject the null hypothesis of no predictability.

D.1 Aggregate Market and Industry Portfolio Excess Returns

Table IX reports the in-sample predictability results for the aggregate market and for each of the 10 industries. For the aggregate market, we find that five variables (BM, DE, DP, DY and EP) predict aggregate market returns. There is no evidence that CFP, INF and SVAR predict market returns. This is consistent with the evidence found in the existing literature for the US market (see, Kothari and Shanken, 1997; Pontiff and Schall, 1998; Lewellen, 2004; Campbell and Thompson, 2008). The existing empirical evidence is strongly in favour of BM as the most popular predictor of market returns.

INSERT TABLE IX

Our findings on industry portfolio excess return predictability highlight important differences in predictability across industries. This can be summarised as follows:

- DE predicts excess returns for all the 10 industries. This is also one of the economic variable that predicts aggregate market excess returns.
- DP predicts excess returns for six industries, namely, consumer goods, financials, health care, industrials, telecommunications, and oil and gas; and EP predicts excess returns for basic materials, financials, healthcare, industrials, and telecommunications. Predictors BM, DY, and INF each predict excess returns for four industries.

- The economic variables that have the least predictive ability are CFP and SVAR. CFP predicts excess returns for the technology industry, while there is no evidence that SVAR predicts excess returns for any industry.
- Telecommunications is the most predictable industry, where five out of eight economic variables predict excess returns. This is followed by basic materials, consumer goods, financials, and industrials, where four economic variables predict excess returns.
- Consumer services and utilities are the least predictable industries, where a maximum of only two economic variables predict excess returns.

D.2 Book-to-Market Portfolio Excess Returns

Next we examine return predictability for the 10 portfolios sorted by book-to-market. The results are reported in Table X. We find that the economic variable, DE, which is a significant predictor of the market and industry returns, also predicts excess returns for all the 10 book-to-market sorted portfolios. The economic variable EP is the second most successful predictor; it predicts excess returns for seven book-to-market sorted portfolios. BM and DP predict excess returns for five and four book-to-market portfolios, respectively; while DY and INF predict excess returns for only two portfolios. The economic variables (CFP and SVAR) that have the least ability to predict industry portfolio returns are also weak predictors of book-to-market portfolio returns. CFP predicts excess returns for only one book-to-market sorted portfolio and there is no evidence that SVAR predicts book-to-market portfolio excess returns. BM1 and BM4 are the portfolios with the highest return predictability, where five out of eight economic variables predict returns. Portfolios BM3, BM7 and BM9 are least predictable; only a maximum of two predictors predict returns.

INSERT TABLE X

D.3 Size Portfolio Excess Returns

Table XI reports results for in-sample predictability of the 10 size-based portfolio excess returns. The results are similar to those in Table IX and Table X reported for industry portfolios and book-to-market sorted portfolios, respectively, in that DE and EP are the significant predictors followed by DP and BM. DY, CFP, INF and SVAR have the least predictive ability. Differences in predictability across size portfolios is clearly evident. Moreover, S2 is the most predictable size portfolio, where five out of eight economic variables predict excess returns. Returns of portfolios S1, S3, S7 and S10 are the least predictable; only two predictors predict returns. For the remaining portfolios (S4, S5, S6, S8 and S9), three economic variables predict returns.

There are three key messages from our in-sample predictability results. First, DE is the most popular predictor of returns. It not only predicts market returns but also predicts returns for all the component portfolios (10 industries, 10 size-based portfolios, and 10 book-to-market sorted portfolios). The second most popular predictor is EP, which predicts returns for aggregate market and for the 20 component portfolios. Second, the least popular return predictors are CFP and SVAR. There is no evidence that SVAR predicts returns, while CFP predicts returns for one industry, one book-to-market sorted portfolio, and one size sorted portfolio. Our final message is that there are pronounced differences in predictability across the component portfolios in that there are some portfolios where high evidence of predictability is found while for others there is limited evidence of predictability. There are, for example, four component portfolios (telecommunications, BM1, BM4 and S2), where five economic variables predict excess returns, whereas there are nine component portfolios (consumer services, utilities, BM3, BM7, BM9, S1, S3, S7 and S10), where a maximum of only two predictors predict returns. For the remaining component portfolios, either 3 or 4 economic variables predict excess returns. Our evidence of variation in results by industry is consistent

with the recent literature on sectoral heterogeneity (see Hong *et al*., 2007; Narayan *et al*., 2011; Narayan and Sharma, 2011; Rapach *et al*., 2014).

INSERT TABLE XI

III. Out-of-Sample predictability Tests

In this section, we examine out-of-sample predictability of returns from all the eight economic variables used as predictors. We also compute mean combination forecasts – the average of the return forecasts from the eight individual predictive regression models and examine their performance against the historical mean model.

A. Out-of-Sample Forecast Evaluation Measures

We examine the out-of-sample forecasting performance using a recursive window approach, following Rapach *et al*. (2010) and Narayan *et al*. (2013). We estimate the predictive regression model for the in-sample period t_0 to t and forecast the returns for the period $t+1$. We then re-estimate the model over the period t_0 to $t+1$ and forecast the returns for the period $t+2$. This process continues until all the data are exhausted. Since we are undertaking recursive forecasting, we are taking into account the information available up to the previous day, thereby mimicking real-time forecasting. The out-of-sample period is set to 50% of the full-sample of data. The out-of-sample estimation covers the period 2003:07 to 2014:06. This period covers the crisis period.

We use the following six well-known measures to evaluate the accuracy of the forecasts. The relative mean absolute error ($RMAE$) is given by;

$$RMAE = MAE_M / MAE_H \tag{8}$$

where MAE_M and MAE_H are the mean absolute errors for the predictive regression model and the historical mean model, respectively. The relative root mean squared error ($RRMSE$) is given by:

$$RRMSE = RMSE_M / RMSE_H \tag{9}$$

where $RMSE_M$ and $RMSE_H$ are the root mean squared errors for the predictive regression model and the historical mean model, respectively. We employ the Campbell and Thompson (2008) out-of-sample R^2 (OR^2) for comparing mean square forecast errors:

$$OR^2 = 1 - (MSFE_M / MSFE_H) \tag{10}$$

Here, $MSFE_M$ and $MSFE_H$ are the mean squared forecast errors for the predictive regression model and the historical average model, respectively. We also compute the Clark and West (2007) $MSFE - adjusted$ test statistic, which examines the null hypothesis that $OR^2 \leq 0$ against the alternative hypothesis $OR^2 > 0$. The other two forecast evaluation metrics used are the Mincer-Zarnowitz R^2 and the success ratio. The Mincer-Zarnowitz R^2 (RMZ) is the R^2 from the following time-series least squares regression model:

$$r_t = c + d\hat{r_t} + \varepsilon_t \tag{11}$$

where r_t and $\hat{r_t}$ are the actual and forecasted returns, respectively. The success ratio (SR) is the percentage of times the sign of forecasted returns is the same as the sign of the actual returns. To compare the predictive regression model forecasts with the historical average forecasts, we use the relative success ratio (RSR), which is computed as the success ratio for our proposed model divided by the success ratio of the benchmark historical mean model. When RSR is greater than one, it indicates that our proposed model predicts the sign of returns accurately relative to the historical mean model.

INSERT TABLE XII

INSERT TABLE XIII

B. Out-of-Sample Predictability Test Results

We now turn to the out-of-sample predictability results, which are reported in Tables XII, XIII and XIV, respectively, for the aggregate market and industry portfolios, the 10 book-to-market sorted portfolios, and the 10 portfolios sorted by size. The out-of-sample results for combination forecasts are reported in Table XV. A summary of these results is presented in Tables XVI, XVII and XVIII. More specifically, in the summary tables, we list the evaluation metrics according to which our predictive regression model beats the historical average model. The metrics are reported for each of the eight models represented by each predictor variable. The last column of all the summary tables reports the forecast evaluation for the combination forecasts relative to the historical average forecasts.

INSERT TABLE XIV

INSERT TABLE XV

B.1 Aggregate Market and Industry Portfolio Excess Returns

We begin with predictability of market and industry excess returns reported in Table XVI. The evidence of out-of-sample predictability for aggregate market is very strong, in that all the six metrics support predictability for the DE, DP, DY and EP-based predictive regression models. For three predictors (CFP, INF, and SVAR), at least three metrics support predictability. For BM-based predictive regression model, only one metric supports predictability. The mean combination forecast of all eight economic variables for the aggregate market outperforms the historical mean model. The combination forecast for the aggregate market yields a statistically significant and economically sizeable OR^2 of 4.65% (reported in Table XV). The out-of-sample results for the aggregate market match reasonably well with the in-sample results. We also find significant evidence of out-of-sample predictability for the industries. This can be summarised as below:

- EP turns out to be the most popular out-of-sample predictor of industry returns. At least four of the six metrics reveal that the EP-based predictive regression model beats the historical average model in six out of 10 industries. DP and DY in turn predict returns for five industries. These predictors produce relatively high and significant OR^2 statistics for most of the industries.
- DE and SVAR are the weakest predictors; they predict returns for only two industries. The remaining predictors, BM, CFP and INF, predict returns for only three industries.
- The combination forecast model predicts returns for all the industries. For seven industries, there are at least five metrics that support the combination forecast method. The OR^2 statistic for these industries is statistically significant and ranges from 0.59% (financials) to 2.41% (telecommunication).
- The most predictable industries are financials, consumer goods, telecommunications, and oil and gas, where there are at least four predictors with at least five evaluation metrics that support the predictive regression model. For health care industry, three predictors (DP, DY and EP) beat the historical average forecasts. These are also the industries that are predictable by the combination forecast method.
- There are three industries with limited evidence of out-of-sample predictability, where there are only two predictors with at least four evaluation metrics that support out-of-sample predictability. They are basic materials, consumer services and industrials. Nevertheless, the combination forecasts improve the out-of-sample forecasting performance for some predictable industries, such as basic materials and consumer services.
- Technology and utilities have weakest evidence of predictability with insignificant OR^2 statistic, as reported in Table XV.

INSERT TABLE XVI

B.2 Book-to-Market Portfolio Excess Returns

We next examine out-of-sample predictability for returns of 10 portfolios sorted by book-to-market (BM1, …, BM10). The results are reported in Table XVII. We find that SVAR, DY and INF are significant predictors of portfolio returns sorted by book-to-market, where at least four metrics support predictability for six portfolios. DP predicts returns for only three portfolios. BM, DE, EP, and CFP are the weakest predictors. BM, DE, and EP predict returns for only one portfolio, while there are less than four evaluation metrics that support the CFP-based predictive regression model. The combination forecast approach supports return predictability for six portfolios. For five of these portfolios, the combination forecast yields significant OR^2 statistic ranging from 0.32% (BM10) to 1.25% (BM1). BM1, BM5 and BM10 are the most predictable portfolios; at least four economic variables predict returns. This is followed by BM3 and BM7 for which three variables predict returns. These are also the portfolios supported by the combination forecast approach. Portfolios BM2, BM4, BM6, BM8 and BM9 are the least predictable. Nevertheless, the combination forecasts improves the out-of-sample forecasting performance for portfolio BM8. There are some similarities and some differences in predictability of book-to-market portfolios relative to the industry portfolios; for instance, DY is a significant predictor of both industry and book-to-market portfolio returns, while SVAR, the weakest predictor of industry returns, significantly predicts the book-to-market portfolio returns.

INSERT TABLE XVII

B.3 Size Portfolio Excess Returns

Table XVIII reports summary results for out-of-sample return predictability for the 10 size portfolios (S1, …, S10). The results are broadly similar to those reported in Tables XVI and XVII for industry and book-to-market portfolios. We see that SVAR, DY and DP turn out to

be the most popular predictors, where at least four metrics support predictability for six portfolios. DY and DP are also significant predictors of industry portfolio returns, while SVAR and DY significantly predict book-to-market portfolios. INF predicts returns for only four portfolios. We notice that BM, DE, EP and CFP turn out to be the weakest predictors. These predictors also display the weakest out-of-sample predictability for book-to-market portfolios, while EP is one of the significant predictors of industry portfolio returns. The combination forecast evaluation metrics support predictability for seven size-based portfolios. The OR^2 statistics are significant for these seven portfolios and range from 0.72% (S5) to 2.29% (S10). In terms of the most predictable portfolios, there are four portfolios (S2, S6, S9 and S10) where at least four predictors predict returns. S1, S3, S4 and S7 are the least predictable. However, the combination forecasts improves out of-sample performance for portfolio S3.

INSERT TABLE XVIII

There is ample evidence of out-of-sample predictability for the excess returns of the aggregate market and its component portfolios. We find that DE, DP, DY and EP predict aggregate market returns out-of-sample. DY and SVAR turn out to be the most successful out-of-sample predictors across all the components of the market, for which at least four of the six metrics support our predictive regression model. We notice that SVAR predicts returns for 20 out of 30 components, while DY predicts returns for 20 component portfolios. This is followed by DP, INF and EP, which predicts returns for 14, 13 and nine component portfolios, respectively. On the other hand, BM, DE and CFP are the weakest predictors in this out-of-sample exercise. The combination forecasts significantly improve the out-of-sample forecasting performance relative to individual predictive regression models. The combination forecast yields a significant OR^2 of 4.65% for the aggregate market and predicts returns for 20 component portfolios (seven industries, seven size and six book-to-market portfolios).

There are three main messages emerging from both in-sample and out-of-sample analysis. First, four economic variables (DE, DP, DY, and EP) predict aggregate market returns both in-sample and out-of-sample. Second, we find that there are six industry portfolios (basic materials, consumer goods, financials, health care, telecommunication, and oil and gas), three book-to-market portfolios (BM1, BM6, and BM10) and three size portfolios (S2, S5, and S9) for which at least one economic variable predicts returns both in-sample and out-of-sample. Among these portfolios, the combination forecast model predicts returns for all but one portfolio. The exception is portfolio BM6. The third message is that while the in-sample tests support DE as a popular predictor, it is one of the weakest predictors in out-of-sample tests. There is no evidence of in-sample predictability when using predictor SVAR, while the same variable significantly predicts book-to-market size portfolios in out-of-sample tests. Meanwhile, CFP turns out to be the weakest predictor in both in-sample and out-of-sample evaluations. Overall, we find that the out-of-sample tests match the in-sample tests reasonably well. The combination forecasts reveal that the predictability we find is robust to the use of individual predictors.

C. Economic Significance

In the return predictability literature, it is common to test the economic significance of return predictability using a mean-variance utility function. We follow this literature (see, *inter alia*, Rapach *et al*., 2010) and compute profits and utility gains[5] (that is, the difference between the utility from our proposed model forecasts and utility from the historical average model forecasts). The methodologies on profits and utility gains are now common and to conserve space we do not repeat them here; interested readers are referred to recent studies, such as Rapach *et al*. (2010) and Westerlund and Narayan (2012). Following Campbell and Thompson

[5] The economic significance analysis is undertaken with forecasting horizon, $h = 1$.

(2008) and Rapach *et al*. (2010), we restrict the portfolio weights to lie between 0 and 1.5 each month. We undertake economic significance analysis for the forecasting models where there is either evidence of in-sample predictability or out-of-sample predictability based on at least 50% of the forecast evaluation metrics. Given this criteria, the results are therefore omitted for some portfolios where there is neither evidence of in-sample nor out-of-sample predictability. The average profits and utility gains for the aggregate market and the 10 industries are reported in Table XIX. The mean profits from all the predictive regression based forecasts are statistically significant at the 1% level. We begin with profits from investing in the market. Profits range from 6.55% per annum when the return forecast is based on BM to 13.48% per annum when the return forecast is based on DP. The utility gains for the aggregate market are positive for seven economic variables, and range from 0.02% per annum (BM) to 0.68% per annum (DP).

INSERT TABLES XIX and XX

We now read profits and utility gains results for each of the 10 industries. There are two interesting features of these results. First, we notice that while all the predictors with either evidence of in-sample or out-of-sample predictability offer investors' statistically significant profits, profits are different and vary from industry-to-industry. For example, profits are generally higher for some industries (such as technology, health care and telecommunications) while they are relatively small for other industries (such as basic materials and industrials). Second, the utility gains are highest for two industries - technology (DE and CFP) and oil and gas (DE). The average profits and utility gains for the 10 book-to-market and the 10 size portfolios are reported in Tables XX and XXI, respectively. We observe similar results in that the profits are statistically significant at the 1% level of significance for all size and book-to-market portfolios. As is expected, profits are generally higher for small size portfolios and high book-to-market portfolios. Profits and utility gains for the combination forecasts reported in

Table XXII provide a good depiction of profits and utility gains based on all the eight economic variables. All profits are statistically significant and vary across the components. The utility gains are positive for four industries (consumer services, industrials, utilities, and oil and gas), eight book-to-market portfolios (exceptions are BM6 and BM8), and six size portfolios (S2, S4, S5, S8, S9 and S10). Overall, these results indicate that profits and utilities are indeed heterogeneous.

INSERT TABLE XXI and XXII

We also investigate the robustness of the results by using risk aversion parameters of three and 12, which represent a high and low risk position for an investor, respectively. The results are qualitatively similar and are reported in an Appendix, which is available from the authors upon request. Additionally, we find that the utility gains for combination forecasts with risk aversion parameter of 3 are positive for four industries (consumer goods, health care, technology and telecommunications) and negative for one industry (oil and gas). A risk aversion parameter of 12 yields positive utility gains for the size portfolio S2 and negative utility gains for consumer services, utilities, BM2, and S3.

IV. Economic Explanations for Component Predictability

A. Out-of-Sample forecast evaluation for crisis and post-crisis periods

Fama and French (1989) and Cochrane (1999, 2007) stress that increased risk aversion during crisis periods demands higher risk premium leading to return predictability during such periods. Rapach *et al.* (2010) also link the combination forecasts of excess returns to the real economy by examining the forecasts during the NBER-dated business cycle phases. In light of this, we evaluate the forecasts for two different phases of our out-of-sample period – expansions (2003:07-2007:01 and 2009:07-2014:06) and recessions (2007:02-2009:06). Expansions (recessions) comprise 103 (29) of the observations for the forecast evaluation period. For

brevity, we only report the Campbell and Thompson (2008) OR^2 statistics for the combination forecasts based on eight economic variables[6]. The results are reported in Table XXIII for the entire 2003:07-2014:06 out-of-sample forecast evaluation period (overall), the expansion and the recession periods. The row "average" of Panel A (B and C) reports the average OR^2 statistic for all the ten industries (10 book-to-market and 10 size portfolios). With respect to the aggregate market portfolio, the OR^2 statistic during expansions (6.25%) is almost twice as that found during recessions (3.24%). A similar pattern emerges for combination forecasts of industry portfolio returns, where the average OR^2 across the 10 industries is 1.72% (0.32%) during expansions (recessions), and the industries with highest OR^2 statistics over the entire forecast evaluation period also generally have the highest values during expansions. For two industries (industrials and utilities), the OR^2 statistic during recessions is greater than during expansions. This reveals evidence of stronger predictability during recessions for some industries while the predictability is higher during expansions for the other industries. This is consistent with the theoretical conjecture that macroeconomic cycles do not affect all industries uniformly (Kadan *et al.*, 2012: 95), and that returns on industry portfolios might convey additional information not available in aggregate market returns.

INSERT TABLE XXIII

Panels B and C of Table XXIII show that predictability often strengthens during recessions for both the book-to-market and size sorted portfolios. The average OR^2 statistics for the book-to-market and size portfolios during recessions are almost twice that during expansions. The extent of predictability is strongest for BM1 with an OR^2 of 2.76% during expansions. This is followed by portfolio BM8 with an OR^2 of 1.88% during recessions. With respect to the size portfolios, the OR^2 statistic during expansions tends to increase with size.

[6] The combination forecasts are picking up economically meaningful changes in all the eight economic variables. So the OR^2 statistics associated with the individual predictive regression model forecasts for the expansion and recession periods are not reported here, but available from the authors upon request.

The extent of predictability is strongest for portfolio S10 (2.71%) and lowest for portfolio S4 (-0.75%).

B. Decomposing Out-of-Sample Predictability

One referee of this journal suggested that component return predictability could be consistent with the rational asset pricing framework apart from the behavioural aspects. The referee's main point was that differentiating the relative importance of rational asset pricing factors and behavioural aspects is imperative. There are two studies (Kong *et al.*, 2009 and Jiang *et al.*, 2011) that utilize the rational asset pricing framework to decompose the out-of-sample predictability into rational predictability and alpha predictability. Rational predictability arises from exposure to time-varying macroeconomic risk premiums, while alpha predictability explains the degree of predictability beyond that of rational predictability. Alpha predictability could potentially be connected with behavioural aspects. We investigate this issue following Kong *et al.* (2009) and Jiang *et al.* (2011).

Following Avramov (2004), consider the following model for the excess return of component i as:

$$r_{i,t} = \alpha_i(x_{t-1}) + \beta_i' f_t + u_{rt} \tag{12}$$

where x_{t-1} is an M-vector of lagged predictive variables, f_t is a set of K monthly excess returns on portfolio-based factors, and β_i is a K-vector containing component i's beta. Here, β_i is time invariant, as in Avramov (2004), Campbell (1987), Connor and Korajczyk (1989), Kirby (1998), among others. The evolution of factors is modelled as:

$$f_t = \lambda(x_{t-1}) + u_{ft} \tag{13}$$

where $\lambda(x_{t-1})$ is the expected value of f_t conditioned on x_{t-1}, u_{ft} is a K-vector of zero-mean disturbances. The factors are portfolio based. Thus, the conditional expected value $\lambda(x_{t-1})$

stands for time-varying risk premiums. Now a conditional version of an asset pricing model implies the relation:

$$E\left(r_{i,t}\middle|x_{t-1}\right) = \beta_i'\lambda(x_{t-1}) \tag{14}$$

When $K = 1$, Equation (14) can be considered as the conditional CAPM, where f_t is a scalar representing the excess return on the aggregate market portfolio, and $\lambda(x_{t-1})$ is the expected market equity premium. Under rational asset pricing in the form of conditional CAPM, any predictability in $r_{i,t}$ emanates solely from the predictability of aggregate market returns in conjunction with the sensitivity of $r_{i,t}$ to the market portfolio, as given by $\beta_i\lambda(x_{t-1})$. Predictability in $r_{i,t}$ beyond what is produced by $\beta_i\lambda(x_{t-1})$ represents alpha predictability.

Following, Kong *et al.* (2009) and Jiang *et al.* (2011), the rational pricing-restricted combination forecast of $r_{i,t}$ based on the conditional CAPM in Equation (14) is given by

$$\hat{r}_{i,t}^{R} = \hat{\beta}_{i,t}\hat{f}_t^{C} \tag{15}$$

where $\hat{f}_t^{C}$ is the time-series of combination forecasts for the aggregate market based on the eight economic variables already explained in Section III. This can be viewed as a real time estimate of $\lambda(x_{t-1})$. $\hat{\beta}_{i,t}$ is obtained by regressing the component i excess return on the aggregate market excess return using the data from the beginning of the sample through $t-1$. The combination forecasts of the component from Section III, denoted by $\hat{r}_{i,t}^{C}$, does not impose the asset-pricing restriction given by Equation (14). It, thus, represents an unrestricted combination forecast that permits both rational and alpha predictability. As in Kong *et al.* (2009) and Jiang *et al.* (2011), we decompose the OR^2 statistics estimated earlier from Equation (10) into two statistics - OR_R^2 representing the rational component and OR_α^2 representing the alpha component. They are given by,

$$OR_R^2 = 1 - (MSFE_R/MSFE_H) \tag{16}$$

$$OR_\alpha^2 = 1 - (MSFE_C/MSFE_R) \tag{17}$$

where $MSFE_R$ and $MSFE_C$ are the mean squared forecast errors for the restricted and the unrestricted combination forecasts, respectively. OR_R^2 measures the reduction in mean squared forecast error for the rational pricing-restricted combination forecast compared to the historical average forecast, and OR_α^2 measures the decrease in the mean squared forecast error for the unrestricted combination forecast relative to the rational pricing-restricted combination forecast.

Table XXIV reports OR_R^2 and OR_α^2 statistics for combination forecasts that use eight economic variables as predictors. Panel A of Table XXIV indicates that nine of the 10 industries have a positive and significant OR_R^2 statistics, indicating that rational pricing as captured by conditional CAPM, explains a significant portion of out-of-sample predictability for almost all industries. Furthermore, OR_α^2 is significant only for one industry (heath care). The results for the book-to-market and size portfolios in Panels B and C, respectively, are similar to those in Panel A for industries. OR_R^2 statistics are positive and significant for the 10 book-to-market and the nine size portfolios. There is no evidence of alpha predictability in book-to-market and size portfolios. Taken together, these results suggest that the out-of-sample predictability based on eight economic variables is almost entirely attributable to rational out-of-sample predictability based on conditional CAPM, and that alpha predictability plays a role only in health care industry.

INSERT TABLE XXIV

As in Kong *et al.* (2009) and Jiang *et al.* (2011), we generate scatter plots (see Figure I) that show the fitted regression line for a cross-section model with OR_R^2 statistic as the dependent variables and the average $\hat{\beta}_{i,t}$ over the out-of-sample period as the independent variables. As per the rational asset pricing built on conditional CAPM, the components with greater exposure to the market portfolio should have significant gains from out-of-sample predictability for the rational-pricing restricted combination forecasts relative to historical

average forecasts. Panels A and C of Figure 1 show a clear positive correlation between the OR_R^2 statistics and the average betas for the industry and size portfolios. Furthermore, the estimated slope coefficient for the size portfolio is statistically significant with a sizeable R^2 of 63.8%. By comparison, there is no evidence of a significantly positive relation between OR_R^2 statistics and the average betas for the book-to-market portfolios. Although beyond the scope of this paper, considering conditional asset pricing models with additional factors could eliminate the alpha predictability evident in health care industry. We leave this for future research.

INSERT FIGURE I

C. Out-of-Sample Predictability and Industry Characteristics

The gradual news diffusion models of, for example, Hong *et al*. (2007), and Rapach *et al.* (2013), suggest that the extent of predictability across stocks is driven partly by information frictions. One source of information frictions is industry concentration. If industry concentration is high it suggests that investors are most likely to have complete information on just few large firms in the market, therefore we expect weaker predictability in industries with greater concentration. If the industry concentration is low it should be more costly for investors to obtain information for industries characterized by a large number of small firms. Information frictions are more pertinent here leading to greater predictability. Along the same lines, we expect a greater (lesser) degree of predictability for industries with smaller (larger) market capitalization share of the entire equity market. Consistent with this, Kong *et al.* (2009) and Jiang *et al.* (2011) show for US and China, respectively, that industry concentration and industry market capitalization significantly explain differences in return predictability across industries for the US and Chinese markets. We explore this possibility for the Indian stock market.

INSERT FIGURE II

Panel A (B) of Figure II shows a scatterplot relating the out-of-sample R^2 statistics for the combination forecasts based on eight economic variables reported in Table XV to industry concentration (industry market capitalization). Following Jiang *et al.* (2011), industry concentration is defined as the sum of the earnings share in percentage linked with the eight largest firms in a particular industry, while industry market capitalization is measured as the industry market capitalization percentage share of the entire equity market on average over our sample period. Panel A of Figure II shows a negative correlation between industry concentration and out-of-sample predictability across industries. The cross-section OLS regression yields a negative but insignificant slope coefficient (t-statistic equals -0.15) and a relatively smaller R^2 of 0.3%. This indicates that at least for some industries industry concentration helps explain predictability. Panel B of Figure II shows a negative correlation between industry market capitalization and out-of-sample predictability. Furthermore, the cross-section OLS regression yields a statistically significant coefficient (t-statistic equals -3.34) with a sizeable R^2 of 40.0%. This reveals the relevance of industry size in explaining out-of-sample predictability.

V. Robustness Tests

In this section, we examine the robustness of in-sample and out-of-sample results by altering the sample periods. The robustness test results are not reported here to conserve space, but are available upon request. In this section, we only discuss these results.

A. In-Sample Predictability Tests

We test whether in-sample predictability results for the pre-crisis period (1992:07-2007:01) are consistent with the full-sample period that includes the crisis period. For the aggregate market,

we find that economic variables (DE, DP, DY and EP) that predict returns over the full-sample period also predict returns during the pre-crisis period. However, BM that shows evidence of predictability over the full-sample period does not predict aggregate market returns over the pre-crisis period. Across all the components of the market (10 industries, 10 book-to-market portfolios, and 10 size portfolios), DE, a popular predictor of returns during the full-sample period, retains its popularity even over the pre-crisis period, while CFP and SVAR remain as the weakest predictors of returns. The predictability of INF strengthens during the pre-crisis period in that INF predicts returns for 25 portfolios as opposed to only four during the full-sample period. Predictors EP and DP predict returns for 10 and nine components, respectively. This compares to the evidence of predictability for 20 and 14 portfolios during the full-sample period. BM and DY predict returns for eight portfolios each. Telecommunications, basic materials and industrials remain the most predictable industries, where four predictors predict returns during pre-crisis period. Consumer goods is the least predictable industry, which was, by comparison, highly predictable over the full-sample period. Consumer services and utilities remain the least predictable industries, where three predictors predict returns. The predictability for health care, and oil and gas strengthens over the pre-crisis period. Regarding the most predictable book-to-market and size portfolios, the results are broadly similar to the full-sample evidence. Predictability of size portfolios strengthens over the pre-crisis period. Overall, we find that there are 100 models with significant predictability during the pre-crisis period as opposed to 98 models with significant predictability during the full-sample period. There are large number of models where in-sample predictability either holds or strengthens while considering a different sample period. The main implication is that while the difference in results can be attributed to the change in sample size and sample period, in the majority of the models the results remain robust to this change.

B. Out-of-Sample Predictability Tests

We use two additional out-of-sample forecast evaluation periods: (i) a long out-of-sample period covering 2001:05-2014:06 (60% of the full-sample period); and (ii) a small out-of-sample period covering 2005:09-2014:06 (40% of the full-sample period). The choice of out-of-sample period is mostly ad-hoc[7]. This motivates many studies to consider multiple out-of-sample evaluation periods (see, for instance, Goyal and Welch, 2008; Rapach *et al*., 2010, among others). The consideration of multiple out-of-sample periods allows one to gauge the robustness of the out-of-sample predictability results.

The out-of-sample predictability results for the aggregate market when using the longer out-of-sample period are similar to the out-of-sample predictability results based on 50% of the full-sample period. However, with a small out-of-sample period, the predictability for aggregate market weakens in that only four predictors predict aggregate market returns compared to the six predictors when using 50% as an out-of-sample period. The combination forecasts based on eight economic variables for the aggregate market remains unchanged with different out-of-sample periods. Across all the components, predictability is slightly higher during the longer out-of-sample period relative to the smaller and 50% out-of-sample period. For example, during the longer out-of-sample period, there are 104 models where at least four metrics support the predictive regression model. This compares to 89 models for the 50% out-of-sample period, and 60 models for the smaller out-of-sample period. These figures also indicate that for more than 67% of the models, the out-of-sample predictability results hold even while considering a longer or smaller out-of-sample period. The combination forecasts for the component portfolios hold for more than 73% of the models[8]. Predictors DY, SVAR

[7] Hansen and Timmermann (2012) and Rossi and Inoue (2012) have recently developed methods for conducting inference to avoid sample-split issues.

[8] Following, Goyal and Welch (2008), we also generate time-series plots of the differences between the cumulative square prediction error for historical average forecast and the cumulative square prediction error for the combination forecast. The plots are generated for the aggregate market and each of the components of the market for the period 2003:07-2014:06. The time-series patterns of the plots provide a useful picture of the out-of-sample

and DP remain popular predictors across all the out-of-sample periods. Consistent with the earlier results, CFP, DE and BM remain the weakest predictors across all sample periods. INF and EP display higher predictability when the out-of-sample period is long. However, the predictability substantially weakens when considering a smaller out-of-sample period. The key implication from this analysis is that, when we consider a small and a long out-of-sample period and compare results with the 50% out-of-sample period, we discover robust results in that predictability holds for more than 67% of the models.

VI. Concluding Remarks

In this paper we undertake an extensive empirical investigation of predictability and profitability in the Indian stock market for the aggregate market portfolio and its components that include industries, book-to-market and size sorted portfolios. We use a range of popular predictors. Our findings suggest that Indian stock returns are predictable although predictability is industry-specific, book-to-market specific, and size-specific. In-sample evidence of heterogeneous predictability is corroborated by an out-of-sample forecasting evaluation. Predictability and profits are therefore heterogeneous. The combination forecasts pick up economically meaningful changes in all the eight economic variables and significantly improve the out-of-sample forecasting performance relative to individual predictive regression models.

We analyse economic explanations for the differences in return predictability across the components of the Indian aggregate market portfolio. We find that industry return predictability is more evident during expansions, while book-to-market and size portfolio return predictability is more evident during recessions. Decomposing out-of-sample return predictability into rational and alpha components reveals that the out-of-sample predictability

forecast stability across different time periods and, as they indicate, the results are broadly consistent across a number of out-of-sample periods. The graphs are not plotted here for brevity but are available upon request.

based on eight economic variables is almost entirely attributable to rational out-of-sample predictability based on the conditional CAPM. Furthermore, industry concentration and industry market capitalization significantly explain differences in return predictability across industries, consistent with the information frictions in the equity market.

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Table I: Variable definitions

This table lists the variable names, their corresponding datatypes, and descriptions for all the variables downloaded from Datastream. The source of accounting data is Worldscope. Worldscope presents all the per share data on a fiscal year end basis.

Variable name	Datatype	Description
Mnemonic	MNEM	A unique identification code assigned by Datastream.
Name	NAME	The name of the security or company.
Geographical name	GEOGN	The home country of the company.
Exchange code	EXMNEM	The ISO exchange code that identifies the default source of price data.
ISIN code	ISIN	A unique international code to identify the security.
Closing price	P	The closing price adjusted for any subsequent capital actions.
Market value	MV	The product of closing price and number of shares in issue.
Turnover by volume	VO	The number of shares in thousands traded on a given day reported by the primary exchange for the stock.
Industry name	INDM2	The level 2 industrial classification name for the company as per the Industry Classification Benchmark.
Book value per share	WC05476	The book value per share represents the book value (proportioned common equity divided by outstanding shares) at the company's fiscal year end.
Cash flow per share	WC05501	The cash flow per share represents the cash earnings per share of the company before all non-cash charges or credits, such as depreciation, amortization, deferred taxes, and provisions.
Dividend per share	WC05101	The dividend per share represents total dividends (includes extra dividends and before normal withholding tax is deducted at the country's basic rate, but excludes the special tax credit available in some countries) per share declared during the fiscal year.
Earnings per share	WC05201	The earnings per share represents the earnings for the 12 months ended the fiscal year. Preferred stocks are included in the share base if they participate along with the common shares in the profits of the company.

Table II: Construction of predictor variables

This table provides the detail construction of eight predictor variables used in our study. To compute the financial ratios, we make sure the accounting data for fiscal year-end in year $t-1$ are used to compute the ratios for the July of year t to June of year $t+1$. The Datastream datatypes used to compute the predictors are mentioned in parenthesis in the second column of the table.

Predictor name	Description
Book-to-market ratio (BM)	For the months of July of year t to June of year $t+1$, BM is computed by dividing the book value (WC05476) for fiscal year-end in year $t-1$ by the price (P) at the end of the current month.
Dividend-payout ratio (DE)	It is the difference between the log dividends (WC05101) and log earnings (WC05201). The dividends and earnings for fiscal year-end in year $t-1$ are used to compute DE for the months of July of year t to June of year $t+1$
Dividend-price ratio (DP)	It is the difference between the log dividends (WC05101) and log of stock prices (P). For the months of July of year t to June of year $t+1$, DP is computed by dividing the log dividends for fiscal year-end in year $t-1$ by the log price at the end of the current month.
Dividend-yield (DY)	It is the difference between the log dividends (WC05101) and log of one-period lagged stock price (P). DY for the months of July of year t to June of year $t+1$ is computed by dividing the log dividends for fiscal year-end in year $t-1$ by the log of one-period lagged stock price.
Earnings-price ratio (EP)	It is the difference between the log earnings ("WC05201) and log of stock prices (P). For the months of July of year t to June of year $t+1$, EP is computed by dividing the log earnings for fiscal year-end in year $t-1$ by the log price at the end of the current month.
Cash flow-price ratio (CFP)	It is the ratio of the cash flow per share (WC05501) to the price (P) at the end of the current month. For the months of July of year t to June of year $t+1$, CFP is computed by dividing the cash flow per share for fiscal year-end in year $t-1$ by the price at the end of current month.
Inflation (INF)	It is computed using the consumer price index data downloaded from the global financial database.
Stock variance (SVAR)	It is the sum of squared daily returns on the value-weighted CNX 500 index return.

Table III: Descriptive statistics

This table reports sample means and standard deviations in percentage for excess returns and the eight economic variables covering the sample period 1992:07 to 2014:06. The excess returns are the returns in excess of weighted average call money rate for India. Skewness and kurtosis are also reported for all the portfolios. Panel A reports the summary statistics for the value-weighted aggregate market portfolio (Market) and the ten value-weighted industry portfolios. Panel B (C) reports summary statistics for 10 portfolios sorted on book-to-market (market capitalization) value. BM1, …, BM10 (S1, …, S10) represent deciles in ascending order for portfolios sorted on book-to-market (market capitalization) value. Paned D reports the summary statistics for eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR) used as predictors of returns.

	Mean	SD	Skew.	Kurt.		Mean	SD	Skew.	Kurt.
Panel A: Aggregate market and industry portfolio excess returns									
Market	-0.269	8.391	-0.539	4.698					
Basic Materials	-0.511	10.568	0.140	5.625	Industrials	-0.152	9.384	-0.401	4.220
Consumer Goods	0.059	7.016	-0.399	3.797	Oil and Gas	-0.033	9.669	-0.354	5.665
Consumer Services	-0.617	11.669	-0.357	5.039	Technology	0.845	13.768	-0.298	5.650
Financials	0.178	9.947	0.040	4.293	Telecommunications	0.231	11.944	-0.124	4.926
Health Care	0.600	7.953	-0.380	5.229	Utilities	-0.233	10.777	-0.233	5.311
Panel B: Book-to-market portfolio excess returns									
BM1	-0.152	8.757	-0.321	5.350	BM6	-0.515	9.802	-0.142	4.132
BM2	-0.095	8.855	-0.384	5.035	BM7	-0.374	9.523	-0.012	4.332
BM3	-0.275	9.144	-0.388	5.036	BM8	0.222	10.166	-0.031	3.529
BM4	-0.114	9.659	-0.179	4.670	BM9	-0.119	11.003	0.055	3.665
BM5	-0.163	9.797	-0.187	4.274	BM10	-0.126	11.438	0.142	3.686
Panel C: Size portfolio excess returns									
S1	0.368	10.396	0.193	3.455	S6	-0.528	10.431	-0.149	4.138
S2	-0.165	10.533	0.104	3.771	S7	-0.462	9.670	-0.369	4.828
S3	-0.009	10.370	-0.027	3.809	S8	-0.302	8.961	-0.167	4.815
S4	-0.084	10.222	-0.151	4.230	S9	-0.124	8.892	-0.211	5.406
S5	-0.217	10.299	-0.196	4.147	S10	-0.162	8.482	-0.232	4.641
Panel D: Economic variables									
BM	0.466	0.168			EP	-2.978	0.326		
DE	-1.428	0.171			CFP	0.109	0.034		
DP	-4.252	0.365			INF	0.635	0.288		
DY	-4.249	0.377			SVAR	0.005	0.006		

Table IV: ADF unit root test results for the aggregate market and industry portfolios

This table reports the augmented Dickey–Fuller (1981) unit root test results for the excess returns and for each of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR) used as predictors of returns. The results are reported for the aggregate market and each of the ten industries. The unit root test results are based on the ADF model and are implemented by including only the intercept term. We use the Schwarz information criterion and set a maximum of eight lags to obtain the optimal lag length. The test statistics and the resulting p-values are reported for each of the variables. The optimal lag length is reported in square brackets.

	Test stat[LL]	p-value	Test stat[LL]	p-value	Test stat[LL]	p-value	Test stat[LL]	p-value	Test stat[LL]	p-value
	Returns		BM		DE		DP		DY	
Market	-14.223[0]	0.000	-2.322[0]	0.166	-2.648[0]	0.085	-3.201[1]	0.021	-3.366[1]	0.013
Basic Materials	-13.815[0]	0.000	-1.747[0]	0.406	-1.798[0]	0.381	-1.884[0]	0.339	-1.944[0]	0.312
Consumer Goods	-16.004[0]	0.000	-3.300[0]	0.016	-1.503[0]	0.531	-2.567[0]	0.101	-2.585[0]	0.097
Consumer Services	-13.898[0]	0.000	-2.891[5]	0.048	-3.050[0]	0.032	-3.195[1]	0.021	-2.814[0]	0.058
Financials	-14.699[0]	0.000	-2.184[0]	0.213	-2.452[0]	0.129	-2.543[0]	0.107	-2.547[0]	0.106
Health Care	-15.315[0]	0.000	-3.496[1]	0.009	-2.877[0]	0.049	-3.470[0]	0.010	-3.499[0]	0.009
Industrials	-13.073[0]	0.000	-1.803[0]	0.379	-1.592[0]	0.485	-1.758[1]	0.401	-1.838[1]	0.362
Oil and Gas	-15.062[0]	0.000	-2.734[1]	0.070	-2.795[0]	0.060	-2.585[0]	0.097	-2.468[0]	0.125
Technology	-13.901[0]	0.000	-2.876[0]	0.050	-2.164[0]	0.220	-2.721[0]	0.072	-2.685[0]	0.078
Telecommunications	-9.014[1]	0.000	-1.863[3]	0.349	-1.859[0]	0.351	-1.501[0]	0.532	-1.501[0]	0.532
Utilities	-16.492[0]	0.000	-2.185[1]	0.213	-3.921[0]	0.002	-2.918[0]	0.045	-3.296[0]	0.016
	EP		CFP							
Market	-3.270[1]	0.017	-2.712[0]	0.073						
Basic Materials	-2.666[0]	0.082	-3.068[0]	0.030						
Consumer Goods	-2.602[0]	0.094	-3.165[0]	0.023						
Consumer Services	-4.216[3]	0.001	-3.244[1]	0.019						
Financials	-2.434[0]	0.133	-2.186[0]	0.212						
Health Care	-2.966[0]	0.040	-3.629[1]	0.006						
Industrials	-2.576[0]	0.099	-2.514[0]	0.113						
Oil and Gas	-2.550[0]	0.105	-3.464[0]	0.010						
Technology	-2.338[0]	0.161	-4.927[5]	0.000						
Telecommunications	-2.195[0]	0.209	-2.686[0]	0.078						
Utilities	-3.098[0]	0.028	-2.817[0]	0.057						
	INF		SVAR							
	-3.901[1]	0.002	-11.099[0]	0.000						

Table V: Results for the first-order autoregressive coefficient

This table reports the degree of persistency in excess returns and the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR) used as predictor of returns. The estimate is based on an autoregressive model of order one. The results are reported for the aggregate market and the ten industries.

	$AR(1)$ coefficient						
	Returns	BM	DE	DP	DY	EP	CFP
Market	0.130	0.961	0.951	0.945	0.936	0.942	0.944
Basic Materials	0.155	0.978	0.975	0.974	0.972	0.948	0.931
Consumer Goods	0.019	0.919	0.983	0.950	0.949	0.949	0.925
Consumer Services	0.149	0.968	0.933	0.945	0.941	0.950	0.943
Financials	0.097	0.966	0.963	0.951	0.951	0.957	0.964
Health Care	0.050	0.850	0.943	0.909	0.909	0.935	0.842
Industrials	0.212	0.975	0.979	0.982	0.981	0.949	0.952
Oil and Gas	0.073	0.956	0.943	0.952	0.955	0.951	0.912
Technology	0.153	0.938	0.975	0.974	0.973	0.960	0.897
Telecommunications	0.116	0.939	0.974	0.981	0.981	0.962	0.946
Utilities	0.008	0.952	0.929	0.941	0.935	0.942	0.950
	INF	SVAR					
	0.832	0.364					

Table VI: Results for heteroskedasticity tests for the aggregate market and industry portfolios

This table reports the heteroskedasticity test results for excess returns and the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR) used as predictors of returns. The results are reported for the aggregate market and for each of the ten industries. We square the variables and estimate the autocorrelations associated with the squared variables. The Q-statistics at lags 1, 4, 8 and 12 are reported with p-values in parenthesis.

	Autocorrelation (Q-stat)				Autocorrelation (Q-stat)			
	Lag 1	Lag 4	Lag 8	Lag 12	Lag 1	Lag 4	Lag 8	Lag 12
	Returns				BM			
Market	1.316 (0.25)	3.128 (0.53)	14.82 (0.06)	20.58 (0.05)	241.5 (0.00)	835.5 (0.00)	1343 (0.00)	1648 (0.00)
Basic Materials	3.254 (0.07)	6.457 (0.16)	42.92 (0.00)	56.55 (0.00)	248.1 (0.00)	881.4 (0.00)	1524 (0.00)	2010 (0.00)
Consumer Goods	0.115 (0.73)	4.962 (0.29)	9.254 (0.32)	16.83 (0.15)	210.7 (0.00)	664.8 (0.00)	927.0 (0.00)	1021 (0.00)
Consumer Services	26.74 (0.00)	63.51 (0.00)	115.5 (0.00)	141.7 (0.00)	234.4 (0.00)	798.1 (0.00)	1251 (0.00)	1517 (0.00)
Financials	0.457 (0.49)	10.81 (0.02)	26.08 (0.00)	27.76 (0.00)	240.8 (0.00)	835.7 (0.00)	1408 (0.00)	1865 (0.00)
Health Care	11.72 (0.00)	16.04 (0.00)	44.96 (0.00)	53.31 (0.00)	145.3 (0.00)	443.3 (0.00)	543.9 (0.00)	544.3 (0.00)
Industrials	1.364 (0.24)	3.529 (0.47)	35.63 (0.00)	37.36 (0.00)	243.6 (0.00)	879.0 (0.00)	1508 (0.00)	1972 (0.00)
Oil and Gas	0.922 (0.33)	1.357 (0.85)	11.21 (0.19)	19.09 (0.08)	238.7 (0.00)	769.6 (0.00)	1212 (0.00)	1560 (0.00)
Technology	42.40 (0.00)	105.0 (0.00)	134.4 (0.00)	186.9 (0.00)	218.5 (0.00)	781.7 (0.00)	1265 (0.00)	1486 (0.00)
Telecommunications	8.976 (0.00)	112.1 (0.00)	146.0 (0.00)	150.9 (0.00)	190.8 (0.00)	481.2 (0.00)	798.1 (0.00)	1018 (0.00)
Utilities	0.468 (0.49)	25.20 (0.00)	29.86 (0.00)	31.63 (0.00)	232.2 (0.00)	813.1 (0.00)	1427 (0.00)	1902 (0.00)
	DE				DP			
Market	238.5 (0.00)	824.4 (0.00)	1325 (0.00)	1586 (0.00)	236.4 (0.00)	725.5 (0.00)	1028 (0.00)	1129 (0.00)
Basic Materials	251.8 (0.00)	931.6 (0.00)	1702 (0.00)	2308 (0.00)	251.0 (0.00)	919.1 (0.00)	1637 (0.00)	2194 (0.00)
Consumer Goods	257.3 (0.00)	985.1 (0.00)	1845 (0.00)	2577 (0.00)	238.2 (0.00)	814.4 (0.00)	1289 (0.00)	1560 (0.00)
Consumer Services	233.2 (0.00)	785.5 (0.00)	1243 (0.00)	1460 (0.00)	243.9 (0.00)	784.3 (0.00)	1116 (0.00)	1190 (0.00)
Financials	246.2 (0.00)	873.5 (0.00)	1475 (0.00)	1864 (0.00)	238.8 (0.00)	804.0 (0.00)	1241 (0.00)	1490 (0.00)
Health Care	235.0 (0.00)	770.6 (0.00)	1161 (0.00)	1295 (0.00)	218.6 (0.00)	674.1 (0.00)	895.1 (0.00)	920.9 (0.00)
Industrials	257.2 (0.00)	982.2 (0.00)	1837 (0.00)	2573 (0.00)	252.8 (0.00)	914.7 (0.00)	1576 (0.00)	2052 (0.00)
Oil and Gas	232.6 (0.00)	757.7 (0.00)	1106 (0.00)	1230 (0.00)	240.2 (0.00)	846.7 (0.00)	1399 (0.00)	1739 (0.00)
Technology	257.3 (0.00)	983.3 (0.00)	1837 (0.00)	2556 (0.00)	256.4 (0.00)	960.2 (0.00)	1750 (0.00)	2407 (0.00)
Telecommunications	248.5 (0.00)	889.0 (0.00)	1523 (0.00)	1962 (0.00)	251.9 (0.00)	918.0 (0.00)	1626 (0.00)	2185 (0.00)
Utilities	228.3 (0.00)	716.0 (0.00)	1007 (0.00)	1062 (0.00)	235.5 (0.00)	806.4 (0.00)	1354 (0.00)	1725 (0.00)

Continued overleaf

Table VI: Continued

	Autocorrelation (Q-stat)				Autocorrelation (Q-stat)			
	Lag 1	Lag 4	Lag 8	Lag 12	Lag 1	Lag 4	Lag 8	Lag 12
	DY				EP			
Market	230.0 (0.00)	692.4 (0.00)	986.8 (0.00)	1089 (0.00)	237.2 (0.00)	729.7 (0.00)	1004 (0.00)	1070 (0.00)
Basic Materials	249.5 (0.00)	912.4 (0.00)	1626 (0.00)	2184 (0.00)	240.2 (0.00)	787.4 (0.00)	1202 (0.00)	1397 (0.00)
Consumer Goods	237.9 (0.00)	810.4 (0.00)	1281 (0.00)	1552 (0.00)	240.3 (0.00)	829.1 (0.00)	1348 (0.00)	1693 (0.00)
Consumer Services	242.3 (0.00)	782.3 (0.00)	1120 (0.00)	1197 (0.00)	240.4 (0.00)	716.1 (0.00)	878.1 (0.00)	886.9 (0.00)
Financials	239.2 (0.00)	803.7 (0.00)	1252 (0.00)	1519 (0.00)	243.2 (0.00)	837.8 (0.00)	1319 (0.00)	1589 (0.00)
Health Care	220.1 (0.00)	658.4 (0.00)	859.7 (0.00)	882.3 (0.00)	232.4 (0.00)	769.8 (0.00)	1144 (0.00)	1286 (0.00)
Industrials	252.9 (0.00)	913.8 (0.00)	1578 (0.00)	2061 (0.00)	238.2 (0.00)	784.9 (0.00)	1173 (0.00)	1339 (0.00)
Oil and Gas	241.2 (0.00)	855.4 (0.00)	1435 (0.00)	1803 (0.00)	240.0 (0.00)	817.1 (0.00)	1253 (0.00)	1460 (0.00)
Technology	255.0 (0.00)	951.8 (0.00)	1731 (0.00)	2380 (0.00)	245.4 (0.00)	849.9 (0.00)	1374 (0.00)	1697 (0.00)
Telecommunications	252.2 (0.00)	918.5 (0.00)	1620 (0.00)	2169 (0.00)	244.4 (0.00)	842.5 (0.00)	1345 (0.00)	1629 (0.00)
Utilities	231.2 (0.00)	783.4 (0.00)	1285 (0.00)	1622 (0.00)	236.5 (0.00)	807.2 (0.00)	1293 (0.00)	1555 (0.00)
	CFP							
Market	231.3 (0.00)	747.7 (0.00)	1097 (0.00)	1298 (0.00)				
Basic Materials	224.5 (0.00)	644.8 (0.00)	843.7 (0.00)	889.2 (0.00)				
Consumer Goods	215.5 (0.00)	653.2 (0.00)	866.3 (0.00)	929.5 (0.00)				
Consumer Services	226.3 (0.00)	652.1 (0.00)	807.5 (0.00)	814.8 (0.00)				
Financials	235.5 (0.00)	803.0 (0.00)	1355 (0.00)	1820 (0.00)				
Health Care	146.5 (0.00)	444.0 (0.00)	542.1 (0.00)	542.8 (0.00)				
Industrials	232.2 (0.00)	781.2 (0.00)	1229 (0.00)	1532 (0.00)				
Oil and Gas	172.1 (0.00)	493.3 (0.00)	679.9 (0.00)	790.6 (0.00)				
Technology	196.7 (0.00)	344.9 (0.00)	378.8 (0.00)	380.4 (0.00)				
Telecommunications	228.6 (0.00)	705.5 (0.00)	1014 (0.00)	1179 (0.00)				
Utilities	230.8 (0.00)	758.3 (0.00)	1157 (0.00)	1352 (0.00)				
	INF				SVAR			
	134.9 (0.00)	360.5 (0.00)	483.8 (0.00)	521.7 (0.00)	5.180 (0.02)	8.657 (0.07)	21.37 (0.00)	31.05 (0.00)

Table VII: Results for ARCH effects for the aggregate market and industry portfolios

This table reports the ARCH test results for excess returns and the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR) used as predictors of returns. The results are reported for the aggregate market and for each of the ten industries. We undertake ARCH tests by filtering each series through running an autoregressive regression model with twelve lags. We then apply the Lagrange Multiplier test to examine the null hypothesis of no ARCH in the filtered series. The F-statistics at lags 1, 4, 6 and 12 are reported with resulting p-values in parenthesis.

	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)
	Returns				BM			
Market	0.78 (0.37)	0.66 (0.61)	1.23 (0.27)	1.26 (0.23)	1.36 (0.24)	3.15 (0.01)	2.04 (0.04)	1.50 (0.12)
Basic Materials	1.64 (0.20)	1.80 (0.12)	3.43 (0.00)	3.21 (0.00)	2.62 (0.10)	7.01 (0.00)	3.84 (0.00)	3.65 (0.00)
Consumer Goods	0.42 (0.51)	0.64 (0.62)	0.69 (0.69)	1.58 (0.09)	0.01 (0.89)	0.28 (0.88)	1.77 (0.08)	1.34 (0.19)
Consumer Services	32.22 (0.00)	11.76 (0.00)	8.21 (0.00)	6.13 (0.00)	60.32 (0.00)	31.23 (0.00)	16.57 (0.00)	11.91(0.00)
Financials	0.02 (0.88)	2.30 (0.05)	2.85 (0.00)	2.15 (0.01)	0.00 (0.92)	0.17 (0.95)	0.42 (0.90)	1.75 (0.05)
Health Care	18.13 (0.00)	5.29 (0.00)	2.56 (0.01)	2.65 (0.00)	0.22 (0.63)	1.09 (0.36)	1.04 (0.40)	2.10 (0.01)
Industrials	0.31 (0.57)	0.45 (0.76)	1.64 (0.11)	1.28 (0.22)	6.14 (0.01)	7.55 (0.00)	7.38 (0.00)	5.17 (0.00)
Oil and Gas	0.22 (0.63)	0.20 (0.93)	0.82 (0.57)	0.99 (0.45)	0.61 (0.43)	1.39 (0.23)	1.08 (0.37)	1.06 (0.39)
Technology	48.05 (0.00)	16.59 (0.00)	8.88 (0.00)	7.09 (0.00)	7.91 (0.00)	5.64 (0.00)	2.95 (0.00)	2.89 (0.00)
Telecommunications	0.25 (0.61)	3.92 (0.00)	2.77 (0.00)	1.57 (0.10)	0.00 (0.97)	8.04 (0.00)	4.39 (0.00)	2.94 (0.00)
Utilities	0.49 (0.48)	5.04 (0.00)	3.18 (0.00)	0.64 (0.80)	0.28 (0.59)	0.52 (0.71)	0.54 (0.81)	13.00(0.00)
	DE				DP			
Market	0.55 (0.45)	6.37 (0.00)	3.19 (0.00)	2.49 (0.00)	2.83 (0.09)	7.11 (0.00)	3.64 (0.00)	3.76 (0.00)
Basic Materials	0.65 (0.41)	0.52 (0.71)	0.55 (0.81)	5.39 (0.00)	0.02 (0.88)	0.04 (0.99)	4.10 (0.00)	2.76 (0.00)
Consumer Goods	0.09 (0.75)	0.15 (0.96)	0.16 (0.99)	0.49 (0.91)	0.43 (0.51)	0.21 (0.92)	0.52 (0.83)	1.71 (0.06)
Consumer Services	0.07 (0.78)	0.42 (0.78)	0.24 (0.98)	0.29 (0.98)	0.43 (0.50)	16.48 (0.00)	8.45 (0.00)	5.47 (0.00)
Financials	0.01 (0.89)	0.04 (0.99)	0.04 (1.00)	0.28 (0.99)	0.01 (0.91)	0.04 (0.99)	0.99 (0.43)	0.66 (0.78)
Health Care	0.27 (0.60)	0.29 (0.87)	0.36 (0.93)	1.97 (0.02)	0.27 (0.59)	0.53 (0.71)	0.69 (0.69)	0.84 (0.60)
Industrials	0.00 (0.99)	0.04 (0.99)	0.04 (0.99)	52.40 (0.00)	1.15 (0.28)	1.07 (0.36)	0.94 (0.47)	2.09 (0.01)
Oil and Gas	0.12 (0.71)	0.08 (0.98)	0.10 (0.99)	0.58 (0.85)	0.14 (0.70)	0.18 (0.94)	0.16 (0.99)	0.50 (0.91)
Technology	0.08 (0.76)	0.06 (0.99)	0.09 (0.99)	4.49 (0.00)	0.06 (0.79)	0.97 (0.41)	0.53 (0.82)	0.74 (0.70)
Telecommunications	0.00 (0.92)	0.02 (0.99)	0.02 (1.00)	0.03 (1.00)	0.04 (0.82)	0.04 (0.99)	0.03 (1.00)	0.03 (1.00)
Utilities	0.03 (0.85)	0.01 (0.99)	0.02 (1.00)	3.66 (0.00)	10.01 (0.00)	6.57 (0.00)	2.88 (0.00)	1.83 (0.04)

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Table VII: Continued

	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)
	DY				EP			
Market	18.61 (0.00)	23.11 (0.00)	12.49 (0.00)	8.49 (0.00)	0.49 (0.48)	2.34 (0.05)	1.43 (0.18)	3.49 (0.00)
Basic Materials	0.00 (0.95)	0.06 (0.99)	3.04 (0.00)	2.14 (0.01)	1.13 (0.28)	0.61 (0.65)	0.42 (0.90)	9.57 (0.00)
Consumer Goods	0.02 (0.86)	0.40 (0.80)	0.81 (0.58)	1.15 (0.31)	0.52 (0.47)	0.29 (0.88)	0.47 (0.87)	0.93 (0.51)
Consumer Services	0.00 (0.92)	12.01 (0.00)	6.03 (0.00)	3.90 (0.00)	3.84 (0.05)	1.04 (0.38)	0.57 (0.80)	1.06 (0.38)
Financials	0.00 (0.94)	0.12 (0.97)	1.78 (0.07)	1.33 (0.19)	0.00 (0.99)	0.05 (0.99)	0.23 (0.98)	2.98 (0.00)
Health Care	0.22 (0.63)	0.30 (0.87)	0.39 (0.92)	0.85 (0.58)	0.15 (0.69)	0.13 (0.96)	0.26 (0.97)	0.28 (0.99)
Industrials	0.02 (0.87)	1.35 (0.24)	0.72 (0.66)	1.03 (0.41)	0.14 (0.70)	0.15 (0.95)	0.13 (0.99)	18.29(0.00)
Oil and Gas	0.07 (0.79)	0.08 (0.98)	0.07 (0.99)	0.15 (0.99)	0.65 (0.41)	0.29 (0.88)	0.41 (0.91)	1.02 (0.42)
Technology	0.00 (0.93)	1.65 (0.16)	0.91 (0.50)	0.79 (0.65)	0.13 (0.71)	0.30 (0.87)	0.16 (0.99)	10.48(0.00)
Telecommunications	0.03 (0.84)	0.03 (0.99)	0.03 (1.00)	0.04 (1.00)	0.04 (0.82)	0.02 (0.99)	0.03 (1.00)	0.23 (0.99)
Utilities	8.36 (0.00)	2.87 (0.02)	1.20 (0.29)	1.13 (0.33)	0.18 (0.67)	0.11 (0.97)	0.24 (0.98)	4.52 (0.00)
	CFP							
Market	0.13 (0.71)	1.20 (0.30)	1.11 (0.35)	1.68 (0.07)				
Basic Materials	0.00 (0.97)	0.30 (0.87)	0.29 (0.96)	2.12 (0.01)				
Consumer Goods	0.01 (0.90)	0.07 (0.98)	0.77 (0.62)	0.57 (0.86)				
Consumer Services	24.25 (0.00)	8.49 (0.00)	5.24 (0.00)	3.95 (0.00)				
Financials	0.04 (0.83)	0.07 (0.99)	0.05 (0.99)	0.09 (1.00)				
Health Care	0.25 (0.61)	1.39 (0.23)	1.31 (0.23)	2.52 (0.00)				
Industrials	0.22 (0.63)	0.21 (0.93)	0.41 (0.91)	0.32 (0.98)				
Oil and Gas	8.23 (0.00)	7.96 (0.00)	0.44 (0.89)	27.92 (0.00)				
Technology	35.72 (0.00)	109.9 (0.00)	56.36 (0.00)	37.40 (0.00)				
Telecommunications	0.58 (0.44)	2.27 (0.06)	2.19 (0.02)	3.93 (0.00)				
Utilities	0.01 (0.90)	0.87 (0.47)	0.47 (0.87)	1.64 (0.08)				
	INF				SVAR			
	30.96 (0.00)	8.40 (0.00)	4.08 (0.00)	9.76 (0.00)	0.21 (0.64)	0.14 (0.96)	0.53 (0.82)	1.07 (0.38)

Table VIII: Results for endogeneity tests for the aggregate market and industry portfolios

This table reports the endogeneity test results obtained through a three-step procedure. In the first step, we run the following predictive regression model: $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the aggregate market or the industry portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). In the second step, we follow Westerlund and Narayan (2014) and model the predictor variable as follows: $x_t = \mu(1-\rho) + \rho x_{t-1} + \varepsilon_{x,t}$. In the third step, the relationship between the error terms is captured using the following regression: $\varepsilon_{r,t} = \gamma \varepsilon_{x,t} + \eta_t$. If the coefficient γ is statistically different from zero, then the predictor variable is endogenous. We report the coefficient on γ, its test statistic and p-value. The three-step procedure is repeated for the eight economic variables.

	γ	t-stat	p-value	γ	t-stat	p-value	γ	t-stat	p-value	γ	t-stat	p-value
		BM			DE			DP			DY	
Market	-13.537	-19.476	0.000	5.738	0.578	0.564	-41.456	-12.654	0.000	-0.522	-0.140	0.888
Basic Materials	-83.423	-17.205	0.000	-5.405	-0.686	0.493	-33.898	-10.838	0.000	-4.870	-1.328	0.185
Consumer Goods	-15.408	-14.588	0.000	-2.964	-0.251	0.802	-55.813	-17.135	0.000	0.349	0.075	0.941
Consumer Services	-97.620	-15.782	0.000	-3.662	-0.580	0.562	-27.949	-10.095	0.000	-3.795	-1.232	0.219
Financials	-85.931	-17.315	0.000	5.782	0.525	0.600	-60.851	-19.773	0.000	-6.350	-1.287	0.199
Health Care	-8.509	-2.190	0.029	12.882	1.908	0.058	-41.225	-11.953	0.000	4.275	1.004	0.317
Industrials	-10.993	-20.822	0.000	-6.181	-0.651	0.515	-70.163	-23.802	0.000	-16.302	-3.140	0.002
Oil and Gas	-12.256	-25.672	0.000	5.642	1.061	0.290	-31.168	-10.043	0.000	0.569	0.152	0.879
Technology	-55.532	-5.209	0.000	8.872	1.237	0.217	-32.779	-9.929	0.000	-1.540	-0.423	0.673
Telecommunications	-36.340	-6.361	0.000	-3.188	-0.847	0.398	-10.611	-5.498	0.000	-2.387	-1.172	0.242
Utilities	-50.555	-12.880	0.000	4.314	0.848	0.397	-63.263	-18.091	0.000	4.941	0.934	0.351
		EP			CFP			INF			SVAR	
Market	-53.768	-16.431	0.000	-55.990	-18.965	0.000	-3.871	-1.183	0.238	-58.202	-6.890	0.000
Basic Materials	-43.791	-13.053	0.000	-34.638	-14.772	0.000	-5.544	-1.343	0.180	-49.728	-4.425	0.000
Consumer Goods	-54.390	-16.829	0.000	-62.265	-14.348	0.000	-1.576	-0.579	0.563	-42.584	-5.894	0.000
Consumer Services	-47.865	-15.019	0.000	-76.739	-14.695	0.000	-3.935	-0.860	0.391	-67.385	-5.568	0.000
Financials	-51.885	-16.919	0.000	-23.041	-12.422	0.000	-3.356	-0.867	0.387	-48.406	-4.647	0.000
Health Care	-44.760	-14.448	0.000	-52.287	-2.752	0.006	-5.285	-1.702	0.090	-55.528	-6.853	0.000
Industrials	-50.294	-15.287	0.000	-52.061	-20.773	0.000	-6.252	-1.714	0.088	-60.941	-6.361	0.000
Oil and Gas	-67.810	-23.438	0.000	-17.983	-9.722	0.000	-5.836	-1.551	0.122	-49.590	-4.804	0.000
Technology	-41.358	-13.152	0.000	-16.657	-1.396	0.164	-5.552	-1.033	0.303	-71.847	-4.911	0.000
Telecommunications	-31.559	-10.096	0.000	-36.608	-11.502	0.000	-5.083	-1.090	0.277	-45.197	-3.489	0.001
Utilities	-40.729	-13.723	0.000	-27.504	-13.181	0.000	-3.125	-0.764	0.446	-49.727	-4.485	0.000

Table IX: In-sample predictability test results for the aggregate market and industry portfolio excess returns

This table reports the in-sample predictability test results for the aggregate market and ten industries based on the following regression model: $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the aggregate market or the industry portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). We employ the following Westerlund and Narayan (2012, 2014) FQGLS-based t-statistic for testing $\beta = 0$:

$$t_{FQGLS} = \frac{\sum_{t=q_m+2}^{T} \pi_t^2 x_{t-1}^d r_t^d}{\sqrt{\sum_{t=q_m+2}^{T} \pi_t^2 (x_{t-1}^d)^2}}$$

where $\pi_t = 1/\sigma_{\eta_t}$ is the FQGLS weight, and $x_t^d = x_t - \sum_{s=2}^{T} x_s/T$ with a similar definition of r_t^d, where T is the sample size, and $q = \max\{q_x, q_{r,x}\}$. We report the 95% confidence interval for β based on both the sub-sample FQGLS test (t_{FQGLS}^{sub}) and the asymptotic FQGLS test (t_{FQGLS}). The estimation covers the sample period 1992:07-2014:06. When the confidence interval includes the value zero, we cannot reject the null of no predictability.

	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}
	BM		DE		DP	
Market	[-0.001 -0.003]	[-0.003 -0.002]	[0.005 0.006]	[0.005 0.005]	[0.007 0.005]	[0.004 0.005]
Basic Materials	[-0.002 -0.007]	[-0.005 -0.004]	[0.004 0.003]	[0.003 0.003]	[0.004 -0.001]	[0.000 0.002]
Consumer Goods	[0.000 -0.001]	[-0.001 -0.001]	[0.003 0.001]	[0.001 0.001]	[-0.003 -0.005]	[-0.006 -0.004]
Consumer Services	[0.000 -0.004]	[-0.004 -0.003]	[0.005 0.006]	[0.005 0.004]	[0.007 0.000]	[0.001 0.003]
Financials	[-0.001 -0.005]	[-0.004 -0.003]	[0.003 0.002]	[0.002 0.002]	[-0.001 -0.005]	[-0.005 -0.003]
Health Care	[0.001 -0.001]	[-0.001 0.000]	[0.007 0.007]	[0.006 0.006]	[-0.001 -0.002]	[-0.003 -0.001]
Industrials	[-0.002 -0.006]	[-0.006 -0.004]	[0.004 0.006]	[0.004 0.004]	[-0.001 -0.005]	[-0.005 -0.003]
Oil and Gas	[0.000 -0.004]	[-0.003 -0.002]	[0.008 0.008]	[0.007 0.007]	[0.010 0.002]	[0.003 0.004]
Technology	[0.001 -0.001]	[-0.001 -0.001]	[0.004 0.001]	[-0.001 0.000]	[0.007 -0.014]	[-0.014 -0.011]
Telecommunications	[-0.001 -0.003]	[-0.003 -0.002]	[0.016 0.014]	[0.013 0.013]	[0.023 0.020]	[0.017 0.019]
Utilities	[0.000 -0.005]	[-0.003 -0.002]	[0.003 0.004]	[0.003 0.003]	[0.002 -0.001]	[-0.001 0.001]

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Table IX: Continued

	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}
	DY		EP		CFP	
Market	[0.008 0.006]	[0.006 0.006]	[0.003 0.001]	[0.000 0.002]	[0.000 0.000]	[0.000 0.000]
Basic Materials	[0.005 0.001]	[0.002 0.002]	[-0.001 -0.005]	[-0.005 -0.004]	[0.000 -0.001]	[-0.001 0.000]
Consumer Goods	[-0.001 -0.003]	[-0.003 -0.003]	[0.001 -0.002]	[-0.002 0.000]	[0.000 0.000]	[0.000 0.000]
Consumer Services	[0.009 0.000]	[0.003 0.002]	[0.002 -0.005]	[-0.004 -0.002]	[0.000 0.000]	[0.000 0.000]
Financials	[0.000 -0.006]	[-0.004 -0.004]	[-0.001 -0.006]	[-0.006 -0.004]	[0.000 -0.001]	[0.000 0.000]
Health Care	[0.003 -0.001]	[0.000 0.000]	[-0.001 -0.004]	[-0.004 -0.002]	[0.000 0.000]	[0.000 0.000]
Industrials	[0.002 -0.003]	[-0.002 -0.002]	[-0.006 -0.009]	[-0.010 -0.008]	[0.000 -0.001]	[-0.001 -0.001]
Oil and Gas	[0.011 0.004]	[0.005 0.005]	[0.000 -0.003]	[-0.003 -0.002]	[0.001 0.000]	[0.000 0.001]
Technology	[0.009 -0.012]	[-0.011 -0.010]	[0.002 -0.005]	[-0.007 -0.005]	[0.002 0.001]	[0.001 0.001]
Telecommunications	[0.023 0.020]	[0.018 0.018]	[-0.006 -0.012]	[-0.012 -0.009]	[0.000 -0.001]	[-0.001 -0.001]
Utilities	[0.005 -0.002]	[0.000 -0.001]	[0.001 0.000]	[-0.003 -0.001]	[0.000 0.000]	[0.000 0.000]

	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}
	INF		SVAR	
Market	[0.002 -0.001]	[-0.001 0.000]	[0.000 0.000]	[0.000 0.000]
Basic Materials	[0.001 -0.002]	[-0.001 -0.001]	[0.000 0.000]	[0.000 0.000]
Consumer Goods	[0.007 0.002]	[0.003 0.004]	[0.000 0.000]	[0.000 0.000]
Consumer Services	[0.004 0.001]	[0.001 0.001]	[0.000 0.000]	[0.000 0.000]
Financials	[0.001 -0.002]	[-0.001 0.000]	[0.000 0.000]	[0.000 0.000]
Health Care	[0.003 0.000]	[0.001 0.002]	[0.000 0.000]	[0.000 0.000]
Industrials	[0.001 -0.002]	[-0.001 -0.001]	[0.000 0.000]	[0.000 0.000]
Oil and Gas	[0.001 -0.002]	[-0.002 -0.001]	[0.000 0.000]	[0.000 0.000]
Technology	[0.003 0.003]	[0.002 0.002]	[0.000 0.000]	[0.000 0.000]
Telecommunications	[0.001 -0.001]	[-0.001 0.000]	[0.000 0.000]	[0.000 0.000]
Utilities	[-0.001 -0.002]	[-0.002 -0.001]	[0.000 0.000]	[0.000 0.000]

Table X: In-sample predictability test results for book-to-market portfolio excess returns

This table reports the in-sample predictability test results for the 10 book-to-market sorted portfolios based on the following regression model: $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for book-to-market sorted portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). BM1, …, BM10 represent deciles in ascending order for portfolios sorted on book-to-market value. We employ the following Westerlund and Narayan (2012, 2014) FQGLS-based t-statistic for testing $\beta = 0$:

$$t_{FQGLS} = \frac{\sum_{t=q_m+2}^{T} \pi_t^2 x_{t-1}^d r_t^d}{\sqrt{\sum_{t=q_m+2}^{T} \pi_t^2 (x_{t-1}^d)^2}}$$

where $\pi_t = 1/\sigma_{\eta_t}$ is the FQGLS weight, and $x_t^d = x_t - \sum_{s=2}^{T} x_s/T$ with a similar definition of r_t^d, where T is the sample size, and $q = \max\{q_x, q_{r,x}\}$. We report the 95% confidence interval for β based on both the sub-sample FQGLS test (t_{FQGLS}^{sub}) and the asymptotic FQGLS test (t_{FQGLS}). The estimation covers the sample period 1992:07-2014:06. When the confidence interval includes the value zero, we cannot reject the null of no predictability.

	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}
	BM		DE		DP	
BM1	[0.001 0.001]	[-0.002 -0.001]	[0.005 0.007]	[0.005 0.005]	[0.011 0.005]	[0.005 0.006]
BM2	[0.000 -0.002]	[-0.002 -0.002]	[0.003 0.002]	[0.002 0.002]	[-0.002 -0.003]	[-0.004 -0.002]
BM3	[0.000 -0.003]	[-0.003 -0.002]	[0.003 0.003]	[0.003 0.003]	[0.000 -0.005]	[-0.005 -0.003]
BM4	[-0.002 -0.006]	[-0.005 -0.004]	[0.003 0.005]	[0.003 0.003]	[-0.001 -0.007]	[-0.005 -0.004]
BM5	[-0.001 -0.006]	[-0.005 -0.004]	[0.002 0.001]	[0.001 0.001]	[0.003 -0.002]	[-0.002 -0.001]
BM6	[-0.002 -0.008]	[-0.008 -0.006]	[0.004 0.004]	[0.004 0.004]	[0.000 -0.004]	[-0.004 -0.002]
BM7	[0.003 -0.006]	[-0.005 -0.003]	[0.003 0.004]	[0.003 0.003]	[0.003 -0.001]	[-0.001 0.000]
BM8	[-0.001 -0.015]	[-0.011 -0.009]	[0.003 0.004]	[0.003 0.004]	[0.000 -0.004]	[-0.003 -0.002]
BM9	[0.004 -0.017]	[-0.011 -0.008]	[0.004 0.004]	[0.004 0.003]	[0.004 -0.004]	[-0.003 -0.001]
BM10	[0.028 -0.022]	[-0.016 -0.003]	[0.003 0.003]	[0.003 0.003]	[0.003 0.001]	[0.000 0.001]

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Table X: Continued

	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}
	DY		EP		CFP	
BM1	[0.014 0.006]	[0.007 0.007]	[0.000 -0.005]	[-0.004 -0.002]	[0.001 0.000]	[0.000 0.000]
BM2	[0.002 -0.001]	[-0.001 -0.001]	[-0.002 -0.006]	[-0.006 -0.004]	[0.000 -0.001]	[-0.001 0.000]
BM3	[0.001 -0.004]	[-0.003 -0.003]	[0.000 -0.008]	[-0.007 -0.005]	[0.000 0.000]	[0.000 0.000]
BM4	[0.000 -0.005]	[-0.003 -0.003]	[-0.004 -0.007]	[-0.009 -0.007]	[-0.001 -0.002]	[-0.002 -0.001]
BM5	[0.004 0.000]	[0.001 0.000]	[-0.003 -0.009]	[-0.009 -0.006]	[0.000 -0.001]	[-0.001 -0.001]
BM6	[0.004 -0.001]	[0.000 0.000]	[-0.004 -0.007]	[-0.009 -0.007]	[0.000 -0.002]	[-0.002 -0.001]
BM7	[0.005 0.000]	[0.002 0.001]	[-0.002 -0.006]	[-0.006 -0.004]	[0.000 -0.001]	[-0.001 0.000]
BM8	[0.002 -0.003]	[-0.001 -0.001]	[-0.004 -0.009]	[-0.009 -0.008]	[0.000 -0.001]	[-0.001 -0.001]
BM9	[0.005 -0.003]	[0.000 -0.001]	[-0.002 -0.008]	[-0.007 -0.005]	[0.000 -0.001]	[-0.001 -0.001]
BM10	[0.004 0.002]	[0.001 0.001]	[0.001 -0.006]	[-0.004 -0.003]	[0.001 -0.002]	[-0.001 -0.001]
	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}		
	INF		SVAR			
BM1	[0.004 0.003]	[0.002 0.002]	[0.000 0.000]	[0.000 0.000]		
BM2	[0.000 -0.002]	[-0.002 -0.001]	[0.000 0.000]	[0.000 0.000]		
BM3	[0.001 -0.001]	[-0.001 0.000]	[0.000 0.000]	[0.000 0.000]		
BM4	[0.001 -0.002]	[-0.001 -0.001]	[0.000 0.000]	[0.000 0.000]		
BM5	[0.000 -0.001]	[-0.002 -0.002]	[0.000 0.000]	[0.000 0.000]		
BM6	[-0.001 -0.003]	[-0.003 -0.002]	[0.000 0.000]	[0.000 0.000]		
BM7	[0.000 -0.003]	[-0.003 -0.002]	[0.000 0.000]	[0.000 0.000]		
BM8	[0.000 -0.002]	[-0.002 -0.002]	[0.000 0.000]	[0.000 0.000]		
BM9	[0.000 -0.001]	[-0.002 -0.002]	[0.000 0.000]	[0.000 0.000]		
BM10	[0.000 -0.001]	[-0.001 -0.001]	[0.000 0.000]	[0.000 0.000]		

Table XI: In-sample predictability test results for size portfolio excess returns

This table reports the in-sample predictability test results for the 10 market capitalization sorted portfolios based on the following regression model: $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for market capitalization sorted portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). S1, …, S10 represent deciles in ascending order for portfolios sorted on market capitalization. We employ the following Westerlund and Narayan (2012, 2014) FQGLS-based t-statistic for testing $\beta = 0$:

$$t_{FQGLS} = \frac{\sum_{t=q_m+2}^{T} \pi_t^2 x_{t-1}^d r_t^d}{\sqrt{\sum_{t=q_m+2}^{T} \pi_t^2 (x_{t-1}^d)^2}}$$

where $\pi_t = 1/\sigma_{\eta_t}$ is the FQGLS weight, and $x_t^d = x_t - \sum_{s=2}^{T} x_s/T$ with a similar definition of r_t^d, where T is the sample size, and $q = \max\{q_x, q_{r,x}\}$. We report the 95% confidence interval for β based on both the sub-sample FQGLS test (t_{FQGLS}^{sub}) and the asymptotic FQGLS test (t_{FQGLS}). The estimation covers the sample period 1992:07-2014:06. When the confidence interval includes the value zero, we cannot reject the null of no predictability.

	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}
	BM		DE		DP	
S1	[0.010 -0.012]	[-0.010 -0.006]	[0.002 0.002]	[0.002 0.002]	[0.003 -0.001]	[-0.001 -0.001]
S2	[0.011 -0.010]	[-0.009 -0.004]	[0.001 0.002]	[0.001 0.001]	[0.005 0.001]	[0.000 0.001]
S3	[0.003 -0.007]	[-0.006 -0.003]	[0.003 0.003]	[0.003 0.003]	[0.002 -0.002]	[-0.003 -0.001]
S4	[0.000 -0.012]	[-0.010 -0.008]	[0.003 0.004]	[0.003 0.003]	[-0.001 -0.007]	[-0.007 -0.005]
S5	[0.004 -0.012]	[-0.009 -0.006]	[0.003 0.004]	[0.003 0.003]	[-0.001 -0.003]	[-0.004 -0.002]
S6	[-0.002 -0.012]	[-0.008 -0.006]	[0.004 0.007]	[0.005 0.005]	[0.001 -0.003]	[-0.003 -0.002]
S7	[0.000 -0.009]	[-0.009 -0.007]	[0.003 0.004]	[0.003 0.003]	[0.001 -0.002]	[-0.003 -0.001]
S8	[-0.001 -0.006]	[-0.005 -0.004]	[0.006 0.005]	[0.005 0.005]	[0.000 -0.004]	[-0.004 -0.002]
S9	[0.000 -0.004]	[-0.004 -0.003]	[0.002 0.002]	[0.001 0.001]	[-0.001 -0.004]	[-0.005 -0.003]
S10	[-0.002 -0.005]	[-0.005 -0.004]	[0.004 0.004]	[0.004 0.004]	[0.000 -0.003]	[-0.003 -0.001]

Continued Overleaf

Table XI: Continued

	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}
	DY		EP		CFP	
S1	[0.004 -0.002]	[0.000 0.000]	[0.001 -0.005]	[-0.003 -0.002]	[0.003 0.003]	[0.002 0.002]
S2	[0.006 0.002]	[0.002 0.002]	[-0.001 -0.009]	[-0.006 -0.005]	[0.000 -0.003]	[-0.002 -0.002]
S3	[0.003 -0.001]	[0.000 0.000]	[-0.001 -0.005]	[-0.005 -0.003]	[0.001 -0.001]	[0.000 0.000]
S4	[0.000 -0.006]	[-0.004 -0.004]	[-0.006 -0.008]	[-0.008 -0.007]	[0.000 -0.002]	[-0.001 -0.001]
S5	[0.002 -0.002]	[-0.001 -0.002]	[-0.002 -0.006]	[-0.006 -0.005]	[0.000 -0.002]	[-0.002 -0.001]
S6	[0.004 -0.001]	[0.000 0.000]	[-0.002 -0.008]	[-0.006 -0.004]	[0.000 -0.002]	[-0.001 -0.001]
S7	[0.002 -0.001]	[0.000 0.000]	[-0.003 -0.008]	[-0.008 -0.006]	[0.000 0.000]	[0.000 0.000]
S8	[0.002 -0.003]	[-0.001 -0.001]	[-0.002 -0.006]	[-0.006 -0.004]	[0.000 -0.001]	[-0.001 -0.001]
S9	[0.003 -0.004]	[-0.002 -0.002]	[-0.001 -0.004]	[-0.005 -0.003]	[0.000 0.000]	[0.000 0.000]
S10	[0.002 -0.002]	[-0.001 -0.001]	[-0.003 -0.007]	[-0.007 -0.005]	[0.000 -0.001]	[-0.001 0.000]
	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}		
	INF		SVAR			
S1	[0.000 -0.001]	[-0.002 -0.001]	[0.000 0.000]	[0.000 0.000]		
S2	[-0.001 -0.002]	[-0.003 -0.002]	[0.000 0.000]	[0.000 0.000]		
S3	[0.000 -0.002]	[-0.002 -0.002]	[0.000 0.000]	[0.000 0.000]		
S4	[0.000 -0.002]	[-0.002 -0.002]	[0.000 0.000]	[0.000 0.000]		
S5	[0.001 -0.002]	[-0.001 -0.001]	[0.000 0.000]	[0.000 0.000]		
S6	[0.000 -0.002]	[-0.002 -0.001]	[0.000 0.000]	[0.000 0.000]		
S7	[0.001 -0.002]	[-0.002 -0.001]	[0.000 0.000]	[0.000 0.000]		
S8	[0.001 -0.002]	[-0.001 -0.001]	[0.000 0.000]	[0.000 0.000]		
S9	[0.002 -0.003]	[-0.001 -0.001]	[0.000 0.000]	[0.000 0.000]		
S10	[0.003 -0.001]	[0.000 0.000]	[0.000 0.000]	[0.000 0.000]		

Table XII: Out-of-sample forecast evaluation results for the aggregate market and industry portfolio excess returns

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the benchmark historical mean model for the 2003:07-2014:06 out-of-sample period. The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the aggregate market or industry portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 50% of the full sample. One-step ahead out-of-sample forecasts are generated recursively. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz R^2(RMZ), and relative success ratio (RSR). $RMAE$ and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that predictive regression model out-performs historical mean model. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	BM						DE					
Market	1.001	1.008	-0.154	0.087	2.768	1.000	0.987	0.984	2.491	1.483*	6.604	1.250
Basic Materials	1.004	1.005	-0.871	-2.167	20.779	0.967	1.005	1.006	-1.061	-1.187	13.351	0.951
Consumer Goods	0.994	0.994	1.118	0.959	0.080	1.086	1.005	0.999	-1.024	-0.179	6.384	1.259
Consumer Services	0.995	1.003	0.981	1.461*	2.475	1.000	1.029	1.024	-5.814	0.644	0.074	1.161
Financials	0.998	0.997	0.360	1.744*	8.657	1.045	1.004	1.003	-0.769	-1.211	7.587	0.940
Health Care	1.000	1.000	-0.050	-1.357	29.347	1.000	1.001	1.006	-0.197	-0.065	0.730	0.890
Industrials	1.003	0.999	-0.691	-1.328	25.550	1.217	1.016	1.039	-3.202	-0.568	0.429	1.043
Oil and Gas	1.006	1.018	-1.250	-0.261	0.949	1.073	0.996	0.990	0.810	1.002	0.022	1.364
Technology	1.001	0.999	-0.179	-0.223	3.783	1.000	1.002	1.000	-0.315	-0.714	4.095	1.000
Telecommunications	1.004	1.003	-0.836	-1.400	10.242	0.971	0.977	0.966	4.495	2.492*	9.740	1.101
Utilities	1.007	1.022	-1.447	-0.912	12.695	1.018	1.001	0.993	-0.121	0.051	6.358	1.263
	DP						DY					
Market	0.962	0.943	7.534	2.941*	2.335	1.404	0.954	0.936	9.055	3.271*	1.494	1.404
Basic Materials	0.999	1.001	0.222	0.604	0.156	0.967	0.996	1.000	0.713	0.880	0.243	1.033
Consumer Goods	0.987	0.999	2.640	2.166*	1.465	1.086	0.985	0.997	3.000	2.470*	0.840	1.121
Consumer Services	1.004	0.998	-0.776	1.030	0.013	1.250	1.001	0.998	-0.293	1.342	0.052	1.268
Financials	0.997	0.997	0.599	1.483*	0.000	1.119	0.993	0.995	1.375	2.320*	0.363	1.104
Health Care	0.982	0.972	3.551	2.639*	1.445	1.024	0.981	0.971	3.841	2.880*	0.782	1.012
Industrials	1.001	1.017	-0.194	0.250	0.001	1.065	0.997	1.020	0.693	1.023	0.923	1.065
Oil and Gas	0.988	0.982	2.444	1.982*	0.924	1.309	0.986	0.983	2.807	2.085*	0.525	1.418
Technology	1.000	0.999	-0.010	0.040	0.268	1.000	1.000	0.999	-0.065	-0.153	0.250	1.000
Telecommunications	0.985	0.979	2.886	2.097*	0.860	1.072	0.983	0.975	3.361	2.242*	0.520	1.101
Utilities	1.012	1.035	-2.410	0.821	0.099	1.140	1.009	1.031	-1.787	0.943	0.057	1.228

Continued Overleaf

Table XII: Continued

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	EP						CFP					
Market	0.978	0.974	4.445	2.224*	6.948	1.231	0.989	1.011	2.207	1.783*	1.056	1.250
Basic Materials	0.989	0.987	2.116	1.805*	5.535	1.148	0.990	0.991	2.031	1.831*	0.716	1.115
Consumer Goods	0.983	0.978	3.299	2.124*	3.014	1.293	0.987	0.975	2.639	1.619*	0.132	1.310
Consumer Services	0.997	1.010	0.526	0.833	1.120	1.000	0.994	1.009	1.123	0.976	0.254	1.054
Financials	0.999	0.999	0.124	0.449	3.700	1.015	0.996	0.999	0.775	1.625*	0.119	1.015
Health Care	0.997	0.991	0.517	0.589	0.046	1.037	1.000	1.000	-0.010	-0.112	1.319	1.000
Industrials	1.000	0.997	0.028	0.163	13.119	1.196	1.002	1.011	-0.495	-0.452	0.445	1.022
Oil and Gas	0.988	0.993	2.373	1.859*	6.241	1.382	1.026	1.061	-5.233	0.452	0.308	1.127
Technology	1.002	1.002	-0.343	-0.620	1.764	0.987	0.999	0.993	0.170	0.411	0.099	1.000
Telecommunications	0.997	0.989	0.675	0.998	0.349	1.029	1.001	1.001	-0.117	-0.876	0.917	1.014
Utilities	1.002	1.031	-0.393	0.421	0.282	1.053	1.001	1.030	-0.253	0.525	0.191	1.035
	INF						SVAR					
Market	0.998	0.995	0.401	0.841	0.032	1.058	0.999	0.993	0.147	0.780	0.073	1.000
Basic Materials	0.998	0.997	0.401	0.874	0.041	1.000	1.001	1.000	-0.125	0.279	0.073	0.885
Consumer Goods	1.005	1.007	-1.026	-0.873	0.282	1.000	1.012	1.022	-2.393	-1.890	0.387	0.948
Consumer Services	1.002	1.002	-0.389	-0.801	0.473	1.000	0.999	0.996	0.154	1.740*	0.416	1.143
Financials	0.996	0.996	0.869	1.268	0.082	1.134	1.000	1.001	-0.082	0.356	0.035	1.030
Health Care	1.004	1.000	-0.842	-0.604	0.241	0.963	1.003	1.009	-0.554	-0.622	0.183	0.951
Industrials	1.000	1.003	-0.063	0.053	0.386	1.152	0.998	0.994	0.342	1.009	0.000	1.413
Oil and Gas	0.999	1.004	0.172	0.616	0.000	1.255	1.001	1.001	-0.270	-1.479	1.213	1.091
Technology	1.005	1.002	-0.911	-1.339	0.544	1.000	1.020	1.016	-4.013	-0.248	0.029	0.987
Telecommunications	0.993	0.994	1.391	1.404*	0.164	1.130	1.001	1.000	-0.153	0.260	0.102	1.014
Utilities	0.993	0.986	1.297	1.229	0.097	1.386	1.001	1.000	-0.150	-0.035	0.351	1.263

Table XIII: Out-of-sample forecast evaluation results for book-to-market portfolio excess returns

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the benchmark historical mean model for the 2003:07-2014:06 out-of-sample period. The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for book-to-market sorted portfolio and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 50% of the full sample. One-step ahead out-of-sample forecasts are generated recursively. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz R^2(RMZ), and relative success ratio (RSR). RMAE and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that predictive regression model out-performs historical mean model. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	RMAE	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	RMAE	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	BM						DE					
BM1	0.993	0.992	1.340	1.419*	1.766	1.193	0.994	1.000	1.295	1.017	0.457	1.053
BM2	1.008	1.016	-1.626	-0.367	7.196	1.094	1.012	0.989	-2.368	-0.401	3.370	1.151
BM3	1.002	1.003	-0.482	-0.353	12.373	1.154	1.007	1.020	-1.505	0.049	0.183	1.077
BM4	1.002	1.002	-0.382	-1.057	28.445	1.054	1.011	1.014	-2.156	-0.900	4.962	0.911
BM5	1.002	1.002	-0.405	-0.054	5.628	1.125	1.010	0.999	-2.041	-0.192	2.363	1.107
BM6	1.006	1.014	-1.187	-0.896	12.458	1.036	1.003	1.006	-0.568	-0.180	1.076	1.000
BM7	1.003	1.012	-0.559	0.082	1.254	1.017	1.017	1.020	-3.447	-2.421	10.913	0.983
BM8	1.003	1.009	-0.659	-0.726	16.218	0.930	1.005	1.005	-0.922	-1.039	9.043	1.000
BM9	1.001	1.001	-0.266	-0.869	26.962	1.089	1.013	1.024	-2.559	-0.926	2.133	1.089
BM10	0.998	1.002	0.351	0.814	1.291	0.894	0.999	0.998	0.144	0.499	2.627	1.061
	DP						DY					
BM1	0.994	0.991	1.101	1.284*	0.235	1.246	0.991	0.989	1.696	1.656*	0.017	1.246
BM2	0.995	1.001	1.009	1.080	0.017	1.189	0.987	0.995	2.646	1.623*	0.204	1.245
BM3	0.998	1.000	0.465	0.539	0.000	1.077	0.988	0.993	2.386	1.319*	0.344	1.192
BM4	1.001	1.001	-0.215	-0.472	2.005	1.107	0.998	1.001	0.448	0.889	0.209	0.946
BM5	0.997	0.998	0.506	1.027	0.052	1.143	0.992	0.995	1.597	1.862*	0.145	1.179
BM6	1.009	1.020	-1.885	-0.132	0.054	1.091	1.004	1.016	-0.764	0.494	0.015	1.109
BM7	0.999	1.010	0.251	0.747	0.036	1.102	0.993	1.006	1.394	1.376*	0.193	1.119
BM8	1.000	1.002	0.036	0.253	2.239	1.000	0.997	1.002	0.510	1.148	0.149	0.972
BM9	1.001	1.007	-0.135	0.187	0.838	1.143	0.998	1.006	0.308	0.646	0.120	1.125
BM10	1.000	0.999	0.050	0.328	1.569	1.045	0.999	0.998	0.270	0.976	0.437	1.015

Continued Overleaf

Table XIII: Continued

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	EP						CFP					
BM1	0.984	0.993	3.239	2.026*	6.762	1.158	1.005	1.009	-1.099	-0.565	0.468	1.000
BM2	1.001	1.004	-0.152	0.248	1.115	1.094	1.011	1.019	-2.200	-0.374	0.365	0.962
BM3	0.999	1.000	0.126	0.297	2.831	0.981	1.002	1.009	-0.430	0.025	0.141	1.000
BM4	1.002	1.000	-0.412	-1.177	12.707	1.089	1.003	1.003	-0.672	-1.718	1.676	0.982
BM5	1.001	1.000	-0.152	-0.340	13.366	1.054	0.998	1.000	0.441	0.721	0.001	1.125
BM6	1.003	1.005	-0.606	-1.245	12.633	1.000	1.005	1.017	-1.046	-0.297	0.135	1.091
BM7	0.997	1.001	0.527	0.672	0.057	0.983	0.993	1.011	1.360	1.270	0.224	1.102
BM8	1.001	1.001	-0.254	-1.163	12.252	1.000	0.997	1.007	0.639	0.989	0.006	0.831
BM9	1.001	0.998	-0.113	-0.255	10.682	1.143	1.001	0.999	-0.174	-0.274	0.781	1.125
BM10	1.002	1.001	-0.347	-0.919	7.633	1.000	0.997	0.998	0.557	1.219	0.067	0.985
	INF						SVAR					
BM1	1.010	1.007	-2.023	-1.547	0.477	1.000	0.999	0.994	0.215	0.617	0.024	1.140
BM2	0.999	1.003	0.231	0.630	0.035	1.189	0.997	0.992	0.615	0.945	0.000	1.170
BM3	0.999	0.998	0.162	0.514	0.042	1.115	0.994	0.989	1.115	1.330*	0.100	1.173
BM4	0.999	0.999	0.231	0.594	0.039	1.179	0.996	0.989	0.729	1.147	0.014	1.179
BM5	0.996	0.999	0.798	1.171	0.032	1.179	0.998	0.987	0.484	0.800	0.002	1.054
BM6	0.995	0.996	1.038	1.279	0.068	1.073	0.996	0.986	0.767	1.077	0.001	1.055
BM7	0.996	0.999	0.709	1.054	0.044	1.153	0.996	0.985	0.759	1.358*	0.040	1.085
BM8	0.996	1.001	0.864	1.203	0.039	1.085	0.996	0.989	0.719	1.293*	0.078	1.028
BM9	0.995	0.999	1.036	1.348*	0.043	1.321	0.997	0.987	0.527	0.998	0.001	1.214
BM10	1.001	1.001	-0.154	-0.221	0.201	1.045	0.997	0.987	0.560	1.027	0.024	1.061

Table XIV: Out-of-sample forecast evaluation results for size portfolio excess returns

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the benchmark historical mean model for the 2003:07-2014:06 out-of-sample period. The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the market capitalization sorted portfolio and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 50% of the full sample. One-step ahead out-of-sample forecasts are generated recursively. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz R^2(RMZ), and relative success ratio (RSR). RMAE and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that predictive regression model out-performs historical mean model. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	RMAE	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	RMAE	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	BM						DE					
S1	1.000	0.999	0.062	0.428	20.568	0.972	1.003	1.006	-0.646	-0.654	12.216	0.917
S2	1.005	1.008	-1.090	-1.371	23.669	0.982	0.999	0.991	0.123	0.980	0.877	1.143
S3	1.002	1.008	-0.415	-0.148	6.519	0.896	0.998	1.006	0.340	0.551	0.048	1.000
S4	1.003	1.005	-0.504	-0.913	21.117	0.932	1.006	1.000	-1.213	-1.315	9.693	1.051
S5	1.001	1.002	-0.290	-1.229	25.634	1.096	1.010	0.995	-1.987	-0.585	3.974	1.231
S6	1.003	1.011	-0.597	-0.205	5.041	1.089	1.012	1.031	-2.370	-0.466	0.163	1.000
S7	1.005	1.010	-1.102	-1.530	21.077	0.982	1.009	1.009	-1.843	-1.092	6.111	1.000
S8	0.999	1.008	0.215	0.666	0.017	1.089	1.008	1.006	-1.566	-0.448	2.522	0.982
S9	0.999	0.998	0.277	0.691	10.234	1.035	1.014	1.013	-2.748	-1.454	7.597	1.123
S10	0.998	1.002	0.460	0.941	1.000	1.132	0.999	0.997	0.200	0.363	1.000	0.962
	DP						DY					
S1	1.004	1.003	-0.779	-1.177	0.657	0.944	1.003	1.002	-0.681	-1.639	0.557	0.944
S2	0.995	0.997	1.018	1.346*	0.016	1.304	0.991	0.994	1.706	1.769*	0.012	1.286
S3	0.998	1.009	0.411	0.839	0.000	0.955	0.994	1.006	1.244	1.288*	0.070	0.940
S4	1.008	1.009	-1.527	-2.055	1.979	0.915	1.007	1.010	-1.419	-1.401	0.572	0.898
S5	0.994	1.004	1.128	1.789*	0.362	1.077	0.988	1.002	2.462	2.324*	0.917	1.096
S6	0.988	1.000	2.318	1.704*	0.997	1.214	0.980	0.995	3.950	2.210*	1.052	1.232
S7	0.997	1.005	0.595	0.745	0.004	1.000	0.990	1.000	2.065	1.496*	0.232	1.053
S8	0.988	1.004	2.292	1.687*	0.681	1.143	0.978	0.997	4.435	2.232*	1.044	1.143
S9	0.994	0.995	1.149	1.252	0.006	1.105	0.984	0.985	3.175	1.941*	0.526	1.175
S10	0.979	0.982	4.141	2.070*	1.000	1.189	0.968	0.969	6.252	2.559*	1.000	1.226

Continued Overleaf

Table XIV: Continued

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	EP						CFP					
S1	1.000	0.999	0.096	0.433	5.172	0.986	1.005	1.005	-0.913	-1.290	1.123	0.917
S2	1.003	1.003	-0.514	-1.816	12.881	1.018	1.007	1.009	-1.493	-1.751	1.187	1.018
S3	1.001	1.007	-0.252	-0.132	5.369	0.791	0.999	1.000	0.130	0.499	0.008	0.910
S4	1.004	1.007	-0.872	-0.926	7.847	0.932	1.002	1.006	-0.333	-0.146	0.448	0.983
S5	1.001	1.000	-0.203	-0.538	13.755	0.962	1.001	1.004	-0.300	-0.286	0.948	1.000
S6	0.999	1.001	0.137	0.328	4.493	0.982	1.000	1.008	0.005	0.379	0.102	1.089
S7	1.001	1.005	-0.119	0.108	3.113	0.877	1.000	1.013	0.009	0.553	0.001	1.000
S8	1.000	1.004	0.067	0.252	1.171	0.964	1.005	1.022	-1.011	0.180	0.008	0.964
S9	0.995	0.995	1.066	1.203	0.008	1.105	0.986	0.992	2.774	2.053*	0.700	1.246
S10	0.993	0.997	1.380	1.673*	1.000	1.057	0.992	1.017	1.608	1.537*	1.000	1.075
	INF						SVAR					
S1	1.000	1.001	-0.078	-0.017	0.258	0.958	0.994	0.981	1.210	1.535*	0.119	1.069
S2	0.995	1.000	0.980	1.245	0.052	1.268	0.993	0.984	1.297	1.652*	0.114	1.125
S3	0.997	1.000	0.611	1.030	0.009	1.104	0.996	0.983	0.864	1.243	0.054	1.015
S4	0.996	0.997	0.704	1.082	0.009	1.220	0.994	0.981	1.205	1.464*	0.073	1.102
S5	1.001	1.003	-0.152	-0.034	0.144	1.135	0.994	0.981	1.171	1.427*	0.158	1.308
S6	0.996	0.998	0.714	1.043	0.015	1.054	0.999	0.994	0.207	0.559	0.039	1.018
S7	0.998	0.998	0.476	0.851	0.001	1.035	1.005	1.007	-0.969	-1.235	0.552	0.965
S8	0.999	1.001	0.250	0.620	0.022	1.107	0.996	0.992	0.764	1.201	0.063	1.143
S9	0.998	0.998	0.480	0.937	0.000	1.123	0.999	0.998	0.157	0.493	0.020	1.088
S10	1.002	1.002	-0.342	-1.399	1.000	0.981	1.001	0.999	-0.252	-0.657	1.000	1.019

Table XV: Out-of-sample forecast evaluation results for combination forecasts based on eight economic variables

This table reports the out-of-sample forecast performance results for the combination forecasts against the benchmark historical mean model for the 2003:07-2014:06 out-of-sample period. We employ a simple forecast combining method, the mean of eight individual predictive regression model forecasts. The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the aggregate market or its component portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 50% of the full sample. One-step ahead out-of-sample forecasts are generated recursively and then the average of these eight individual forecasts gives the mean combination forecasts. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz R^2(RMZ), and relative success ratio (RSR). $RMAE$ and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that combination forecasts out-performs historical average forecasts. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE-adj$	RMZ	RSR		$RMAE$	$RRMSE$	OR^2 (%)	$MSFE-adj$	RMZ	RSR
Panel A: Aggregate market and industry portfolios													
Market	0.976	0.973	4.658	3.077*	1.021	1.308							
Basic Mat.	0.995	0.995	0.930	1.316*	0.847	1.000	Industrials	1.000	1.009	-0.023	0.189	1.063	1.043
Cons. Goods	0.992	0.993	1.672	1.775*	0.471	1.207	Oil and Gas	0.993	0.998	1.338	1.333*	1.009	1.309
Cons. Serv.	0.989	0.988	2.136	1.959*	0.861	1.089	Technology	1.001	0.997	-0.293	-0.479	0.256	1.000
Financials	0.997	0.996	0.599	1.797*	0.884	1.015	Telecom	0.988	0.984	2.412	2.153*	0.429	1.087
Health Care	0.992	0.988	1.657	2.433*	0.813	1.000	Utilities	0.995	1.002	1.071	1.264	0.837	1.105
Panel B: Book-to-market portfolios													
BM1	0.994	0.994	1.257	1.970*	0.865	1.175	BM6	1.000	1.005	0.097	0.387	1.066	1.000
BM2	0.997	0.998	0.622	0.839	0.957	0.981	BM7	0.996	1.000	0.874	1.274	1.102	1.102
BM3	0.996	0.999	0.824	1.326*	0.878	1.058	BM8	0.998	0.998	0.463	1.451*	0.937	1.042
BM4	1.001	0.999	-0.106	-0.142	1.008	1.089	BM9	0.999	1.001	0.163	0.527	0.839	1.179
BM5	0.997	0.995	0.623	1.566*	0.824	1.107	BM10	0.998	0.997	0.326	1.326*	0.601	1.030
Panel C: Size portfolios													
S1	1.000	0.998	0.035	0.248	0.740	1.000	S6	0.994	1.002	1.102	1.697*	1.977	1.010
S2	0.995	0.994	0.923	1.867*	0.882	1.071	S7	0.999	1.004	0.247	0.590	0.861	1.000
S3	0.996	0.999	0.830	1.405*	0.731	1.925	S8	0.993	1.001	1.344	1.705*	1.055	1.964
S4	1.001	1.000	-0.191	-0.365	0.953	1.017	S9	0.994	0.995	1.112	2.118*	1.961	0.982
S5	0.996	0.995	0.728	2.358*	0.869	1.173	S10	0.988	0.992	2.293	2.376*	1.000	1.151

Table XVI: Summary of out-of-sample forecast evaluation results for the aggregate market and industry portfolio excess returns

This table reports the summary of the out-of-sample forecast evaluation results reported in Table XII. We list the evaluation metrics according to which our predictive regression model beats the historical average model. The metrics are reported for each of the eight models represented by each predictor variable, namely, book-to-market ratio (BM), dividend-payout ratio (DE), dividend-price ratio (DP), dividend yield (DY), earnings-price ratio (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). The last column reports the evaluation metrics for the combination forecast (CF) model. The results are reported for the market and for each of the ten industries. $RMAE$ and $RRMSE$ represent the relative mean absolute error and relative root mean squared error; RMZ and RSR represent the Mincer Zarnowitz R^2 and relative success ratios; OR^2 is the Campbell and Thompson (2008) out-of-sample R^2 statistic; and $MSFEA$ is the Clark and West (2007) $MSFE-adjusted$ statistic, which tests the null hypothesis that $OR^2 \leq 0$ against the alternative hypothesis $OR^2 > 0$, respectively.

	BM	DE	DP	DY	EP	CFP	INF	SVAR	CF
Market	RMZ	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ $MSFEA, RMZ$ RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$
Basic Materials	RMZ	RMZ	$RMAE, OR^2$	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE$		$RMAE, OR^2$ $RRMSE$ $MSFEA$
Consumer Goods	$RMAE, OR^2$ $RRMSE, RSR$	$RRMSE$ RMZ, RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	RSR		$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
Consumer Serv.	$RMAE, OR^2$ $MSFEA, RMZ$	RSR	$RRMSE, RSR$	$RRMSE, RSR$	$RMAE$ OR^2, RMZ	$RMAE$ OR^2, RSR		$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
Financials	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	RMZ	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ RMZ	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$	RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
Health Care	RMZ		$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$	RMZ			$RMAE, OR^2$ $RRMSE$ $MSFEA$
Industrials	$RRMSE$ RMZ, RSR	RSR	RSR	$RMAE, OR^2$ RSR	$RMAE, OR^2$ RMZ, RSR	RSR	RSR	$RMAE, OR^2$ $RRMSE, RSR$	RMZ, RSR
Oil and Gas	RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, RSR$	$RMAE, OR^2$ RSR	RMZ, RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$
Technology	$RRMSE$ RMZ	RMZ	$RRMSE$	$RRMSE$	RMZ	$RMAE, RSR$ $RRMSE$			$RRMSE$
Telecom.	RMZ	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$		RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
Utilities	RMZ, RSR	$RRMSE$ RMZ, RSR	RSR	RSR	RSR	RSR	$RMAE, OR^2$ $RRMSE, RSR$	RSR	$RMAE, OR^2$ RSR

Table XVII: Summary of out-of-sample forecast evaluation results for book-to-market portfolio excess returns

This table reports the summary of the out-of-sample forecast evaluation results reported in Table XIII. We list the evaluation metrics according to which our predictive regression model beats the historical average model. The metrics are reported for each of the eight models represented by each predictor variable, namely, book-to-market ratio (BM), dividend-payout ratio (DE), dividend-price ratio (DP), dividend yield (DY), earnings-price ratio (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). The last column reports the evaluation metrics for the combination forecast approach. The results are reported for each of the 10 book-to-market sorted portfolios. $RMAE$ and $RRMSE$ represent the relative mean absolute error and relative root mean squared error; RMZ and RSR represent the Mincer Zarnowitz R^2 and relative success ratios; OR^2 is the Campbell and Thompson (2008) out-of-sample R^2 statistic; and $MSFEA$ is the Clark and West (2007) $MSFE-adjusted$ statistic, which tests the null hypothesis that $OR^2 \leq 0$ against the alternative hypothesis $OR^2 > 0$, respectively.

	BM	DE	DP	DY	EP	CFP	INF	SVAR	CF
BM1	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$			$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
BM2	RMZ, RSR	$RRMSE$ RMZ, RSR	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	RMZ, RSR		$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE$
BM3	RMZ, RSR	RSR	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ RMZ		$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
BM4	RMZ, RSR	RMZ	RMZ, RSR	$RMAE, OR^2$	RMZ, RSR	RMZ	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$	$RRMSE, RSR$ RMZ
BM5	RMZ, RSR	$RRMSE$ RMZ, RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	RMZ, RSR	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
BM6	RMZ, RSR	RMZ	RSR	RSR	RMZ	RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$	OR^2, RMZ
BM7	RMZ, RSR	RMZ	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $MSFEA, RSR$	$RMAE, OR^2$	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ RMZ, RSR
BM8	RMZ	RMZ	OR^2, RMZ	$RMAE, OR^2$	RMZ	$RMAE, OR^2$	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
BM9	RMZ, RSR	RMZ, RSR	RSR	$RMAE, OR^2$ RSR	$RRMSE$ RMZ, RSR	$RMAE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ RSR
BM10	$RMAE, OR^2$ RMZ	$RMAE, OR^2$ $RRMSE, RSR$ RMZ	$RMAE, OR^2$ RMZ, RSR	$RMAE, OR^2$ $RRMSE, RSR$	RMZ	$RMAE, OR^2$ $RRMSE$	RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$

Table XVIII: Summary of out-of-sample forecast evaluation results for size sorted portfolio excess returns

This table reports the summary of the out-of-sample forecast evaluation results reported in Table XIV. We list the evaluation metrics according to which our predictive regression model beats the historical average model. The metrics are reported for each of the eight models represented by each predictor variable, namely, book-to-market ratio (BM), dividend-payout ratio (DE), dividend-price ratio (DP), dividend yield (DY), earnings-price ratio (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). The last column reports the evaluation metrics for the combination forecast approach. The results are reported for each of the 10 size sorted portfolios. $RMAE$ and $RRMSE$ represent the relative mean absolute error and relative root mean squared error; RMZ and RSR represent the Mincer Zarnowitz R^2 and relative success ratios; OR^2 is the Campbell and Thompson (2008) out-of-sample R^2 statistic; and $MSFEA$ is the Clark and West (2007) $MSFE-adjusted$ statistic, which tests the null hypothesis that $OR^2 \leq 0$ against the alternative hypothesis $OR^2 > 0$, respectively.

	BM	DE	DP	DY	EP	CFP	INF	SVAR	CF
S1	$RRMSE, OR^2$ RMZ	RMZ			$RRMSE, OR^2$ RMZ	RMZ		$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RRMSE, OR^2$
S2	RMZ	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	RSR, RMZ	RMZ, RSR	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
S3	RMZ	$RMAE, OR^2$	$RMAE, OR^2$	$RMAE, OR^2$ $MSFEA$	RMZ	$RMAE, OR^2$	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
S4	RMZ	RMZ, RSR	RMZ		RMZ		$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	RSR
S5	RMZ, RSR	$RRMSE, RSR$ RMZ	$RMAE, OR^2$ $MSFEA, RSR$	$RMAE, OR^2$ $MSFEA, RSR$	RMZ		RSR	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
S6	RMZ, RSR		$RMAE, OR^2$ $MSFEA, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	$RMAE, OR^2$ RMZ	RSR, OR^2	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $MSFEA, RSR$ RMZ
S7	RMZ	RMZ	$RMAE, OR^2$	$RMAE, OR^2$ $MSFEA, RSR$	RMZ	OR^2	$RMAE, OR^2$ $RRMSE, RSR$		$RMAE, OR^2$
S8	$RMAE, OR^2$ RSR	RMZ	$RMAE, OR^2$ $MSFEA, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA, RMZ$	RMZ, OR^2		$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $MSFEA, RMZ$ RSR
S9	$RMAE, OR^2$ $RRMSE, RSR$ RMZ	RMZ, RSR	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $MSFEA, RSR$	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$
S10	$RMAE, OR^2$ RSR	$RMAE, OR^2$ $RRMSE$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $MSFEA, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$	$RMAE, OR^2$ $MSFEA, RSR$		$RRMSE, RSR$	$RMAE, OR^2$ $RRMSE, RSR$ $MSFEA$

Table XIX: Economic significance results for aggregate market and industry portfolio excess returns

This table reports the economic significance results for the aggregate market and industry portfolios resulting from a dynamic trading strategy based on a mean–variance investor utility function. One-step ahead forecasted returns are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. We take the first 50% of the sample and generate the first forecast; then we take the first 50% plus the observation containing the forecasted return and generate return for the next day. This process is repeated until all the data are exhausted. The portfolio weights are computed using risk aversion parameter of 6, which typically represents a medium level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the forecasting models where there is either evidence of in-sample predictability or evidence that at least 50% of forecast evaluation metrics support the predictive regression based model. Utility gain is the difference between the utility from our proposed model and the utility from the historical average model.

	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain
		BM			DE			DP			DY	
Market	0.546	33.986	0.002	0.585	34.243	0.019	1.124	10.055	0.057	1.115	10.144	-0.037
Basic Materials	0.549	33.979	0.000	0.586	23.328	0.028	-	-	-	0.544	34.787	0.000
Consumer Goods	0.716	18.926	0.000	1.037	17.428	0.120	0.640	30.796	0.030	0.643	30.864	0.027
Consumer Services	0.544	34.650	0.000	1.539	11.986	-0.080	-	-	-	-	-	-
Financials	0.914	30.433	-0.015	0.845	20.801	-0.092	0.767	19.012	-0.103	0.727	21.077	-0.131
Health Care	-	-	-	1.225	31.937	-0.310	1.773	15.175	-1.401	1.638	15.017	-0.679
Industrials	0.651	22.558	0.030	0.544	34.685	0.013	0.544	34.650	0.013	0.544	34.650	0.013
Oil and Gas	-	-	-	0.931	25.387	0.235	0.769	21.498	0.096	0.807	19.321	0.104
Technology	-	-	-	2.204	64.582	0.208	-	-	-	-	-	-
Telecommunications	1.407	21.017	-0.109	2.562	11.593	-0.029	2.023	12.822	-0.325	2.166	12.495	-0.276
Utilities	-	-	-	0.899	25.822	0.176	-	-	-	-	-	-
		EP			CFP			INF			SVAR	
Market	0.695	19.855	0.051	0.573	26.094	0.023	0.563	33.294	0.005	0.551	34.949	0.003
Basic Materials	0.587	27.076	0.040	0.587	18.547	0.044	0.554	33.434	0.007	-	-	-
Consumer Goods	1.078	21.717	0.026	0.972	14.280	0.109	0.752	22.425	0.113	-	-	-
Consumer Services	0.546	34.865	0.003	0.564	32.901	0.023	0.544	34.650	0.000	0.647	24.894	0.089
Financials	0.901	26.464	-0.036	0.659	33.548	-0.198	0.977	16.259	-0.192	-	-	-
Health Care	1.514	28.864	-0.742	-	-	-	-	-	-	-	-	-
Industrials	0.614	25.226	0.042	-	-	-	-	-	-	0.653	27.000	0.046
Oil and Gas	0.622	27.344	0.055	-	-	-	0.733	23.714	0.035	-	-	-
Technology	-	-	-	2.432	111.952	0.559	2.184	52.502	-0.394	-	-	-
Telecommunications	1.829	14.503	-0.395	-	-	-	1.179	15.585	-0.484	-	-	-
Utilities	-	-	-	-	-	-	0.799	20.337	0.067	-	-	-

Table XX: Economic significance results for book-to-market sorted portfolio returns

This table reports the economic significance results for 10 portfolios sorted on book-to-market resulting from a dynamic trading strategy based on a mean–variance investor utility function. One-step ahead forecasted returns are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. We take the first 50% of the sample and generate the first forecast; then we take the first 50% plus the observation containing the forecasted return and generate return for the next day. This process is repeated until all the data are exhausted. The portfolio weights are computed using risk aversion parameter of 6, which typically represents a medium level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the forecasting models where there is either evidence of in-sample predictability or evidence that at least 50% of forecast evaluation metrics support the predictive regression based model. Utility gain is the difference between the utility from our proposed model and the utility from the historical average model.

	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain
		BM			DE			DP			DY	
BM1	0.962	11.070	-0.197	0.786	21.712	0.138	0.945	31.580	0.193	1.030	32.462	0.234
BM2	-	-	-	1.109	9.818	-0.688	0.793	16.728	0.078	0.831	15.054	0.057
BM3	-	-	-	0.548	34.710	0.003	0.601	28.064	0.056	0.613	26.042	0.074
BM4	0.625	28.826	0.056	0.553	33.889	0.007	0.600	29.452	0.035	-	-	-
BM5	0.798	18.177	0.114	1.113	13.057	-0.161	0.652	23.805	0.077	0.721	19.389	0.102
BM6	0.573	28.334	0.022	0.544	34.650	0.000	-	-	-	-	-	-
BM7	-	-	-	0.549	33.108	0.002	0.611	24.710	0.036	0.642	22.609	0.048
BM8	0.970	22.129	-0.025	0.830	23.168	-0.186	-	-	-	-	-	-
BM9	-	-	-	0.594	29.800	0.071	-	-	-	0.849	21.532	0.159
BM10	0.585	26.052	-0.022	0.756	23.130	0.055	0.751	34.575	0.060	0.774	31.191	0.061
		EP			CFP			INF			SVAR	
BM1	0.776	18.015	0.087	-	-	-	0.732	19.085	0.095	0.640	28.925	0.044
BM2	0.813	18.037	0.137	-	-	-	0.610	28.479	0.033	0.683	25.647	0.068
BM3	0.584	28.668	0.028	-	-	-	0.580	32.333	0.013	0.666	25.207	0.049
BM4	0.604	27.490	0.042	0.650	26.927	0.063	0.618	28.301	0.034	0.708	24.147	0.057
BM5	0.580	30.820	0.013	0.737	17.435	0.082	0.707	22.863	0.049	0.703	24.582	0.043
BM6	0.544	34.650	0.000	-	-	-	0.591	30.889	0.025	0.553	34.322	0.008
BM7	0.582	29.782	0.030	0.667	16.840	0.116	0.637	25.238	0.007	0.585	31.018	0.028
BM8	1.058	30.763	-0.048	-	-	-	0.988	16.526	-0.191	1.152	17.519	-0.532
BM9	0.707	26.603	0.058	-	-	-	0.763	18.908	0.019	0.756	22.935	0.037
BM10	-	-	-	0.826	21.444	0.006	-	-	-	0.818	20.698	-0.081

Table XXI: Economic significance results for size sorted portfolio returns

This table reports the economic significance results for 10 portfolios sorted on size resulting from a dynamic trading strategy based on a mean–variance investor utility function. One-step ahead forecasted returns are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. We take the first 50% of the sample and generate the first forecast; then we take the first 50% plus the observation containing the forecasted return and generate return for the next day. This process is repeated until all the data are exhausted. The portfolio weights are computed using risk aversion parameter of 6, which typically represents a medium level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the forecasting models where there is either evidence of in-sample predictability or evidence that at least 50% of forecast evaluation metrics support the predictive regression based model. Utility gain is the difference between the utility from our proposed model and the utility from the historical average model.

	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain
		BM			DE			DP			DY	
S1	1.289	41.411	0.073	1.310	26.717	-0.059	-	-	-	-	-	-
S2	-	-	-	1.136	17.168	0.294	1.300	14.578	0.230	1.402	13.946	0.191
S3	-	-	-	0.605	25.699	-0.080	-	-	-	1.034	18.512	0.037
S4	-	-	-	0.907	17.219	0.097	0.582	32.832	0.012	-	-	-
S5	-	-	-	1.166	14.311	0.109	0.553	34.496	0.017	0.569	35.736	0.040
S6	0.602	22.137	0.023	0.544	34.650	0.000	0.553	36.236	0.007	0.564	38.415	0.013
S7	-	-	-	0.566	25.901	0.014	-	-	-	0.594	29.877	0.048
S8	0.815	14.247	-0.036	0.554	31.138	0.004	0.596	28.305	0.047	0.611	27.247	0.061
S9	0.702	22.488	0.086	0.661	22.503	0.059	0.809	18.572	0.119	0.948	14.738	0.110
S10	0.585	27.014	0.019	0.544	34.698	0.004	0.866	16.073	0.056	0.811	18.903	0.097
		EP			CFP			INF			SVAR	
S1	1.156	31.230	-0.128	1.026	26.074	-0.205	-	-	-	1.312	16.939	-0.803
S2	0.606	28.565	0.051	-	-	-	0.747	18.819	-0.007	0.829	19.284	0.006
S3	0.646	27.222	-0.072	-	-	-	0.837	18.952	-0.060	0.934	19.739	-0.164
S4	0.643	25.440	0.024	-	-	-	0.731	21.073	0.036	0.842	20.051	0.010
S5	0.552	33.512	0.016	-	-	-	-	-	-	0.770	20.621	0.056
S6	0.563	34.433	0.010	-	-	-	0.586	31.744	0.020	0.551	34.483	0.007
S7	0.573	30.753	0.020	-	-	-	0.554	34.816	0.010	-	-	-
S8	0.604	26.252	0.024	-	-	-	0.563	34.193	0.005	0.621	27.687	0.034
S9	0.699	22.323	0.060	0.732	16.317	0.104	0.642	28.767	0.047	0.656	28.270	0.060
S10	0.576	29.644	0.035	0.578	25.150	0.035	-	-	-	-	-	-

Table XXII: Economic significance results for combination forecasts based on eight economic variables

This table reports the economic significance results for mean combination forecasts that use eight economic variables (book-to-market ratio, dividend-payout ratio, dividend-price ratio, dividend yield, earnings-price, cash flow-to-price, inflation, and stock variance) as predictors. One-step ahead forecasted returns for predictive regression model are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. The mean combination forecast is then computed as the average of the forecasts from individual predictive regression models. The portfolio weights are computed using risk aversion parameter of 6, which typically represents a medium level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the aggregate market and its component portfolios that include 10 industries, 10 book-to-market sorted portfolios, and 10 size sorted portfolios. Utility gain is the difference between the utility from the combination forecast model and the utility from the historical average model.

	Mean	t-stat	Utility gain		Mean	t-stat	Utility gain
Panel A: Aggregate market and industry portfolios							
Market	0.646	27.031	0.009				
Basic Materials	0.544	34.650	0.000	Industrials	0.545	34.636	0.013
Consumer Goods	0.724	24.953	-0.028	Oil and Gas	0.561	33.514	0.014
Consumer Services	0.644	20.728	0.039	Technology	2.120	57.068	-0.058
Financials	0.778	23.629	-0.112	Telecommunications	1.640	15.103	-0.135
Health Care	1.698	39.765	-0.160	Utilities	0.794	23.744	0.062
Panel B: Book-to-market portfolios							
BM1	0.754	26.144	0.103	BM6	0.544	34.650	0.000
BM2	0.718	19.767	0.053	BM7	0.546	34.159	0.002
BM3	0.544	34.683	0.003	BM8	0.867	27.411	-0.125
BM4	0.576	32.313	0.036	BM9	0.568	34.059	0.035
BM5	0.610	28.271	0.044	BM10	0.673	31.148	0.018
Panel C: Size portfolios							
S1	1.152	25.929	-0.269	S6	0.544	34.650	0.000
S2	0.744	20.115	0.096	S7	0.544	34.650	0.000
S3	0.653	22.998	-0.038	S8	0.563	30.660	0.017
S4	0.580	32.230	0.035	S9	0.635	23.288	0.070
S5	0.569	32.536	0.024	S10	0.563	36.174	0.016

Table XXIII: Out-of-sample forecast evaluation results for combination forecasts – expansions and recessions

This table reports the out-of-sample forecast performance results for the combination forecasts against the benchmark historical mean model for three sample periods – (i) overall (2003:07-2014:06) out-of-sample forecast evaluation period, (ii) expansions (2003:07-2007:01 and 2009:07-2014:06) and (iii) recessions (2007:02-2009:06). The combination forecasts are simply the average of forecasts from individual predictive regression models that use eight economic variables (book-to-market ratio, dividend-payout ratio, dividend-price ratio, dividend yield, earnings-price, cash flow-to-price, inflation, and stock variance) as predictors. For brevity, we only report the Campbell and Thompson (2008) OR^2 statistics. The OR^2statistics are computed for the overall out-of-sample period and separately for the expansions and recessions. Expansions (recessions) comprise 103 (29) of the observations for the forecast evaluation period. The results are reported for the aggregate market and its component portfolios. The row "average" in Panels A, B and C reports the average OR^2 statistics for ten industries, ten book-to-market and ten size sorted portfolios, respectively.

	Overall	Expansion	Recession		Overall	Expansion	Recession
Panel A: Aggregate market and industry portfolios							
Market	4.658	6.254	3.243				
Basic Materials	0.930	1.359	0.606	Industrials	-0.023	-0.804	0.775
Consumer Goods	1.672	3.266	-0.602	Oil and Gas	1.338	1.921	0.680
Consumer Services	2.136	3.113	1.220	Technology	-0.293	0.590	-1.279
Financials	0.599	0.810	0.378	Telecommunications	2.412	3.653	-0.644
Health Care	1.657	2.709	0.351	Utilities	1.071	0.633	1.760
Average	1.150	1.725	0.325				
Panel B: Book-to-market portfolios							
BM1	1.257	2.761	0.224	BM6	0.097	-1.225	1.524
BM2	0.622	0.656	0.594	BM7	0.874	-0.058	1.888
BM3	0.824	0.460	1.163	BM8	0.463	0.201	0.782
BM4	-0.106	-0.229	0.016	BM9	0.163	0.058	0.297
BM5	0.623	0.731	0.510	BM10	0.326	0.366	0.271
Average	0.514	0.372	0.727				
Panel C: Size portfolios							
S1	0.035	-0.013	0.103	S6	1.102	0.537	1.664
S2	0.923	0.752	1.159	S7	0.247	-0.463	0.964
S3	0.830	0.129	1.627	S8	1.344	0.605	2.044
S4	-0.191	-0.758	0.395	S9	1.112	1.364	0.909
S5	0.728	1.044	0.414	S10	2.293	2.716	1.933
Average	0.842	0.591	1.121				

Table XXIV: Rational and alpha components of out-of-sample predictability

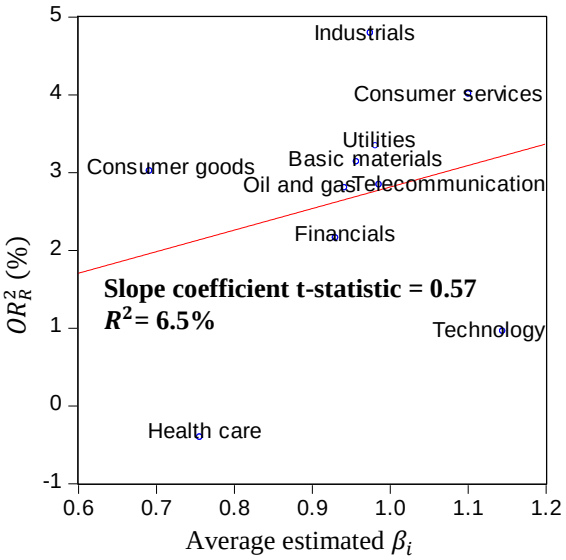
This table reports the OR_R^2 and OR_α^2 statistic for 2003:07-2014:06 out-of-sample forecast evaluation period for industries (Panel A), book-to-market sorted portfolios (Panel B), and size sorted portfolios (Panel C). BM1, …, BM10 (S1, …, S10) represent deciles in ascending order for portfolios sorted on book-to-market (market capitalization) value. Results are reported for the mean combination forecasts based on eight economic variables, namely, book-to-market, dividend-payout, dividend-price, dividend yield, earnings-price, cash flow-to-price, inflation, and stock variance. OR_R^2 measures the reduction in mean square prediction error for the rational-pricing restricted combination forecast based on the conditional CAPM relative to the historical average combination forecast. OR_α^2 measures the reduction in mean square prediction error for the unrestricted combination forecast relative to the rational-pricing restricted combination forecast. "*" denotes that the OR_R^2 or OR_α^2 is significant at 10% level or better according to the p-value corresponding to the Clark and West (2007) $MSFE-adjusted$ statistic.

	OR_R^2 (%)	OR_α^2 (%)		OR_R^2 (%)	OR_α^2 (%)
Panel A: Aggregate market and industry portfolio excess returns					
Basic Materials	3.136*	-2.278	Industrials	4.794*	-5.060
Consumer Goods	3.020*	-1.389	Oil and Gas	2.802*	-1.506
Consumer Services	4.010*	-1.953	Technology	0.958*	-1.263
Financials	2.156*	-1.592	Telecommunications	2.843*	-0.443
Healthcare	-0.402	2.051*	Utilities	3.341*	-2.349
Panel B: Book-to-market portfolio excess returns					
BM1	2.915*	-1.707	BM6	4.225*	-4.311
BM2	3.538*	-3.023	BM7	3.503*	-2.724
BM3	3.597*	-2.876	BM8	2.022*	-1.591
BM4	3.555*	-3.797	BM9	2.790*	-2.703
BM5	2.838*	-2.281	BM10	2.256*	-1.975
Panel C: Size portfolio excess returns					
S1	1.349	-1.332	S6	3.714*	-2.713
S2	3.017*	-2.158	S7	3.575*	-3.451
S3	2.365*	-1.572	S8	3.394*	-2.122
S4	3.040*	-3.333	S9	3.102*	-2.055
S5	3.104*	-2.453	S10	3.774*	-1.539

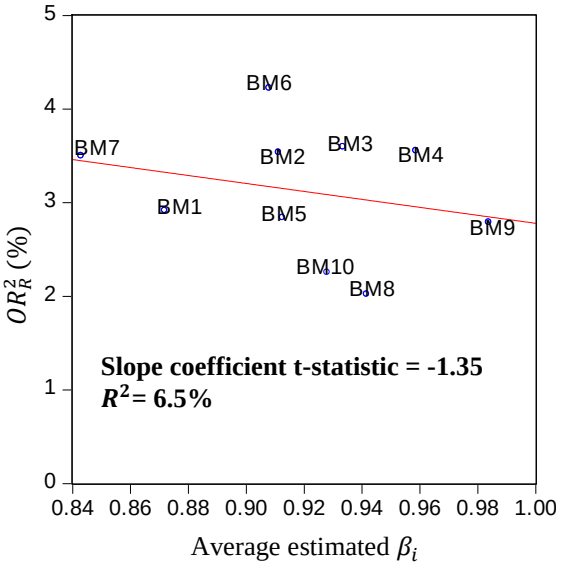
Figure I: Relationship between OR_R^2 statistic and average estimated betas

These scatter plots shows the fitted line and the estimation results from a cross-section regression model with OR_R^2 (reported in Table XXIV over the 2003:07-2014:06 out-of-sample period) as the dependent variable and average estimated β_i (used to compute rational pricing-restricted combination forecasts) as the independent variable. The cross-section regression model includes a constant, and the t-statistics reported are based on White (1980) heteroskedasticity consistent standard errors. Panels A, B and C depict the plots for industry return, book-to-market value return and size return, respectively.

Panel A: Industry return



Panel B: Book-to-market value return



Panel C: Size return

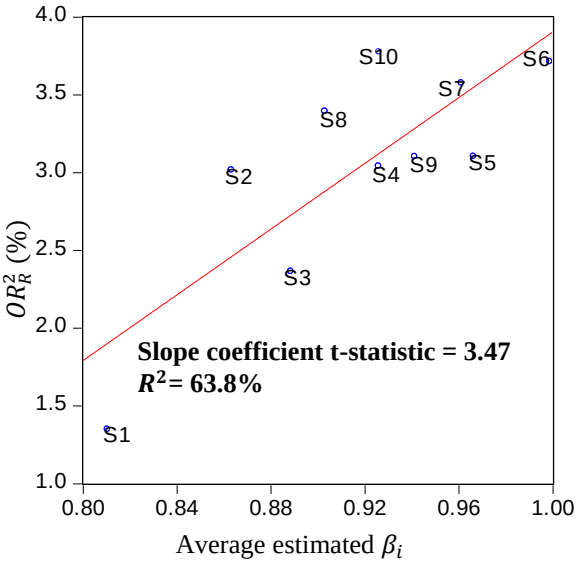
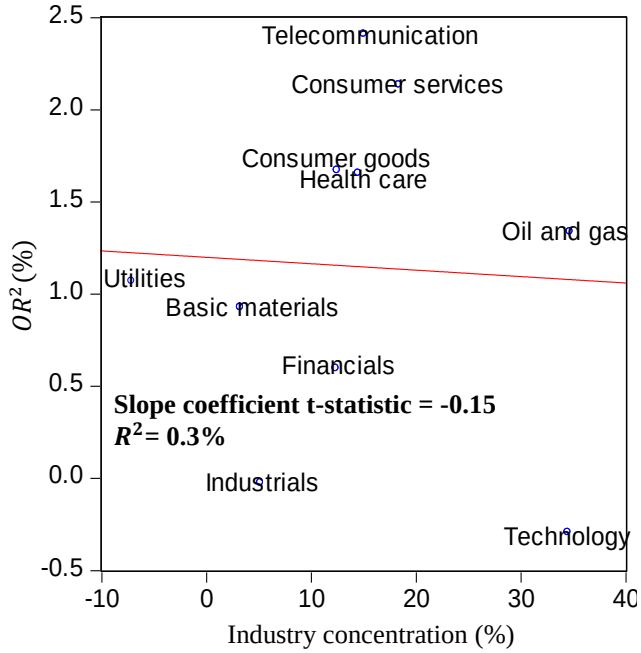


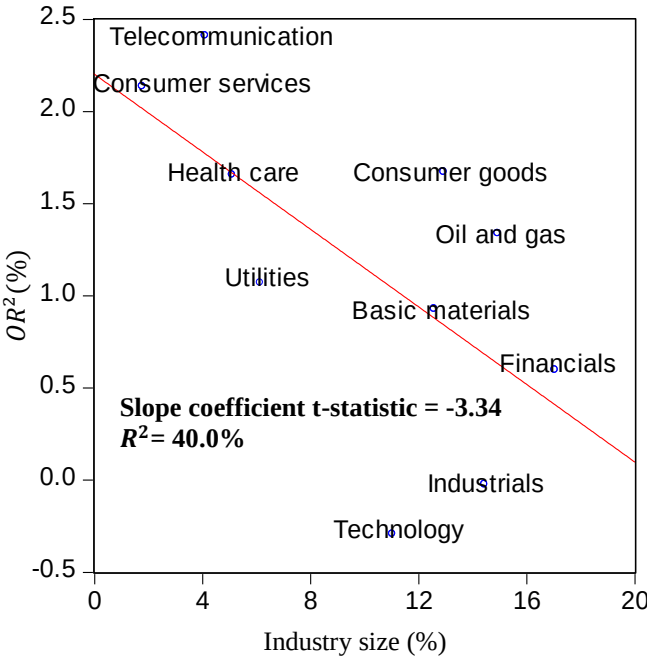
Figure II: Relationship between industry concentration or size and OR^2 statistics

These scatter plots shows the fitted line and the estimation results from a cross-section regression model with OR^2 as the dependent variable and industry concentration (or industry market capitalization) as the independent variable. The cross-section regression model includes a constant, and the t-statistics reported are based on White (1980) heteroskedasticity consistent standard errors. Panels A and B depict the plots with industry concentration and industry market capitalization, respectively, as the independent variables.

Panel A: OR^2 and industry concentration



Panel B: OR^2 and industry size



Appendix for

"Are Indian Stock Returns Predictable?"

This Appendix reports the complete set of additional results described in the paper. Tables A.I to A.IX report the preliminary test results for book-to-market and size sorted portfolios. Tables A.X to A.XVII report the economic significance results with risk aversion parameters of three and twelve. These are reported for the aggregate market and ten industries (Tables A.X and A.XIV), 10 portfolios sorted on book-to-market (Tables A.XI and A.XV), and 10 portfolios sorted on size (Tables A.XII and A.XVI). The economic significance results with varying risk aversions are also reported for combination forecasts[9] (Tables A.XIII and A.XVII). Tables A.XVIII, A.XIX and A.XX report the out-of-sample forecast evaluation results for the expansion and recession phases of the out-of-sample period. Tables A.XXI, A.XXII and A.XXIII report the in-sample predictability test results for the pre-crisis period. Tables A.XXIV to A.XXVII report the out-of-sample forecast evaluation results for a longer out-of-sample period. Tables A.XXVIII to A.XXXI report out-of-sample forecast evaluation results for a smaller out-of-sample period. Figures A.I and A.II show the plots of the difference between the cumulative squared prediction errors of the historical average forecast and the cumulative squared prediction errors of the combination forecast for the 2003:07-2014:06 out-of-sample period.

[9] We do not find any extreme portfolio weights with the monthly data. The average portfolio weights for the component portfolios with risk aversion of six range between 0.002 to 1.471 with standard deviations of 0.057 % and 0.097%, respectively.

Table A.I: ADF unit root test results for book-to-market portfolios

This table reports the augmented Dickey–Fuller (1981) unit root test results for the excess returns of 10 portfolios sorted on book-to-market value and for the corresponding six economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), and cash flow-to-price (CFP) used as predictors of returns. BM1, …, BM10 represent deciles in ascending order for portfolios sorted on book-to-market value. The unit root test results are based on the ADF model and are implemented by including only the intercept term. We use the Schwarz information criterion and set a maximum of eight lags to obtain the optimal lag length. The test statistics and the resulting p-values are reported for each of the variables. The optimal lag length is reported in square brackets.

	Test stat[LL]	p-value	Test stat[LL]	p-value	Test stat[LL]	p-value	Test stat[LL]	p-value
	Returns		BM		DE		DP	
BM1	-13.958[0]	0.000	-2.721[0]	0.072	-2.562[0]	0.102	-2.172[0]	0.217
BM2	-13.686[0]	0.000	-3.062[0]	0.031	-1.976[0]	0.297	-2.702[0]	0.075
BM 3	-13.269[0]	0.000	-2.995[1]	0.037	-1.768[0]	0.396	-2.831[1]	0.055
BM 4	-13.419[0]	0.000	-2.484[0]	0.121	-2.655[0]	0.083	-3.415[0]	0.011
BM 5	-13.596[0]	0.000	-2.758[1]	0.066	-2.258[0]	0.187	-2.360[0]	0.154
BM 6	-13.406[0]	0.000	-2.475[1]	0.123	-2.573[0]	0.100	-2.778[1]	0.063
BM 7	-13.205[0]	0.000	-2.742[1]	0.068	-1.971[0]	0.300	-2.594[0]	0.096
BM 8	-13.538[0]	0.000	-2.211[1]	0.203	-3.259[0]	0.018	-2.286[0]	0.177
BM 9	-13.609[0]	0.000	-2.021[0]	0.278	-3.201[0]	0.021	-2.574[0]	0.100
BM 10	-14.107[0]	0.000	-1.823[0]	0.369	-1.855[0]	0.354	-2.108[0]	0.242
	DY		EP		CFP			
BM1	-2.131[0]	0.233	-2.381[0]	0.148	-4.358[4]	0.000		
BM2	-2.662[0]	0.082	-2.661[0]	0.082	-3.491[0]	0.009		
BM 3	-3.041[1]	0.033	-2.907[1]	0.046	-3.370[1]	0.013		
BM 4	-3.508[0]	0.009	-2.339[0]	0.161	-3.070[0]	0.030		
BM 5	-2.463[0]	0.126	-2.676[0]	0.080	-2.896[0]	0.047		
BM 6	-2.879[1]	0.049	-2.536[0]	0.108	-2.832[0]	0.055		
BM 7	-2.716[0]	0.073	-3.237[1]	0.019	-3.408[1]	0.012		
BM 8	-2.277[0]	0.180	-1.936[0]	0.315	-2.797[0]	0.060		
BM 9	-2.744[0]	0.068	-2.437[0]	0.133	-4.378[6]	0.000		
BM 10	-2.236[0]	0.194	-2.002[0]	0.286	-4.025[0]	0.002		

Table A.II: ADF unit root test results for size portfolios

This table reports the augmented Dickey–Fuller (1981) unit root test results for the excess returns of 10 portfolios sorted on market capitalization and for the corresponding six economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), and cash flow-to-price (CFP) used as predictors of returns. S1, …, S10 represent deciles in ascending order for portfolios sorted on market capitalization. The unit root test results are based on the ADF model and are implemented by including only the intercept term. We use the Schwarz information criterion and set a maximum of eight lags to obtain the optimal lag length. The test statistics and the resulting p-values are reported for each of the variables. The optimal lag length is reported in square brackets.

	Test stat[LL]	p-value	Test stat[LL]	p-value	Test stat[LL]	p-value	Test stat[LL]	p-value
	Returns		BM		DE		DP	
S1	-14.064[0]	0.000	-1.952[0]	0.308	-1.916[0]	0.324	-1.497[0]	0.534
S2	-13.700[0]	0.000	-2.605[0]	0.093	-2.913[0]	0.045	-3.300[0]	0.016
S3	-13.796[0]	0.000	-2.085[0]	0.251	-2.765[0]	0.065	-1.994[0]	0.289
S4	-13.217[0]	0.000	-2.570[3]	0.101	-2.149[0]	0.226	-1.921[0]	0.322
S5	-13.253[0]	0.000	-2.154[0]	0.224	-1.497[0]	0.534	-2.539[0]	0.107
S6	-13.322[0]	0.000	-2.893[0]	0.048	-1.746[0]	0.407	-2.547[0]	0.106
S7	-13.397[0]	0.000	-3.077[0]	0.030	-1.928[0]	0.319	-2.653[1]	0.084
S8	-13.517[0]	0.000	-3.454[1]	0.010	-1.976[0]	0.297	-2.93[1]	0.043
S9	-13.048[0]	0.000	-2.720[0]	0.072	-2.117[0]	0.238	-2.802[1]	0.059
S10	-14.115[0]	0.000	-3.115[1]	0.027	-2.555[0]	0.104	-2.740[0]	0.069
	DY		EP		CFP			
S1	-1.628[0]	0.467	-2.104[0]	0.243	-4.417[1]	0.000		
S2	-3.379[0]	0.013	-1.954[0]	0.307	-2.999[0]	0.036		
S3	-1.905[0]	0.330	-2.463[0]	0.126	-3.656[0]	0.005		
S4	-2.182[0]	0.214	-3.048[1]	0.032	-3.835[1]	0.003		
S5	-2.602[0]	0.094	-2.470[0]	0.124	-3.173[0]	0.023		
S6	-2.550[0]	0.105	-2.940[0]	0.042	-3.197[0]	0.021		
S7	-2.384[0]	0.147	-2.608[0]	0.093	-3.885[0]	0.003		
S8	-2.662[0]	0.082	-3.152[1]	0.024	-3.804[1]	0.003		
S9	-2.480[0]	0.122	-3.008[1]	0.035	-2.976[0]	0.039		
S10	-2.852[0]	0.053	-2.985[1]	0.038	-2.789[0]	0.061		

Table A.III: Results for the first-order autoregressive coefficient

This table reports the degree of persistency in excess returns and the six economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP) and cash flow-to-price (CFP) used as predictors of returns. The estimate is based on an autoregressive model of order one. The results are reported for 10 portfolios sorted on book-to-market value and 10 portfolios sorted on market capitalization. BM1, …, BM10 (S1, …, S10) represent deciles in ascending order for portfolios sorted on book-to-market (market capitalization) value.

	$AR(1)$ coefficient						
	Returns	BM	DE	DP	DY	EP	CFP
BM1	0.152	0.946	0.960	0.972	0.972	0.960	0.548
BM2	0.163	0.932	0.972	0.944	0.946	0.946	0.910
BM3	0.194	0.959	0.978	0.957	0.953	0.960	0.948
BM4	0.181	0.957	0.953	0.917	0.913	0.958	0.929
BM5	0.169	0.962	0.962	0.963	0.960	0.960	0.942
BM6	0.182	0.968	0.951	0.957	0.956	0.955	0.942
BM7	0.196	0.969	0.970	0.963	0.961	0.943	0.937
BM8	0.172	0.975	0.924	0.964	0.966	0.972	0.943
BM9	0.172	0.972	0.933	0.964	0.962	0.954	0.915
BM10	0.132	0.978	0.971	0.975	0.973	0.969	0.889
	Returns	BM	DE	DP	DY	EP	CFP
S1	0.137	0.973	0.967	0.981	0.978	0.970	0.901
S2	0.160	0.951	0.946	0.950	0.948	0.971	0.934
S3	0.155	0.971	0.955	0.971	0.973	0.960	0.904
S4	0.196	0.976	0.964	0.975	0.969	0.951	0.919
S5	0.191	0.967	0.981	0.950	0.949	0.959	0.927
S6	0.192	0.940	0.976	0.949	0.950	0.939	0.926
S7	0.183	0.933	0.972	0.967	0.963	0.953	0.893
S8	0.174	0.937	0.973	0.957	0.953	0.950	0.920
S9	0.212	0.950	0.974	0.959	0.956	0.951	0.937
S10	0.136	0.956	0.952	0.942	0.939	0.951	0.940

Table A.IV: Results for heteroskedasticity tests for book-to-market portfolios

This table reports the heteroskedasticity test results for excess returns of 10 portfolios sorted on book-to-market value and for the corresponding six economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), and cash flow-to-price (CFP) used as predictors of returns. BM1, …, BM10 represent deciles in ascending order for portfolios sorted on book-to-market value. We square the variables and estimate the autocorrelations associated with the squared variables. The Q-statistics at lags 1, 4, 8 and 12 are reported with p-values in parenthesis.

	Autocorrelation (Q-stat)				Autocorrelation (Q-stat)			
	Lag 1	Lag 4	Lag 8	Lag 12	Lag 1	Lag 4	Lag 8	Lag 12
	Returns				BM			
BM1	10.34 (0.00)	16.71 (0.00)	51.25 (0.00)	54.88 (0.00)	195.6 (0.00)	571.1 (0.00)	872.2 (0.00)	1101 (0.00)
BM2	5.577 (0.01)	8.420 (0.07)	48.01 (0.00)	50.56 (0.00)	211.0 (0.00)	576.0 (0.00)	693.0 (0.00)	715.3 (0.00)
BM3	4.499 (0.03)	5.316 (0.25)	46.73 (0.00)	48.18 (0.00)	232.4 (0.00)	691.6 (0.00)	894.5 (0.00)	961.5 (0.00)
BM4	5.167 (0.02)	5.508 (0.23)	44.82 (0.00)	46.57 (0.00)	229.6 (0.00)	738.1 (0.00)	1097 (0.00)	1288 (0.00)
BM5	7.412 (0.00)	7.750 (0.10)	48.88 (0.00)	49.60 (0.00)	236.6 (0.00)	759.9 (0.00)	1104 (0.00)	1249 (0.00)
BM6	4.118 (0.04)	4.225 (0.37)	36.54 (0.00)	38.95 (0.00)	239.6 (0.00)	800.3 (0.00)	1239 (0.00)	1502 (0.00)
BM7	9.756 (0.00)	10.31 (0.03)	40.27 (0.00)	45.48 (0.00)	244.7 (0.00)	810.4 (0.00)	1249 (0.00)	1502 (0.00)
BM8	7.736 (0.00)	8.090 (0.08)	27.34 (0.00)	31.18 (0.00)	246.0 (0.00)	862.4 (0.00)	1420 (0.00)	1782 (0.00)
BM9	4.407 (0.03)	4.662 (0.32)	11.82 (0.15)	14.63 (0.26)	241.2 (0.00)	844.1 (0.00)	1435 (0.00)	1811 (0.00)
BM10	5.645 (0.01)	5.800 (0.21)	19.46 (0.01)	21.21 (0.04)	244.1 (0.00)	878.4 (0.00)	1486 (0.00)	1905 (0.00)
	DE				DP			
BM1	244.4 (0.00)	856.6 (0.00)	1424 (0.00)	1762 (0.00)	253.7 (0.00)	932.8 (0.00)	1670 (0.00)	2246 (0.00)
BM2	253.1 (0.00)	938.6 (0.00)	1691 (0.00)	2277 (0.00)	238.2 (0.00)	771.9 (0.00)	1076 (0.00)	1117 (0.00)
BM3	253.3 (0.00)	940.1 (0.00)	1695 (0.00)	2286 (0.00)	240.7 (0.00)	778.7 (0.00)	1112 (0.00)	1199 (0.00)
BM4	239.8 (0.00)	815.7 (0.00)	1296 (0.00)	1529 (0.00)	223.7 (0.00)	677.7 (0.00)	949.3 (0.00)	1012 (0.00)
BM5	246.0 (0.00)	873.1 (0.00)	1477 (0.00)	1858 (0.00)	246.9 (0.00)	880.0 (0.00)	1493 (0.00)	1900 (0.00)
BM6	239.6 (0.00)	813.8 (0.00)	1290 (0.00)	1516 (0.00)	243.6 (0.00)	814.1 (0.00)	1270 (0.00)	1495 (0.00)
BM7	250.3 (0.00)	911.8 (0.00)	1601 (0.00)	2096 (0.00)	245.6 (0.00)	858.5 (0.00)	1447 (0.00)	1831 (0.00)
BM8	226.9 (0.00)	703.3 (0.00)	976.0 (0.00)	1020 (0.00)	248.9 (0.00)	894.4 (0.00)	1516 (0.00)	1893 (0.00)
BM9	231.0 (0.00)	740.1 (0.00)	1075 (0.00)	1164 (0.00)	246.1 (0.00)	864.4 (0.00)	1463 (0.00)	1886 (0.00)
BM10	243.0 (0.00)	847.7 (0.00)	1398 (0.00)	1713 (0.00)	246.4 (0.00)	876.8 (0.00)	1506 (0.00)	1960 (0.00)

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Table A.IV: Continued

	Autocorrelation (Q-stat)				Autocorrelation (Q-stat)			
	Lag 1	Lag 4	Lag 8	Lag 12	Lag 1	Lag 4	Lag 8	Lag 12
	DY				EP			
BM1	252.7 (0.00)	933.6 (0.00)	1678 (0.00)	2260 (0.00)	243.9 (0.00)	836.8 (0.00)	1350 (0.00)	1648 (0.00)
BM2	240.2 (0.00)	783.5 (0.00)	1084 (0.00)	1126 (0.00)	238.3 (0.00)	772.5 (0.00)	1113 (0.00)	1215 (0.00)
BM3	239.9 (0.00)	774.8 (0.00)	1112 (0.00)	1205 (0.00)	245.4 (0.00)	828.3 (0.00)	1267 (0.00)	1447 (0.00)
BM4	222.1 (0.00)	663.8 (0.00)	937.3 (0.00)	1007 (0.00)	244.2 (0.00)	825.2 (0.00)	1256 (0.00)	1439 (0.00)
BM5	245.5 (0.00)	873.9 (0.00)	1469 (0.00)	1858 (0.00)	244.3 (0.00)	851.1 (0.00)	1389 (0.00)	1699 (0.00)
BM6	242.9 (0.00)	811.0 (0.00)	1270 (0.00)	1492 (0.00)	244.6 (0.00)	829.4 (0.00)	1310 (0.00)	1557 (0.00)
BM7	244.8 (0.00)	857.4 (0.00)	1430 (0.00)	1795 (0.00)	238.4 (0.00)	770.6 (0.00)	1144 (0.00)	1287 (0.00)
BM8	248.6 (0.00)	891.1 (0.00)	1501 (0.00)	1864 (0.00)	250.5 (0.00)	901.4 (0.00)	1523 (0.00)	1909 (0.00)
BM9	244.3 (0.00)	861.6 (0.00)	1453 (0.00)	1869 (0.00)	238.7 (0.00)	815.0 (0.00)	1296 (0.00)	1554 (0.00)
BM10	244.9 (0.00)	877.4 (0.00)	1504 (0.00)	1950 (0.00)	249.0 (0.00)	900.3 (0.00)	1552 (0.00)	2004 (0.00)
	CFP							
BM1	15.61 (0.00)	90.31 (0.00)	144.0 (0.00)	198.8 (0.00)				
BM2	209.3 (0.00)	538.4 (0.00)	596.2 (0.00)	597.2 (0.00)				
BM3	230.2 (0.00)	641.3 (0.00)	752.4 (0.00)	762.5 (0.00)				
BM4	209.3 (0.00)	618.9 (0.00)	825.9 (0.00)	905.6 (0.00)				
BM5	233.8 (0.00)	739.7 (0.00)	1048. (0.00)	1132 (0.00)				
BM6	226.3 (0.00)	664.5 (0.00)	892.4 (0.00)	973.2 (0.00)				
BM7	224.4 (0.00)	649.3 (0.00)	847.5 (0.00)	886.0 (0.00)				
BM8	227.9 (0.00)	695.3 (0.00)	1008 (0.00)	1136 (0.00)				
BM9	166.3 (0.00)	276.8 (0.00)	319.0 (0.00)	320.3 (0.00)				
BM10	180.8 (0.00)	463.6 (0.00)	584.8 (0.00)	597.6 (0.00)				

Table A.V: Results for heteroskedasticity tests for size portfolios

This table reports the heteroskedasticity test results for excess returns of 10 portfolios sorted on market capitalization and for the corresponding six economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), and cash flow-to-price (CFP) used as predictors of returns. S1, …, S10 represent deciles in ascending order for portfolios sorted on market capitalization. We square the variables and estimate the autocorrelations associated with the squared variables. The Q-statistics at lags 1, 4, 8 and 12 are reported with p-values in parenthesis.

	Autocorrelation (Q-stat)				Autocorrelation (Q-stat)			
	Lag 1	Lag 4	Lag 8	Lag 12	Lag 1	Lag 4	Lag 8	Lag 12
	Returns				BM			
S1	4.375 (0.03)	4.546 (0.33)	15.56 (0.04)	20.18 (0.06)	244.9 (0.00)	844.0 (0.00)	1431 (0.00)	1764 (0.00)
S2	8.474 (0.00)	8.651 (0.07)	28.98 (0.00)	37.22 (0.00)	220.7 (0.00)	658.5 (0.00)	904.4 (0.00)	966.8 (0.00)
S3	10.06 (0.00)	10.11 (0.03)	32.54 (0.00)	36.64 (0.00)	240.7 (0.00)	833.9 (0.00)	1377 (0.00)	1718 (0.00)
S4	6.840 (0.00)	7.280 (0.12)	40.46 (0.00)	46.70 (0.00)	248.8 (0.00)	872.6 (0.00)	1377 (0.00)	1612 (0.00)
S5	6.353 (0.01)	7.220 (0.12)	45.21 (0.00)	48.76 (0.00)	230.0 (0.00)	799.4 (0.00)	1387 (0.00)	1786 (0.00)
S6	4.889 (0.02)	6.781 (0.14)	44.92 (0.00)	48.15 (0.00)	216.6 (0.00)	637.1 (0.00)	932.7 (0.00)	1039 (0.00)
S7	3.713 (0.05)	4.360 (0.35)	32.82 (0.00)	34.26 (0.00)	207.6 (0.00)	590.4 (0.00)	783.9 (0.00)	880.5 (0.00)
S8	6.655 (0.01)	6.886 (0.14)	52.84 (0.00)	53.62 (0.00)	219.5 (0.00)	622.7 (0.00)	807.2 (0.00)	846.1 (0.00)
S9	4.012 (0.04)	6.369 (0.17)	48.31 (0.00)	48.97 (0.00)	229.0 (0.00)	721.7 (0.00)	1067 (0.00)	1261 (0.00)
S10	0.854 (0.35)	3.542 (0.47)	31.91 (0.00)	34.35 (0.00)	237.8 (0.00)	734.2 (0.00)	1042 (0.00)	1155 (0.00)
	DE				DP			
S1	241.6 (0.00)	831.1 (0.00)	1342 (0.00)	1609 (0.00)	249.4 (0.00)	915.7 (0.00)	1636 (0.00)	2204 (0.00)
S2	234.0 (0.00)	769.0 (0.00)	1161 (0.00)	1301 (0.00)	234.8 (0.00)	776.0 (0.00)	1199 (0.00)	1401 (0.00)
S3	242.9 (0.00)	845.6 (0.00)	1389 (0.00)	1694 (0.00)	252.5 (0.00)	910.1 (0.00)	1552 (0.00)	1948 (0.00)
S4	248.7 (0.00)	897.6 (0.00)	1554 (0.00)	2006 (0.00)	251.0 (0.00)	904.1 (0.00)	1579 (0.00)	2088 (0.00)
S5	254.7 (0.00)	953.0 (0.00)	1739 (0.00)	2372 (0.00)	238.1 (0.00)	804.4 (0.00)	1286 (0.00)	1524 (0.00)
S6	252.1 (0.00)	928.8 (0.00)	1658 (0.00)	2209 (0.00)	237.2 (0.00)	758.8 (0.00)	1089 (0.00)	1167 (0.00)
S7	252.2 (0.00)	929.6 (0.00)	1660 (0.00)	2215 (0.00)	247.3 (0.00)	858.2 (0.00)	1413 (0.00)	1757 (0.00)
S8	253.0 (0.00)	939.2 (0.00)	1696 (0.00)	2292 (0.00)	242.3 (0.00)	811.8 (0.00)	1273 (0.00)	1527 (0.00)
S9	252.9 (0.00)	938.6 (0.00)	1696 (0.00)	2285 (0.00)	245.9 (0.00)	833.3 (0.00)	1259 (0.00)	1416 (0.00)
S10	240.3 (0.00)	823.2 (0.00)	1326 (0.00)	1587 (0.00)	234.5 (0.00)	746.9 (0.00)	1092 (0.00)	1243 (0.00)

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Table A.V: Continued

	Autocorrelation (Q-stat)				Autocorrelation (Q-stat)			
	Lag 1	Lag 4	Lag 8	Lag 12	Lag 1	Lag 4	Lag 8	Lag 12
	DY				EP			
S1	247.6 (0.00)	907.5 (0.00)	1628 (0.00)	2215 (0.00)	248.6 (0.00)	896.7 (0.00)	1554 (0.00)	2040 (0.00)
S2	233.3 (0.00)	771.3 (0.00)	1190 (0.00)	1381 (0.00)	246.5 (0.00)	874.5 (0.00)	1470 (0.00)	1844 (0.00)
S3	253.2 (0.00)	918.8 (0.00)	1570 (0.00)	1974 (0.00)	242.5 (0.00)	838.7 (0.00)	1376 (0.00)	1675 (0.00)
S4	248.3 (0.00)	896.5 (0.00)	1557 (0.00)	2048 (0.00)	241.0 (0.00)	788.0 (0.00)	1167 (0.00)	1284 (0.00)
S5	238.4 (0.00)	806.5 (0.00)	1284 (0.00)	1526 (0.00)	245.9 (0.00)	856.6 (0.00)	1386 (0.00)	1682 (0.00)
S6	238.3 (0.00)	773.9 (0.00)	1131 (0.00)	1228 (0.00)	236.6 (0.00)	754.9 (0.00)	1095 (0.00)	1209 (0.00)
S7	246.2 (0.00)	860.1 (0.00)	1417 (0.00)	1757 (0.00)	242.0 (0.00)	818.1 (0.00)	1277 (0.00)	1498 (0.00)
S8	241.0 (0.00)	810.6 (0.00)	1271 (0.00)	1530 (0.00)	239.8 (0.00)	767.0 (0.00)	1105 (0.00)	1198 (0.00)
S9	244.0 (0.00)	822.4 (0.00)	1229 (0.00)	1382 (0.00)	242.6 (0.00)	805.7 (0.00)	1176 (0.00)	1285 (0.00)
S10	232.8 (0.00)	745.1 (0.00)	1109 (0.00)	1273 (0.00)	242.2 (0.00)	799.8 (0.00)	1183 (0.00)	1332 (0.00)
	CFP							
S1	179.7 (0.00)	355.2 (0.00)	418.3 (0.00)	420.9 (0.00)				
S2	211.6 (0.00)	596.4 (0.00)	785.8 (0.00)	804.0 (0.00)				
S3	210.0 (0.00)	576.3 (0.00)	725.7 (0.00)	744.0 (0.00)				
S4	207.2 (0.00)	539.6 (0.00)	716.7 (0.00)	735.6 (0.00)				
S5	210.2 (0.00)	609.6 (0.00)	842.5 (0.00)	914.8 (0.00)				
S6	221.3 (0.00)	640.4 (0.00)	832.2 (0.00)	857.6 (0.00)				
S7	198.3 (0.00)	472.5 (0.00)	509.6 (0.00)	512.7 (0.00)				
S8	216.6 (0.00)	557.4 (0.00)	608.0 (0.00)	610.6 (0.00)				
S9	224.2 (0.00)	666.2 (0.00)	929.0 (0.00)	1073 (0.00)				
S10	229.8 (0.00)	677.1 (0.00)	883.3 (0.00)	928.1 (0.00)				

Table A.VI: Results for ARCH effects for book-to-market portfolios

This table reports the ARCH test results for excess returns of 10 portfolios sorted on book-to-market value and for the corresponding six economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), and cash flow-to-price (CFP) used as predictors of returns. BM1, …, BM10 represent deciles in ascending order for portfolios sorted on book-to-market value. We undertake ARCH tests by filtering each series through running an autoregressive regression model with twelve lags. We then apply the Lagrange Multiplier test to examine the null hypothesis of no ARCH in the filtered series. The F-statistics at lags 1, 4, 6 and 12 are reported with resulting p-values reported in parenthesis.

	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)
	Returns				BM			
BM1	7.60 (0.00)	3.48 (0.00)	3.77 (0.00)	2.99 (0.00)	19.95 (0.00)	5.70 (0.00)	7.20 (0.00)	6.93 (0.00)
BM2	2.44 (0.11)	0.77 (0.54)	3.18 (0.00)	2.68 (0.00)	13.16 (0.00)	4.33 (0.00)	2.42 (0.01)	1.62 (0.08)
BM3	2.21 (0.13)	0.66 (0.61)	3.33 (0.00)	2.36 (0.00)	11.97 (0.00)	5.01 (0.00)	5.08 (0.00)	3.60 (0.00)
BM4	0.94 (0.33)	0.27 (0.89)	2.96 (0.00)	2.07 (0.01)	6.74 (0.01)	1.90 (0.11)	1.36 (0.21)	0.97 (0.47)
BM5	5.12 (0.02)	1.48 (0.20)	3.29 (0.00)	2.22 (0.01)	8.48 (0.00)	4.23 (0.00)	4.23 (0.00)	3.31 (0.00)
BM6	1.44 (0.23)	0.39 (0.81)	1.95 (0.05)	1.42 (0.15)	8.82 (0.00)	3.22 (0.01)	2.72 (0.00)	1.98 (0.02)
BM7	5.10 (0.02)	1.37 (0.24)	1.98 (0.04)	1.51 (0.12)	0.29 (0.58)	0.43 (0.78)	0.54 (0.81)	0.36 (0.97)
BM8	3.40 (0.06)	0.89 (0.46)	1.29 (0.24)	0.98 (0.46)	18.39 (0.00)	6.10 (0.00)	4.21 (0.00)	3.13 (0.00)
BM9	3.94 (0.04)	1.00 (0.40)	0.64 (0.74)	0.41 (0.95)	24.56 (0.00)	7.59 (0.00)	3.97 (0.00)	3.48 (0.00)
BM10	6.40 (0.01)	1.70 (0.14)	1.50 (0.15)	1.06 (0.38)	9.49 (0.00)	10.84 (0.00)	7.88 (0.00)	8.03 (0.00)
	DE				DP			
BM1	0.15 (0.69)	0.16 (0.95)	0.18 (0.99)	1.39 (0.17)	0.07 (0.78)	0.02 (0.99)	0.05 (0.99)	0.90 (0.54)
BM2	0.20 (0.65)	0.22 (0.92)	0.25 (0.97)	3.88 (0.00)	0.00 (0.98)	0.02 (0.99)	0.04 (1.00)	0.91 (0.53)
BM3	0.48 (0.48)	0.53 (0.71)	0.67 (0.71)	6.21 (0.00)	0.11 (0.73)	0.14 (0.96)	0.61 (0.76)	0.75 (0.70)
BM4	0.33 (0.56)	0.38 (0.82)	0.46 (0.88)	13.62 (0.00)	0.08 (0.77)	0.08 (0.98)	0.09 (0.99)	12.14 (0.00)
BM5	0.29 (0.58)	0.31 (0.86)	0.37 (0.93)	2.19 (0.01)	0.01 (0.89)	0.32 (0.85)	0.29 (0.96)	0.43 (0.94)
BM6	0.06 (0.80)	0.06 (0.99)	0.06 (0.99)	2.81 (0.00)	0.03 (0.86)	0.16 (0.95)	0.21 (0.98)	3.02 (0.00)
BM7	0.43 (0.50)	0.47 (0.75)	0.58 (0.79)	3.06 (0.00)	0.00 (0.95)	0.16 (0.95)	0.33 (0.95)	6.84 (0.00)
BM8	0.36 (0.54)	0.42 (0.79)	0.53 (0.83)	5.10 (0.00)	0.07 (0.78)	0.15 (0.95)	0.17 (0.99)	0.32 (0.98)
BM9	0.19 (0.65)	0.33 (0.85)	0.43 (0.90)	0.87 (0.57)	0.05 (0.81)	0.29 (0.88)	0.40 (0.91)	11.49 (0.00)
BM10	0.39 (0.53)	0.41 (0.79)	0.51 (0.84)	4.19 (0.00)	0.01 (0.91)	0.07 (0.99)	0.08 (0.99)	1.45 (0.14)

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Table A.VI: Continued

	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)
	DY				EP			
BM1	0.12 (0.72)	0.08 (0.98)	0.07 (0.99)	1.34 (0.19)	2.04 (0.15)	1.95 (0.10)	1.80 (0.07)	2.24 (0.01)
BM2	0.01 (0.89)	0.04 (0.99)	0.04 (0.99)	1.31 (0.21)	2.99 (0.08)	0.89 (0.47)	1.02 (0.41)	1.77 (0.05)
BM3	0.17 (0.67)	0.23 (0.91)	0.39 (0.92)	1.21 (0.27)	0.06 (0.80)	0.88 (0.47)	1.25 (0.26)	2.01 (0.02)
BM4	0.19 (0.65)	0.13 (0.97)	0.09 (0.99)	5.39 (0.00)	0.08 (0.76)	0.22 (0.92)	0.31 (0.95)	1.59 (0.09)
BM5	0.00 (0.98)	0.20 (0.93)	0.18 (0.99)	0.53 (0.89)	0.57 (0.44)	0.24 (0.90)	0.18 (0.99)	0.26 (0.99)
BM6	0.03 (0.84)	0.09 (0.98)	0.12 (0.99)	1.23 (0.25)	0.03 (0.85)	0.15 (0.96)	0.14 (0.99)	3.35 (0.00)
BM7	0.63 (0.42)	0.46 (0.76)	0.39 (0.92)	5.72 (0.00)	0.06 (0.80)	0.23 (0.92)	0.44 (0.89)	7.96 (0.00)
BM8	0.02 (0.87)	0.10 (0.97)	0.10 (0.99)	0.29 (0.99)	0.00 (0.94)	0.41 (0.79)	0.42 (0.90)	2.06 (0.02)
BM9	0.21 (0.64)	0.34 (0.84)	0.40 (0.91)	4.60 (0.00)	0.28 (0.59)	0.21 (0.92)	0.27 (0.97)	2.09 (0.01)
BM10	0.07 (0.78)	0.12 (0.97)	0.09 (0.99)	1.32 (0.20)	0.00 (0.97)	0.09 (0.98)	0.13 (0.99)	1.35 (0.18)
	CFP							
BM1	108.9 (0.00)	31.14 (0.00)	19.86 (0.00)	12.86 (0.00)				
BM2	6.58 (0.01)	2.33 (0.05)	1.34 (0.22)	1.37 (0.17)				
BM3	12.67 (0.00)	4.27 (0.00)	5.94 (0.00)	4.07 (0.00)				
BM4	3.38 (0.06)	0.86 (0.48)	0.49 (0.85)	0.45 (0.93)				
BM5	0.17 (0.67)	0.08 (0.98)	0.31 (0.95)	1.69 (0.06)				
BM6	0.18 (0.66)	1.04 (0.38)	0.62 (0.75)	0.83 (0.61)				
BM7	0.19 (0.66)	0.17 (0.94)	0.08 (0.99)	0.53 (0.88)				
BM8	1.73 (0.18)	1.10 (0.35)	0.65 (0.73)	3.66 (0.00)				
BM9	13.65 (0.00)	7.60 (0.00)	5.29 (0.00)	4.49 (0.00)				
BM10	0.11 (0.73)	0.93 (0.44)	0.53 (0.82)	1.81 (0.04)				

Table A.VII: Results for ARCH effects for size portfolios

This table reports the ARCH test results for excess returns of 10 portfolios sorted on market capitalization and for the corresponding six economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), and cash flow-to-price (CFP) used as predictors of returns. S1, …, S10 represent deciles in ascending order for portfolios sorted on market capitalization. We undertake ARCH tests by filtering each series through running an autoregressive regression model with twelve lags. We then apply the Lagrange Multiplier test to examine the null hypothesis of no ARCH in the filtered series. The F-statistics at lags 1, 4, 6 and 12 are reported with resulting p-values reported in parenthesis.

	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)
	Returns				BM			
S1	5.78 (0.01)	1.74 (0.14)	1.42 (0.18)	1.12 (0.34)	0.10 (0.74)	0.23 (0.91)	0.29 (0.96)	0.29 (0.99)
S2	10.98 (0.00)	3.00 (0.01)	2.28 (0.02)	1.72 (0.06)	0.00 (0.96)	1.49 (0.20)	0.72 (0.66)	9.05 (0.00)
S3	7.21 (0.00)	1.89 (0.11)	1.75 (0.08)	1.32 (0.20)	6.05 (0.01)	3.34 (0.01)	4.71 (0.00)	3.45 (0.00)
S4	3.81 (0.05)	0.91 (0.45)	1.71 (0.09)	1.24 (0.25)	9.51 (0.00)	3.36 (0.01)	4.73 (0.00)	3.35 (0.00)
S5	1.96 (0.16)	0.73 (0.56)	2.15 (0.03)	1.49 (0.12)	27.80 (0.00)	23.10 (0.00)	14.88 (0.00)	10.55 (0.00)
S6	1.80 (0.18)	0.56 (0.68)	2.49 (0.01)	1.67 (0.07)	0.24 (0.61)	0.33 (0.85)	0.29 (0.96)	3.82 (0.00)
S7	2.65 (0.10)	0.83 (0.50)	2.20 (0.02)	1.59 (0.09)	9.09 (0.00)	2.33 (0.05)	1.32 (0.23)	1.01 (0.43)
S8	2.25 (0.13)	0.62 (0.64)	4.14 (0.00)	2.88 (0.00)	0.24 (0.61)	3.17 (0.01)	1.61 (0.12)	1.27 (0.23)
S9	1.42 (0.23)	0.83 (0.50)	4.92 (0.00)	3.50 (0.00)	4.37 (0.03)	1.83 (0.12)	3.13 (0.00)	2.06 (0.02)
S10	0.28 (0.59)	0.96 (0.42)	2.40 (0.01)	1.91 (0.03)	0.12 (0.72)	2.15 (0.07)	1.22 (0.28)	1.59 (0.09)
	DE				DP			
S1	0.13 (0.71)	0.14 (0.96)	0.16 (0.99)	1.73 (0.06)	0.00 (0.99)	0.06 (0.99)	0.07 (0.99)	3.04 (0.00)
S2	0.21 (0.64)	0.23 (0.91)	0.27 (0.97)	1.60 (0.09)	0.12 (0.72)	0.23 (0.91)	0.21 (0.98)	1.55 (0.10)
S3	0.55 (0.45)	0.67 (0.61)	0.90 (0.51)	22.08 (0.00)	0.01 (0.89)	0.15 (0.96)	0.21 (0.98)	2.19 (0.01)
S4	0.29 (0.58)	0.30 (0.87)	0.35 (0.94)	7.25 (0.00)	0.41 (0.51)	0.62 (0.64)	0.53 (0.83)	1.99 (0.02)
S5	0.40 (0.52)	0.44 (0.77)	0.55 (0.81)	2.69 (0.00)	0.00 (0.97)	0.07 (0.99)	0.09 (0.99)	0.18 (0.99)
S6	0.30 (0.58)	0.31 (0.86)	0.37 (0.93)	6.96 (0.00)	0.19 (0.65)	0.52 (0.71)	0.92 (0.49)	11.83 (0.00)
S7	0.46 (0.49)	0.50 (0.73)	0.63 (0.74)	3.65 (0.00)	2.60 (0.10)	0.81 (0.51)	0.56 (0.80)	0.39 (0.96)
S8	0.32 (0.56)	0.42 (0.79)	0.55 (0.81)	14.94 (0.00)	0.71 (0.39)	1.03 (0.39)	1.18 (0.30)	0.87 (0.57)
S9	0.10 (0.75)	0.09 (0.98)	0.10 (0.99)	0.19 (0.99)	0.01 (0.91)	0.19 (0.94)	0.89 (0.51)	1.16 (0.31)
S10	0.23 (0.62)	0.22 (0.92)	0.26 (0.97)	5.46 (0.00)	0.36 (0.54)	0.15 (0.96)	0.13 (0.99)	0.39 (0.96)

Continued overleaf

Table A.VII: Continued

	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)	ARCH(1)	ARCH(4)	ARCH(6)	ARCH(12)
	DY				EP			
S1	0.00 (0.93)	0.08 (0.98)	0.06 (0.99)	3.04 (0.00)	0.00 (0.99)	0.01 (0.99)	0.04 (1.00)	2.51 (0.00)
S2	0.18 (0.66)	0.36 (0.83)	0.24 (0.98)	0.62 (0.82)	0.03 (0.85)	0.43 (0.78)	0.35 (0.94)	1.31 (0.21)
S3	0.17 (0.67)	0.47 (0.75)	0.57 (0.79)	5.18 (0.00)	0.15 (0.69)	0.31 (0.87)	0.41 (0.91)	3.56 (0.00)
S4	0.12 (0.72)	0.31 (0.86)	0.27 (0.97)	0.50 (0.90)	0.78 (0.37)	0.26 (0.90)	0.30 (0.96)	0.29 (0.98)
S5	0.12 (0.72)	0.08 (0.98)	0.07 (0.99)	0.19 (0.99)	0.13 (0.71)	0.13 (0.96)	0.28 (0.97)	0.79 (0.65)
S6	0.65 (0.42)	0.40 (0.80)	0.60 (0.77)	10.29 (0.00)	0.01 (0.89)	0.04 (0.99)	0.10 (0.99)	2.39 (0.00)
S7	0.00 (0.95)	0.05 (0.99)	0.14 (0.99)	0.11 (0.99)	0.14 (0.70)	0.06 (0.99)	0.25 (0.97)	0.27 (0.99)
S8	0.02 (0.86)	0.59 (0.66)	1.21 (0.29)	0.87 (0.56)	0.30 (0.58)	0.44 (0.77)	0.41 (0.91)	1.57 (0.10)
S9	0.09 (0.76)	0.22 (0.92)	1.00 (0.43)	1.46 (0.13)	0.03 (0.85)	0.09 (0.98)	0.42 (0.90)	1.51 (0.12)
S10	0.01 (0.90)	0.02 (0.99)	0.08 (0.99)	0.67 (0.77)	0.80 (0.37)	0.33 (0.85)	0.34 (0.94)	1.52 (0.11)
	CFP							
S1	1.73 (0.18)	3.28 (0.01)	2.29 (0.02)	4.70 (0.00)				
S2	0.07 (0.78)	12.00 (0.00)	6.74 (0.00)	6.28 (0.00)				
S3	0.00 (0.96)	0.00 (0.99)	0.01 (1.00)	0.13 (0.99)				
S4	0.49 (0.48)	0.32 (0.85)	0.29 (0.96)	1.13 (0.33)				
S5	2.32 (0.12)	0.70 (0.59)	0.38 (0.92)	1.57 (0.09)				
S6	0.15 (0.69)	0.09 (0.98)	0.09 (0.99)	1.61 (0.08)				
S7	0.03 (0.85)	0.07 (0.99)	0.15 (0.99)	3.32 (0.00)				
S8	2.57 (0.10)	1.56 (0.18)	0.89 (0.52)	1.58 (0.09)				
S9	0.03 (0.84)	0.20 (0.93)	0.21 (0.98)	0.99 (0.45)				
S10	2.07 (0.15)	2.41 (0.04)	1.00 (0.42)	1.33 (0.20)				

Table A.VIII: Results for endogeneity tests for book-to-market portfolios

This table reports the endogeneity test results obtained through a three-step procedure. In the first step, we run the following predictive regression model: $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the book-to-market sorted portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). In the second step, we follow Westerlund and Narayan (2014) and model the predictor variable as follows: $x_t = \mu(1-\rho) + \rho x_{t-1} + \varepsilon_{x,t}$. In the third step, the relationship between the error terms is captured using the following regression: $\varepsilon_{r,t} = \gamma \varepsilon_{x,t} + \eta_t$. If the coefficient γ is statistically different from zero, then the predictor variable is endogenous. We report the coefficient on γ, its test statistic and p-value. BM1, …, BM10 represent deciles in ascending order for portfolios sorted on book-to-market value.

	γ	t-stat	p-value	γ	t-stat	p-value	γ	t-stat	p-value	γ	t-stat	p-value
		BM			DE			DP			DY	
BM1	7.240	1.994	0.047	4.671	0.493	0.622	-33.742	-9.275	0.000	-3.619	-0.902	0.368
BM2	-14.754	-17.016	0.000	2.949	0.259	0.796	-49.062	-13.702	0.000	-7.483	-1.580	0.115
BM3	-13.139	-21.429	0.000	-2.618	-0.159	0.874	-76.146	-23.030	0.000	-12.503	-2.259	0.025
BM4	-78.922	-16.341	0.000	4.740	0.460	0.646	-36.927	-11.042	0.000	-5.671	-1.412	0.159
BM5	-77.183	-22.090	0.000	12.615	0.893	0.373	-62.675	-15.436	0.000	-4.051	-0.738	0.461
BM6	-61.255	-22.655	0.000	3.905	0.431	0.667	-51.777	-15.771	0.000	-12.668	-2.836	0.005
BM7	-56.829	-27.237	0.000	5.961	0.543	0.587	-65.572	-18.623	0.000	-13.094	-2.529	0.012
BM8	-41.946	-24.892	0.000	0.735	0.091	0.928	-48.652	-12.190	0.000	-7.188	-1.400	0.163
BM9	-24.819	-16.026	0.000	2.904	0.263	0.793	-48.675	-12.605	0.000	-12.019	-2.473	0.014
BM10	-7.195	-15.834	0.000	7.442	0.602	0.548	-30.926	-6.477	0.000	-0.515	-0.103	0.918
		EP			CFP			INF			SVAR	
BM1	-73.054	-23.636	0.000	8.115	0.985	0.326	-3.789	-1.115	0.266	-53.561	-5.935	0.000
BM2	-74.641	-25.380	0.000	-43.431	-14.915	0.000	-5.455	-1.579	0.116	-61.503	-6.791	0.000
BM3	-73.808	-23.934	0.000	-49.515	-20.375	0.000	-5.448	-1.528	0.128	-61.966	-6.569	0.000
BM4	-61.061	-19.616	0.000	-26.406	-14.383	0.000	-4.801	-1.272	0.205	-56.965	-5.600	0.000
BM5	-62.109	-17.844	0.000	-24.872	-14.422	0.000	-6.455	-1.693	0.092	-60.221	-5.958	0.000
BM6	-53.303	-17.290	0.000	-18.525	-15.156	0.000	-5.724	-1.501	0.135	-58.209	-5.735	0.000
BM7	-45.447	-14.864	0.000	-16.929	-16.079	0.000	-5.628	-1.519	0.130	-56.676	-5.706	0.000
BM8	-66.687	-18.444	0.000	-17.286	-16.229	0.000	-5.168	-1.303	0.194	-55.684	-5.209	0.000
BM9	-55.424	-15.235	0.000	-2.483	-0.500	0.617	-5.785	-1.354	0.177	-59.843	-5.141	0.000
BM10	-53.960	-12.897	0.000	-27.657	-5.048	0.000	-6.661	-1.491	0.137	-64.305	-5.363	0.000

Table A.IX: Results for endogeneity tests for size portfolios

This table reports the endogeneity test results obtained through a three-step procedure. In the first step, we run the following predictive regression model: $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the market capitalization sorted portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). In the second step, we follow Westerlund and Narayan (2014) and model the predictor variable as follows: $x_t = \mu(1-\rho) + \rho x_{t-1} + \varepsilon_{x,t}$. In the third step, the relationship between the error terms is captured using the following regression: $\varepsilon_{r,t} = \gamma \varepsilon_{x,t} + \eta_t$. If the coefficient γ is statistically different from zero, then the predictor variable is endogenous. We report the coefficient on γ, its test statistic and p-value. S1, …, S10 represent deciles in ascending order for portfolios sorted on market capitalization.

	γ	t-stat	p-value	γ	t-stat	p-value	γ	t-stat	p-value	γ	t-stat	p-value
	BM			DE			DP			DY		
S1	-6.715	-7.795	0.000	19.980	1.524	0.129	-29.915	-6.016	0.000	-1.951	-0.378	0.706
S2	-4.554	-6.042	0.000	13.861	1.062	0.289	-40.897	-9.172	0.000	-3.211	-0.649	0.517
S3	-27.480	-18.189	0.000	-15.300	-1.159	0.248	-74.396	-19.867	0.000	-18.416	-3.054	0.002
S4	-33.216	-17.617	0.000	6.341	0.698	0.486	-63.855	-16.203	0.000	-9.323	-1.790	0.075
S5	-28.703	-13.257	0.000	9.465	0.755	0.451	-53.927	-12.497	0.000	-3.136	-0.581	0.561
S6	-35.632	-14.884	0.000	8.708	0.834	0.405	-41.648	-12.764	0.000	-10.234	-2.491	0.013
S7	-45.087	-15.385	0.000	-2.966	-0.250	0.803	-77.171	-22.552	0.000	-10.371	-1.832	0.068
S8	-54.059	-14.113	0.000	1.706	0.166	0.868	-78.508	-26.671	0.000	-10.235	-1.888	0.060
S9	-10.300	-19.910	0.000	-18.484	-0.978	0.329	-77.204	-24.726	0.000	-12.206	-2.220	0.027
S10	-17.201	-23.352	0.000	9.432	0.974	0.331	-63.664	-19.057	0.000	-3.984	-0.800	0.425
	EP			CFP			INF			SVAR		
S1	-48.095	-12.130	0.000	3.762	1.216	0.225	-6.260	-1.546	0.123	-54.171	-5.028	0.000
S2	-54.256	-14.171	0.000	-33.725	-5.646	0.000	-6.436	-1.571	0.117	-59.064	-5.467	0.000
S3	-64.326	-17.966	0.000	-55.242	-6.564	0.000	-5.853	-1.446	0.149	-57.170	-5.280	0.000
S4	-58.586	-17.880	0.000	-16.924	-12.520	0.000	-6.201	-1.560	0.120	-63.437	-6.019	0.000
S5	-62.190	-17.876	0.000	-14.538	-11.523	0.000	-6.261	-1.556	0.121	-64.499	-6.113	0.000
S6	-51.639	-16.981	0.000	-16.271	-12.409	0.000	-5.788	-1.428	0.154	-63.035	-5.883	0.000
S7	-68.860	-21.706	0.000	-16.434	-11.172	0.000	-4.939	-1.308	0.192	-60.363	-6.056	0.000
S8	-56.462	-18.022	0.000	-24.819	-13.508	0.000	-4.764	-1.360	0.175	-53.198	-5.785	0.000
S9	-66.923	-20.537	0.000	-40.478	-18.528	0.000	-4.179	-1.205	0.229	-54.664	-5.979	0.000
S10	-64.830	-20.863	0.000	-42.257	-17.590	0.000	-4.364	-1.318	0.189	-53.253	-6.138	0.000

Table A.X: Economic significance results for aggregate market and industry portfolios with a risk aversion factor of three

This table reports the economic significance results for the aggregate market and ten industries resulting from a dynamic trading strategy based on a mean–variance investor utility function. One-step ahead forecasted returns are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. We take the first 50% of the sample and generate the first forecast; then we take the first 50% plus the observation containing the forecasted return and generate return for the next day. This process is repeated until all the data are exhausted. The portfolio weights are computed using risk aversion parameter of 3, which typically represents a high level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the predictive regression based forecasting models where there is either evidence of in-sample predictability or evidence that at least 50% of forecast evaluation metrics support the predictive regression based model. Utility gain is the difference between the utility from our proposed model and the utility from the historical average model.

	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain
		BM			DE			DP			DY	
Market	0.546	33.970	0.002	0.596	33.911	0.025	1.218	10.436	0.164	1.257	10.238	0.155
Basic Materials	0.551	33.552	0.004	0.605	21.452	0.044	-	-	-	0.545	34.885	0.000
Consumer Goods	0.780	18.487	-0.003	1.061	17.944	0.348	0.660	28.154	0.045	0.673	28.465	0.052
Consumer Services	0.544	34.650	0.000	1.737	12.974	0.519	-	-	-	-	-	-
Financials	0.922	30.882	0.000	0.857	21.361	-0.059	0.784	18.544	-0.134	0.747	20.545	-0.159
Health Care	-	-	-	1.269	34.138	-0.284	2.167	16.534	-0.807	2.160	14.588	-1.002
Industrials	0.665	22.368	0.072	0.544	34.717	0.004	0.544	34.650	0.004	0.544	34.650	0.004
Oil and Gas	-	-	-	0.947	26.333	0.271	0.790	21.836	0.078	0.825	19.681	0.095
Technology	-	-	-	2.204	64.582	0.227	-	-	-	-	-	-
Telecommunication	1.423	21.674	0.024	2.641	11.948	0.518	2.117	13.488	0.236	2.260	13.089	0.300
Utilities	-	-	-	0.906	26.217	0.277	-	-	-	-	-	-
		EP			CFP			INF			SVAR	
Market	0.779	17.490	0.082	0.596	20.004	0.038	0.567	33.011	0.014	0.554	35.069	0.006
Basic Materials	0.620	21.122	0.059	0.604	18.051	0.058	0.555	33.349	0.009	-	-	-
Consumer Goods	1.137	22.664	0.222	1.148	13.854	0.069	0.785	22.701	0.166	-	-	-
Consumer Services	0.549	34.941	0.005	0.585	26.115	0.044	0.544	34.650	0.000	0.713	21.352	0.124
Financials	0.919	26.716	-0.035	0.664	33.756	-0.244	1.037	16.079	-0.085	-	-	-
Health Care	1.575	29.771	-0.331	-	-	-	-	-	-	-	-	-
Industrials	0.623	24.773	0.052	-	-	-	-	-	-	0.672	26.766	0.090
Oil and Gas	0.664	24.875	0.039	-	-	-	0.768	22.027	0.077	-	-	-
Technology	-	-	-	2.432	111.952	0.521	2.213	56.120	-0.007	-	-	-
Telecommunication	1.919	15.550	0.148	-	-	-	1.228	16.041	-0.335	-	-	-
Utilities	-	-	-	-	-	-	0.853	18.800	0.149	-	-	-

Table A.XI: Economic significance results for book-to-market sorted portfolios with a risk aversion factor of three

This table reports the economic significance results for 10 portfolios sorted on book-to-market resulting from a dynamic trading strategy based on a mean–variance investor utility function. One-step ahead forecasted returns are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. We take the first 50% of the sample and generate the first forecast; then we take the first 50% plus the observation containing the forecasted return and generate return for the next day. This process is repeated until all the data are exhausted. The portfolio weights are computed using risk aversion parameter of 3, which typically represents a high level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the predictive regression based forecasting models where there is either evidence of in-sample predictability or evidence that at least 50% of forecast evaluation metrics support the predictive regression based model. Utility gain is the difference between the utility from our proposed model and the utility from the historical average model.

	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain
		BM			DE			DP			DY	
BM1	1.208	9.666	-0.255	0.792	21.842	0.152	0.948	31.838	0.280	1.034	33.032	0.338
BM2	-	-	-	1.266	9.911	0.060	0.834	17.244	0.175	0.921	15.064	0.191
BM3	-	-	-	0.548	34.710	0.001	0.650	20.069	0.075	0.678	16.482	0.119
BM4	0.633	28.594	0.066	0.553	33.918	-0.002	0.621	25.028	0.050	-	-	-
BM5	0.822	18.535	0.195	1.421	11.968	-0.222	0.673	22.079	0.091	0.773	18.330	0.153
BM6	0.578	27.771	0.029	0.544	34.650	0.000	-	-	-	-	-	-
BM7	-	-	-	0.550	33.110	0.004	0.625	24.892	0.069	0.673	22.415	0.102
BM8	0.977	22.646	-0.017	0.868	24.434	-0.149	-	-	-	-	-	-
BM9	-	-	-	0.630	23.992	0.077	-	-	-	0.862	21.543	0.240
BM10	0.590	25.386	-0.059	0.809	22.240	0.068	0.757	35.113	0.077	0.788	31.823	0.086
		EP			CFP			INF			SVAR	
BM1	0.822	17.182	0.104	-	-	-	0.781	17.733	0.154	0.655	29.240	0.086
BM2	0.876	17.035	0.174	-	-	-	0.614	28.526	0.044	0.704	25.762	0.111
BM3	0.602	26.082	0.038	-	-	-	0.584	31.985	0.024	0.694	25.000	0.095
BM4	0.612	26.873	0.041	0.667	26.060	0.077	0.623	28.333	0.049	0.735	24.207	0.120
BM5	0.582	31.011	0.009	0.809	15.923	0.108	0.716	22.682	0.086	0.734	24.588	0.103
BM6	0.544	34.650	0.000	-	-	-	0.616	26.747	0.034	0.558	33.634	0.012
BM7	0.603	27.505	0.054	0.758	13.170	0.159	0.672	23.213	0.042	0.600	29.935	0.041
BM8	1.064	31.530	0.011	-	-	-	1.018	16.814	-0.179	1.203	18.076	-0.151
BM9	0.725	27.269	0.115	-	-	-	0.788	18.341	0.097	0.795	23.242	0.133
BM10	-	-	-	0.859	20.863	0.073	-	-	-	0.869	20.934	0.041

Table A.XII: Economic significance results for size sorted portfolios with a risk aversion factor of three

This table reports the economic significance results for 10 portfolios sorted on size resulting from a dynamic trading strategy based on a mean–variance investor utility function. One-step ahead forecasted returns are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. We take the first 50% of the sample and generate the first forecast; then we take the first 50% plus the observation containing the forecasted return and generate return for the next day. This process is repeated until all the data are exhausted. The portfolio weights are computed using risk aversion parameter of 3, which typically represents a high level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the predictive regression based forecasting models where there is either evidence of in-sample predictability or evidence that at least 50% of forecast evaluation metrics support the predictive regression based model. Utility gain is the difference between the utility from our proposed model and the utility from the historical average model.

	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain
		BM			DE			DP			DY	
S1	1.292	41.839	0.090	1.336	27.770	0.042	-	-	-	-	-	-
S2	-	-	-	1.355	16.092	0.374	1.469	13.981	0.483	1.610	13.699	0.529
S3	-	-	-	0.616	25.397	-0.114	-	-	-	1.123	17.986	0.140
S4	-	-	-	0.926	17.367	0.247	0.590	32.435	0.009	-	-	-
S5	-	-	-	1.375	13.407	0.302	0.559	34.658	0.014	0.592	30.566	0.051
S6	0.617	21.471	0.040	0.544	34.650	0.000	0.559	36.864	0.014	0.583	37.279	0.026
S7	-	-	-	0.572	24.344	0.020	-	-	-	0.623	25.304	0.077
S8	0.928	13.776	0.083	0.556	30.843	0.007	0.637	23.716	0.077	0.667	21.007	0.101
S9	0.703	22.566	0.123	0.682	22.152	0.088	0.833	18.765	0.200	1.062	14.339	0.265
S10	0.592	26.835	0.033	0.545	34.704	0.002	0.956	16.531	0.141	1.006	14.917	0.125
		EP			CFP			INF			SVAR	
S1	1.164	31.545	-0.095	1.084	28.188	-0.155	-	-	-	1.372	17.570	-0.298
S2	0.627	26.497	0.048	-	-	-	0.787	17.594	0.091	0.893	19.477	0.131
S3	0.650	27.279	-0.096	-	-	-	0.854	19.143	-0.021	0.987	20.399	0.041
S4	0.651	24.908	0.044	-	-	-	0.749	20.612	0.093	0.894	20.554	0.146
S5	0.553	33.646	0.010	-	-	-	-	-	-	0.825	20.466	0.137
S6	0.568	33.656	0.018	-	-	-	0.603	29.025	0.032	0.555	33.995	0.010
S7	0.586	29.346	0.032	-	-	-	0.558	33.814	0.015	-	-	-
S8	0.617	24.963	0.042	-	-	-	0.565	34.083	0.014	0.640	27.382	0.063
S9	0.714	22.502	0.105	0.812	14.497	0.116	0.647	28.864	0.064	0.671	28.677	0.095
S10	0.596	27.526	0.050	0.596	22.726	0.048	-	-	-	-	-	-

Table A.XIII: Economic significance results for combination forecasts with a risk aversion factor of three

This table reports the economic significance results for the mean combination forecasts that use eight economic variables (book-to-market ratio, dividend-payout ratio, dividend-price ratio, dividend yield, earnings-price, cash flow-to-price, inflation, and stock variance) as predictors. One-step ahead forecasted returns from the predictive regression model are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. The mean combination forecast is then computed as the average of the forecasts from individual predictive regression models. The portfolio weights are computed using risk aversion parameter of 3, which typically represents a high level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the aggregate market and its components that include ten industries, 10 book-to-market sorted portfolios, and 10 size sorted portfolios. Utility gain is the difference between the utility from the combination forecast model and the utility from the historical average model.

	Mean	t-stat	Utility gain		Mean	t-stat	Utility gain
Panel A: Aggregate market and industry portfolios							
Market	0.659	26.509	0.025				
Basic Materials	0.544	34.650	0.000	Industrials	0.546	34.512	0.005
Consumer Goods	0.758	25.689	0.062	Oil and Gas	0.564	33.568	-0.023
Consumer Services	0.667	17.162	0.059	Technology	2.147	62.871	0.099
Financials	0.788	23.532	-0.135	Telecommunication	1.685	15.417	0.100
Health Care	1.711	42.087	0.043	Utilities	0.814	24.294	0.165
Panel B: Book-to-market portfolios							
BM1	0.767	26.474	0.135	BM6	0.544	34.650	0.000
BM2	0.729	20.177	0.112	BM7	0.547	34.031	0.003
BM3	0.544	34.715	0.001	BM8	0.900	28.254	-0.118
BM4	0.586	31.423	0.032	BM9	0.576	34.487	0.022
BM5	0.616	28.236	0.041	BM10	0.693	31.576	0.015
Panel C: Size portfolios							
S1	1.188	27.626	-0.131	S6	0.544	34.650	0.000
S2	0.774	20.651	0.161	S7	0.544	34.650	0.000
S3	0.659	23.392	-0.072	S8	0.570	29.382	0.023
S4	0.595	31.329	0.027	S9	0.638	23.291	0.078
S5	0.580	31.186	0.031	S10	0.575	35.237	0.025

Table A.XIV: Economic significance results for aggregate market and industry portfolios with a risk aversion factor of twelve

This table reports the economic significance results for the market and ten industries resulting from a dynamic trading strategy based on a mean–variance investor utility function. One-step ahead forecasted returns are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. We take the first 50% of the sample and generate the first forecast; then we take the first 50% plus the observation containing the forecasted return and generate return for the next day. This process is repeated until all the data are exhausted. The portfolio weights are computed using risk aversion parameter of 12, which typically represents a low level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the predictive regression based forecasting models where there is either evidence of in-sample predictability or evidence that at least 50% of forecast evaluation metrics support the predictive regression based model. Utility gain is the difference between the utility from our proposed model and the utility from the historical average model.

	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain
		BM			DE			DP			DY	
Market	0.545	34.303	0.001	0.576	33.856	0.003	0.982	10.436	-0.406	0.883	12.687	-0.215
Basic Materials	0.546	34.482	-0.007	0.568	28.896	0.000	-	-	-	0.544	34.723	0.000
Consumer Goods	0.650	23.305	-0.072	0.983	17.232	-0.615	0.619	32.621	0.013	0.605	35.397	0.019
Consumer Services	0.544	34.650	0.000	1.401	10.995	-1.430	-	-	-	-	-	-
Financials	0.903	30.053	-0.062	0.818	20.702	-0.179	0.742	20.999	-0.063	0.703	23.376	-0.082
Health Care	-	-	-	1.162	28.478	-0.451	1.340	15.918	-1.909	1.178	16.339	-1.048
Industrials	0.630	23.486	-0.056	0.544	34.667	0.033	0.544	34.650	0.033	0.544	34.650	0.033
Oil and Gas	-	-	-	0.899	24.012	0.158	0.751	21.171	0.139	0.777	19.672	0.138
Technology	-	-	-	2.202	63.550	0.146	-	-	-	-	-	-
Telecommunication	1.360	19.508	-0.653	2.463	11.231	-1.853	1.944	12.241	-2.028	2.080	11.962	-2.096
Utilities	-	-	-	0.876	26.106	-0.050	-	-	-	-	-	-
		EP			CFP			INF			SVAR	
Market	0.632	22.745	-0.030	0.559	32.307	0.011	0.555	34.498	-0.019	0.549	34.840	-0.003
Basic Materials	0.565	31.418	0.015	0.572	22.205	0.027	0.551	34.293	-0.002	-	-	-
Consumer Goods	0.941	22.247	-0.590	0.805	16.453	-0.035	0.710	22.081	-0.010	-	-	-
Consumer Services	0.545	34.775	0.001	0.554	35.020	0.011	0.544	34.650	0.000	0.595	30.989	0.043
Financials	0.875	25.802	-0.103	0.652	33.430	-0.114	0.875	16.641	-0.657	-	-	-
Health Care	1.400	26.848	-1.819	-	-	-	-	-	-	-	-	-
Industrials	0.599	26.253	0.011	-	-	-	-	-	-	0.623	28.208	-0.030
Oil and Gas	0.587	29.922	0.107	-	-	-	0.690	24.421	-0.075	-	-	-
Technology	-	-	-	2.432	111.952	0.643	2.014	42.248	-1.617	-	-	-
Telecommunication	1.595	14.185	-2.264	-	-	-	1.063	15.409	-1.119	-	-	-
Utilities	-	-	-	-	-	-	0.743	20.721	-0.171	-	-	-

Table A.XV Economic significance results for book-to-market sorted portfolios with a risk aversion factor of twelve

This table reports the economic significance results for 10 portfolios sorted on book-to-market resulting from a dynamic trading strategy based on a mean–variance investor utility function. One-step ahead forecasted returns are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. We take the first 50% of the sample and generate the first forecast; then we take the first 50% plus the observation containing the forecasted return and generate return for the next day. This process is repeated until all the data are exhausted. The portfolio weights are computed using risk aversion parameter of 12, which typically represents a low level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the predictive regression based forecasting models where there is either evidence of in-sample predictability or evidence that at least 50% of forecast evaluation metrics support the predictive regression based model. Utility gain is the difference between the utility from our proposed model and the utility from the historical average model.

	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain
	BM			DE			DP			DY		
BM1	0.759	16.356	-0.156	0.783	21.616	0.121	0.920	32.230	-0.024	0.982	30.580	-0.079
BM2	-	-	-	0.971	9.584	-2.803	0.719	18.567	-0.101	0.714	18.501	-0.122
BM3	-	-	-	0.546	34.931	0.007	0.573	33.901	0.027	0.578	33.992	0.042
BM4	0.617	28.992	0.045	0.552	33.880	0.022	0.581	33.422	0.010	-	-	-
BM5	0.741	18.834	-0.144	0.891	14.630	-0.654	0.622	25.621	0.030	0.674	20.585	-0.005
BM6	0.564	30.254	0.008	0.544	34.650	0.000	-	-	-	-	-	-
BM7	-	-	-	0.548	33.652	-0.004	0.592	26.243	-0.003	0.612	24.186	-0.003
BM8	0.956	21.317	-0.047	0.791	22.575	-0.227	-	-	-	-	-	-
BM9	-	-	-	0.576	30.464	0.098	-	-	-	0.769	22.776	-0.074
BM10	0.571	29.004	0.065	0.692	24.457	0.029	0.728	33.156	0.008	0.740	31.500	-0.019
	EP			CFP			INF			SVAR		
BM1	0.738	18.590	0.057	-	-	-	0.660	26.761	0.004	0.615	29.384	-0.028
BM2	0.740	19.558	0.014	-	-	-	0.592	30.551	0.012	0.647	26.706	-0.002
BM3	0.567	31.450	0.003	-	-	-	0.568	33.655	-0.017	0.621	28.155	-0.004
BM4	0.588	30.400	0.030	0.630	27.746	0.034	0.600	29.807	0.013	0.664	25.290	-0.036
BM5	0.575	31.078	0.016	0.654	21.730	0.055	0.672	24.842	-0.049	0.663	25.561	-0.041
BM6	0.544	34.650	0.000	-	-	-	0.567	35.481	0.008	0.548	34.786	0.002
BM7	0.564	32.660	0.011	0.615	20.106	0.053	0.595	32.134	-0.020	0.566	33.780	0.008
BM8	1.024	29.103	-0.146	-	-	-	0.931	16.673	-0.355	1.035	17.243	-1.182
BM9	0.684	26.002	-0.076	-	-	-	0.684	24.150	-0.051	0.702	23.592	-0.117
BM10	-	-	-	0.748	22.834	-0.168	-	-	-	0.746	21.446	-0.240

Table A.XVI: Economic significance results for size sorted portfolios with a risk aversion factor of twelve

This table reports the economic significance results for 10 portfolios sorted on size resulting from a dynamic trading strategy based on a mean–variance investor utility function. One-step ahead forecasted returns are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. We take the first 50% of the sample and generate the first forecast; then we take the first 50% plus the observation containing the forecasted return and generate return for the next day. This process is repeated until all the data are exhausted. The portfolio weights are computed using risk aversion parameter of 12, which typically represents a low level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the predictive regression based forecasting models where there is either evidence of in-sample predictability or evidence that at least 50% of forecast evaluation metrics support the predictive regression based model. Utility gain is the difference between the utility from our proposed model and the utility from the historical average model.

	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain	Mean	t-stat	Utility gain
		BM			DE			DP			DY	
S1	1.253	38.227	0.098	1.246	25.100	-0.288	-	-	-	-	-	-
S2	-	-	-	0.970	16.251	-0.214	1.086	15.053	-0.439	1.116	14.547	-0.639
S3	-	-	-	0.597	25.686	0.017	-	-	-	0.890	19.042	-0.249
S4	-	-	-	0.866	17.491	-0.088	0.575	32.728	0.017	-	-	-
S5	-	-	-	0.970	14.914	-0.605	0.549	34.500	0.027	0.557	36.531	0.044
S6	0.588	24.266	-0.018	0.544	34.650	0.000	0.548	35.615	0.003	0.554	37.264	0.006
S7	-	-	-	0.555	31.682	-0.007	-	-	-	0.574	32.357	0.020
S8	0.693	18.459	-0.068	0.550	33.496	-0.009	0.570	33.088	0.022	0.577	33.273	0.029
S9	0.689	22.768	-0.013	0.634	23.614	-0.004	0.757	19.058	-0.002	0.813	15.724	-0.340
S10	0.573	28.179	-0.014	0.544	34.690	0.007	0.720	22.046	0.010	0.678	28.129	0.054
		EP			CFP			INF			SVAR	
S1	1.104	29.755	-0.180	0.963	23.671	-0.300	-	-	-	1.185	16.537	-1.516
S2	0.586	31.396	0.048	-	-	-	0.663	25.617	-0.022	0.729	21.627	-0.069
S3	0.632	27.655	-0.033	-	-	-	0.776	20.576	-0.183	0.844	19.609	-0.453
S4	0.621	27.204	-0.024	-	-	-	0.676	24.485	-0.015	0.755	21.304	-0.120
S5	0.552	33.493	0.027	-	-	-	-	-	-	0.685	23.619	-0.006
S6	0.556	34.934	-0.007	-	-	-	0.565	35.386	0.000	0.548	34.812	0.002
S7	0.559	33.400	0.002	-	-	-	0.549	35.390	0.004	-	-	-
S8	0.579	31.026	-0.008	-	-	-	0.555	35.111	-0.017	0.591	30.738	0.002
S9	0.660	23.354	-0.034	-	-	-	0.626	29.546	-0.007	0.631	28.886	0.000
S10	0.563	31.663	0.022	0.562	30.774	0.023	-	-	-	-	-	-

Table A.XVII: Economic significance results for combination forecasts with a risk aversion factor of twelve

This table reports the economic significance results for the mean combination forecasts that use eight economic variables (book-to-market ratio, dividend-payout ratio, dividend-price ratio, dividend yield, earnings-price, cash flow-to-price, inflation, and stock variance) as predictors. One-step ahead forecasted returns from the predictive regression model are generated using a recursive window for the out-of-sample period which is 50% of the full-sample data. The mean combination forecast is then computed as the average of the forecasts from individual predictive regression models. The portfolio weights are computed using risk aversion parameter of 12, which typically represents a low level of risk position for an investor. The estimated portfolio weights are restricted to between 0 and 1.5 preventing the investor from short-selling or taking more than 50% leverage. We report the average monthly profits in percentage, the corresponding t-statistic examining the null hypothesis that profits are zero, and the utility gains for the aggregate market and its components that include 10 industries, 10 book-to-market sorted portfolios, and 10 size sorted portfolios. Utility gain is the difference between the utility from the combination forecast model and the utility from the historical average model.

	Mean	t-stat	Utility gain		Mean	t-stat	Utility gain
Panel A: Aggregate market and industry portfolios							
Market	0.602	33.788	-0.007				
Basic Materials	0.544	34.650	0.000	Industrials	0.544	34.656	0.032
Consumer Goods	0.671	24.892	-0.270	Oil and Gas	0.554	33.961	0.099
Consumer Services	0.610	25.141	-0.005	Technology	2.005	39.744	-0.882
Financials	0.752	23.843	-0.113	Telecommunication	1.528	14.209	-1.054
Health Care	1.620	37.272	-0.786	Utilities	0.745	24.322	-0.116
Panel B: Book-to-market portfolios							
BM1	0.726	25.970	0.007	BM6	0.544	34.650	0.000
BM2	0.684	20.673	-0.078	BM7	0.545	34.418	0.001
BM3	0.544	34.666	0.007	BM8	0.826	25.971	-0.157
BM4	0.566	33.190	0.041	BM9	0.559	34.650	0.069
BM5	0.606	28.241	0.043	BM10	0.639	31.511	0.030
Panel C: Size portfolios							
S1	1.042	24.705	-0.452	S6	0.544	34.650	0.000
S2	0.676	21.808	-0.024	S7	0.544	34.650	0.000
S3	0.644	22.903	0.048	S8	0.554	32.982	0.008
S4	0.571	32.363	0.063	S9	0.624	23.762	0.058
S5	0.562	32.923	0.020	S10	0.555	35.633	0.014

Table A.XVIII: Out-of-sample forecast evaluation results for aggregate market and industry portfolios – expansions and recessions

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the benchmark historical mean model for three sample periods – (i) overall (2003:07-2014:06) out-of-sample forecast evaluation period, (ii expansions (2003:07-2007:01 and 2009:07-2014:06) and (iii) recessions (2007:02-2009:06). For brevity, we only report the Campbell and Thompson (2008) OR^2 statistics. The OR^2statistics are computed for the overall out-of-sample period and separately for the expansions and recessions. Expansions (recessions) comprise 103 (29) of the observations for the forecast evaluation period. The results are reported for the aggregate market and for each of the ten industries. The row "average" reports the average OR^2statistic for the ten industry portfolios. The eight economic variables used as predictors are: book-to-market ratio (BM), dividend-payout ratio (DE), dividend-price ratio (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR).

	Overall	Expansions	Recessions	Overall	Expansions	Recessions	Overall	Expansions	Recessions	Overall	Expansions	Recessions
		BM			DE			DP			DY	
Market	-0.154	-1.176	0.752	2.491	2.651	2.348	7.534	10.931	4.523	9.055	11.156	7.193
Basic Materials	-0.871	-1.627	-0.300	-1.061	-0.632	-1.384	0.222	1.411	-0.674	0.713	1.710	-0.039
Consumer Goods	1.118	3.359	-2.080	-1.024	1.195	-4.189	2.640	2.975	2.161	3.000	3.259	2.630
Consumer Services	0.981	0.881	1.074	-5.814	-6.939	-4.759	-0.776	1.048	-2.485	-0.293	0.450	-0.989
Financials	0.360	0.518	0.194	-0.769	-0.634	-0.911	0.599	0.701	0.491	1.375	1.201	1.558
Health Care	-0.050	-0.125	0.044	-0.197	-0.721	0.455	3.551	5.053	1.686	3.841	5.039	2.354
Industrials	-0.691	-0.717	-0.666	-3.202	-5.629	-0.721	-0.194	-1.585	1.229	0.693	-1.902	3.347
Oil and Gas	-1.250	-2.575	0.247	0.810	2.104	-0.650	2.444	3.905	0.794	2.807	3.944	1.522
Technology	-0.179	0.827	-1.304	-0.315	0.357	-1.065	-0.010	0.434	-0.505	-0.065	0.575	-0.781
Telecommunications	-0.836	-0.623	-1.362	4.495	7.504	-2.920	2.886	4.976	-2.263	3.361	5.788	-2.621
Utilities	-1.447	-1.731	-1.000	-0.121	-0.004	-0.305	-2.410	-7.298	5.284	-1.787	-7.191	6.720
Average	-0.287	-0.181	-0.515	-0.720	-0.340	-1.645	0.895	1.162	0.572	1.364	1.287	1.370
		EP			CFP			INF			SVAR	
Market	4.445	6.435	2.681	2.207	1.842	2.531	0.401	0.852	0.000	0.147	0.860	-0.484
Basic Materials	2.116	0.986	2.968	2.031	1.864	2.158	0.401	1.071	-0.105	-0.125	0.492	-0.591
Consumer Goods	3.299	6.889	-1.826	2.639	7.715	-4.607	-1.026	-1.260	-0.693	-2.393	-3.702	-0.526
Consumer Services	0.526	-1.501	2.426	1.123	-0.246	2.406	-0.389	-0.885	0.077	0.154	0.466	-0.139
Financials	0.124	0.157	0.090	0.775	0.665	0.890	0.869	1.432	0.280	-0.082	0.253	-0.431
Health Care	0.517	3.049	-2.626	-0.010	-0.046	0.035	-0.842	-0.759	-0.945	-0.554	0.312	-1.629
Industrials	0.028	0.387	-0.340	-0.495	-1.684	0.722	-0.063	-0.060	-0.066	0.342	0.828	-0.155
Oil and Gas	2.373	2.637	2.076	-5.233	-5.970	-4.400	0.172	0.360	-0.040	-0.270	-0.203	-0.346
Technology	-0.343	-0.132	-0.579	0.170	2.016	-1.893	-0.911	-0.653	-1.199	-4.013	-2.858	-5.303
Telecommunications	0.675	2.172	-3.014	-0.117	-0.137	-0.066	1.391	1.541	1.020	-0.153	-0.573	0.882
Utilities	-0.393	0.444	-1.711	-0.253	0.841	-1.975	1.297	2.527	-0.637	-0.150	0.434	-1.068
Average	0.892	1.509	-0.253	0.063	0.502	-0.673	0.090	0.332	-0.231	-0.724	-0.455	-0.931

Table A.XIX: Out-of-sample forecast evaluation results for book-to-market sorted portfolios – expansions and recessions

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the benchmark historical mean model for three sample periods – (i) overall (2003:07-2014:06) out-of-sample forecast evaluation period, (ii expansions (2003:07-2007:01 and 2009:07-2014:06) and (iii) recessions (2007:02-2009:06). For brevity, we only report the Campbell and Thompson (2008) OR^2 statistics. The OR^2statistics are computed for the overall out-of-sample period and separately for the expansions and recessions. Expansions (recessions) comprise 103 (29) of the observations for the forecast evaluation period. The results are reported for the 10 portfolios sorted on book-to-market value. The row "average" reports the average OR^2statistic for the ten book-to-market portfolios. The eight economic variables used as predictors are: book-to-market ratio (BM), dividend-payout ratio (DE), dividend-price ratio (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR).

	Overall	Expansions	Recessions	Overall	Expansions	Recessions	Overall	Expansions	Recessions	Overall	Expansions	Recessions
		BM			DE			DP			DY	
BM1	1.340	3.669	-0.260	1.295	2.900	0.192	1.101	3.091	-0.267	1.696	3.749	0.285
BM2	-1.626	-4.341	0.660	-2.368	1.120	-5.307	1.009	0.527	1.415	2.646	1.634	3.499
BM3	-0.482	-1.184	0.172	-1.505	-2.889	-0.215	0.465	0.622	0.318	2.386	1.969	2.775
BM4	-0.382	-0.617	-0.148	-2.156	-2.621	-1.689	-0.215	-0.442	0.012	0.448	-0.142	1.039
BM5	-0.405	-1.958	1.208	-2.041	2.251	-6.499	0.506	0.149	0.877	1.597	0.960	2.257
BM6	-1.187	-3.423	1.228	-0.568	-0.699	-0.426	-1.885	-5.517	2.038	-0.764	-4.688	3.473
BM7	-0.559	-2.809	1.889	-3.447	-5.621	-1.081	0.251	-1.130	1.754	1.394	-0.146	3.069
BM8	-0.659	-1.915	0.874	-0.922	-1.154	-0.639	0.036	-0.206	0.332	0.510	-0.010	1.145
BM9	-0.266	-0.474	0.002	-2.559	-4.951	0.502	-0.135	-0.820	0.742	0.308	-0.356	1.158
BM10	0.351	-0.089	0.949	0.144	0.452	-0.274	0.050	0.064	0.031	0.270	0.253	0.293
Average	-0.387	-1.314	0.657	-1.413	-1.121	-1.544	0.118	-0.366	0.725	1.049	0.322	1.899
		EP			CFP			INF			SVAR	
BM1	3.239	4.880	2.111	-1.099	-1.183	-1.041	-2.023	-3.707	-0.867	0.215	0.832	-0.209
BM2	-0.152	0.496	-0.698	-2.200	-3.170	-1.383	0.231	0.005	0.421	0.615	0.911	0.365
BM3	0.126	0.493	-0.216	-0.430	-1.823	0.867	0.162	0.080	0.238	1.115	2.041	0.252
BM4	-0.412	-0.083	-0.741	-0.672	-0.951	-0.393	0.231	0.171	0.292	0.729	1.399	0.059
BM5	-0.152	-0.369	0.074	0.441	-1.456	2.412	0.798	1.079	0.506	0.484	0.712	0.248
BM6	-0.606	-1.201	0.036	-1.046	-4.090	2.242	1.038	1.263	0.794	0.767	1.259	0.235
BM7	0.527	-0.361	1.494	1.360	-0.617	3.510	0.709	0.675	0.747	0.759	1.905	-0.489
BM8	-0.254	-0.276	-0.228	0.639	-0.150	1.602	0.864	0.942	0.768	0.719	1.346	-0.044
BM9	-0.113	0.294	-0.635	-0.174	0.293	-0.773	1.036	1.561	0.364	0.527	1.195	-0.329
BM10	-0.347	-0.212	-0.531	0.557	0.732	0.319	-0.154	-0.307	0.054	0.560	1.049	-0.105
Average	0.186	0.366	0.067	-0.262	-1.242	0.736	0.289	0.176	0.332	0.649	1.265	-0.002

Table A.XX: Out-of-sample forecast evaluation results for size sorted portfolios – expansions and recessions

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the benchmark historical mean model for three sample periods – (i) overall (2003:07-2014:06) out-of-sample forecast evaluation period, (ii expansions (2003:07-2007:01 and 2009:07-2014:06) and (iii) recessions (2007:02-2009:06). For brevity, we only report the Campbell and Thompson (2008) OR^2 statistics. The OR^2statistics are computed for the overall out-of-sample period and separately for the expansions and recessions. Expansions (recessions) comprise 103 (29) of the observations for the forecast evaluation period. The results are reported for the 10 portfolios sorted on market capitalization. The row "average" reports the average OR^2statistic for the ten size sorted portfolios. The eight economic variables used as predictors are: book-to-market ratio (BM), dividend-payout ratio (DE), dividend-price ratio (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR).

	Overall	Expansions	Recessions	Overall	Expansions	Recessions	Overall	Expansions	Recessions	Overall	Expansions	Recessions
		BM			DE			DP			DY	
S1	0.062	0.156	-0.074	-0.646	-0.967	-0.184	-0.779	-1.067	-0.364	-0.681	-0.929	-0.323
S2	-1.090	-2.542	0.904	0.123	0.378	-0.229	1.018	0.609	1.581	1.706	1.315	2.243
S3	-0.415	-2.189	1.602	0.340	-0.405	1.186	0.411	-0.791	1.778	1.244	0.116	2.526
S4	-0.504	-1.458	0.483	-1.213	-0.686	-1.758	-1.527	-3.046	0.045	-1.419	-3.462	0.693
S5	-0.290	-0.633	0.050	-1.987	1.828	-5.780	1.128	1.061	1.194	2.462	2.108	2.813
S6	-0.597	-2.793	1.589	-2.370	-4.700	-0.051	2.318	2.499	2.138	3.950	3.924	3.976
S7	-1.102	-2.561	0.370	-1.843	-1.727	-1.959	0.595	-0.166	1.363	2.065	0.915	3.225
S8	0.215	-2.356	2.648	-1.566	-0.689	-2.396	2.292	1.718	2.835	4.435	3.128	5.671
S9	0.277	0.371	0.202	-2.748	-3.248	-2.345	1.149	1.555	0.822	3.175	3.035	3.288
S10	0.460	-0.123	0.956	0.200	0.778	-0.292	4.141	6.167	2.415	6.252	7.373	5.297
Average	-0.298	-1.413	0.873	-1.171	-0.944	-1.381	1.075	0.854	1.381	2.319	1.752	2.941
		EP			CFP			INF			SVAR	
S1	0.096	0.194	-0.046	-0.913	-1.353	-0.279	-0.078	-0.184	0.075	1.210	2.319	-0.388
S2	-0.514	-0.777	-0.154	-1.493	-3.221	0.879	0.980	1.039	0.898	1.297	2.262	-0.030
S3	-0.252	-1.283	0.921	0.130	-1.215	1.658	0.611	0.584	0.643	0.864	1.724	-0.115
S4	-0.872	-1.842	0.130	-0.333	-1.686	1.067	0.704	0.802	0.602	1.205	2.462	-0.095
S5	-0.203	-0.090	-0.315	-0.300	-1.361	0.755	-0.152	-0.597	0.290	1.171	1.554	0.789
S6	0.137	0.337	-0.062	0.005	-1.777	1.778	0.714	0.819	0.609	0.207	0.170	0.243
S7	-0.119	-0.536	0.302	0.009	-2.083	2.121	0.476	0.560	0.392	-0.969	-1.720	-0.211
S8	0.067	0.179	-0.040	-1.011	-4.497	2.286	0.250	0.241	0.259	0.764	1.764	-0.182
S9	1.066	1.926	0.374	2.774	2.936	2.645	0.480	0.877	0.161	0.157	0.384	-0.026
S10	1.380	1.289	1.459	1.608	-0.090	3.054	-0.342	-0.528	-0.184	-0.252	0.025	-0.487
Average	0.079	-0.060	0.257	0.048	-1.435	1.596	0.364	0.361	0.374	0.565	1.094	-0.050

Table A.XXI: In- sample predictability test results for aggregate market and industry portfolio excess returns over pre-crisis period

This table reports the in-sample predictability test results for the aggregate market and ten industries based on the following regression model: $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the aggregate market or the industry portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). We employ the following Westerlund and Narayan (2012, 2014) FQGLS-based t-statistic for testing $\beta = 0$:

$$t_{FQGLS} = \frac{\sum_{t=q_m+2}^{T} \pi_t^2 x_{t-1}^d r_t^d}{\sqrt{\sum_{t=q_m+2}^{T} \pi_t^2 (x_{t-1}^d)^2}}$$

where $\pi_t = 1/\sigma_{\eta_t}$ is the FQGLS weight, and $x_t^d = x_t - \sum_{s=2}^{T} x_s/T$ with a similar definition of r_t^d, where T is the sample size, and $q = \max\{q_x, q_{r,x}\}$. We report the 95% confidence interval for β based on both the sub-sample FQGLS test (t_{FQGLS}^{sub}) and the asymptotic FQGLS test (t_{FQGLS}). The estimation covers the sample period 1992:07-2007:01. When the confidence interval includes the value zero, we cannot reject the null of no predictability.

	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}
	BM		DE		DP	
Market	[0.000 -0.003]	[-0.003 -0.002]	[0.007 0.008]	[0.007 0.007]	[0.013 0.010]	[0.009 0.010]
Basic Materials	[0.000 -0.009]	[-0.008 -0.005]	[0.006 0.006]	[0.005 0.005]	[0.013 0.007]	[0.008 0.010]
Consumer Goods	[0.001 -0.001]	[-0.001 0.000]	[0.002 0.001]	[0.001 0.001]	[0.002 -0.004]	[-0.004 -0.001]
Consumer Services	[0.001 -0.005]	[-0.004 -0.003]	[0.010 0.009]	[0.008 0.007]	[0.008 0.000]	[0.002 0.003]
Financials	[0.000 -0.006]	[-0.004 -0.002]	[0.003 0.002]	[0.002 0.002]	[-0.001 -0.007]	[-0.006 -0.003]
Health Care	[0.001 -0.001]	[0.000 0.000]	[0.004 0.004]	[0.004 0.004]	[-0.001 -0.002]	[-0.003 -0.001]
Industrials	[-0.005 -0.008]	[-0.009 -0.007]	[0.005 0.005]	[0.004 0.004]	[0.000 -0.005]	[-0.005 -0.003]
Oil and Gas	[0.001 -0.004]	[-0.004 -0.002]	[0.010 0.011]	[0.010 0.009]	[0.020 0.009]	[0.010 0.011]
Technology	[0.001 -0.001]	[-0.001 0.000]	[0.002 0.002]	[0.001 0.001]	[0.018 -0.009]	[-0.010 -0.006]
Telecommunications	[0.000 -0.002]	[-0.004 -0.003]	[0.016 0.017]	[0.013 0.012]	[0.028 0.015]	[0.020 0.023]
Utilities	[-0.001 -0.006]	[-0.005 -0.002]	[0.003 0.003]	[0.003 0.002]	[0.003 0.000]	[0.000 0.002]

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Table A.XXI: Continued

	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}
	DY		EP		CFP	
Market	[0.014 0.011]	[0.012 0.010]	[0.006 0.005]	[0.003 0.004]	[0.000 0.000]	[0.000 0.000]
Basic Materials	[0.012 0.009]	[0.011 0.010]	[0.003 -0.002]	[-0.002 0.000]	[0.001 0.000]	[0.000 0.000]
Consumer Goods	[0.002 -0.003]	[-0.001 -0.001]	[0.004 -0.001]	[-0.001 0.001]	[0.000 0.000]	[0.000 0.000]
Consumer Services	[0.011 0.001]	[0.004 0.003]	[0.003 -0.004]	[-0.004 -0.001]	[0.000 0.000]	[0.000 0.000]
Financials	[0.000 -0.008]	[-0.005 -0.005]	[0.000 -0.007]	[-0.006 -0.003]	[0.001 0.000]	[0.000 0.001]
Health Care	[0.002 -0.002]	[-0.001 -0.001]	[-0.001 -0.003]	[-0.003 -0.001]	[0.000 0.000]	[0.000 0.000]
Industrials	[0.002 -0.003]	[-0.002 -0.002]	[-0.002 -0.009]	[-0.010 -0.007]	[0.000 -0.001]	[-0.001 -0.001]
Oil and Gas	[0.019 0.009]	[0.012 0.011]	[0.001 -0.003]	[-0.001 0.000]	[0.002 0.000]	[0.000 0.001]
Technology	[0.012 -0.008]	[-0.006 -0.005]	[0.001 -0.005]	[-0.005 -0.003]	[0.003 0.001]	[0.001 0.001]
Telecommunications	[0.032 0.015]	[0.022 0.021]	[-0.007 -0.014]	[-0.014 -0.01]	[0.000 -0.001]	[-0.001 -0.001]
Utilities	[0.006 -0.002]	[0.000 0.000]	[0.001 0.000]	[-0.003 0.000]	[0.000 -0.001]	[0.000 0.000]

	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}
	INF		SVAR	
Market	[-0.002 -0.001]	[-0.004 -0.004]	[0.000 0.000]	[0.000 0.000]
Basic Materials	[-0.002 -0.002]	[-0.004 -0.003]	[0.000 0.000]	[0.000 0.000]
Consumer Goods	[0.006 0.003]	[0.001 0.002]	[0.000 0.000]	[0.000 0.000]
Consumer Services	[0.001 0.001]	[0.000 0.000]	[0.000 0.000]	[0.000 0.000]
Financials	[-0.003 -0.004]	[-0.005 -0.005]	[0.000 0.000]	[0.000 0.000]
Health Care	[0.003 0.003]	[0.002 0.002]	[0.000 0.000]	[0.000 0.000]
Industrials	[-0.001 -0.002]	[-0.003 -0.003]	[0.000 0.000]	[0.000 0.000]
Oil and Gas	[-0.004 -0.003]	[-0.005 -0.004]	[0.000 0.000]	[0.000 0.000]
Technology	[0.003 0.002]	[0.001 0.001]	[0.000 0.000]	[0.000 0.000]
Telecommunications	[0.000 0.000]	[-0.001 -0.001]	[0.000 0.000]	[0.000 0.000]
Utilities	[-0.002 -0.002]	[-0.004 -0.004]	[0.000 0.000]	[0.000 0.000]

Table A.XXII: In- sample predictability test results for book-to-market portfolio excess returns over the pre-crisis period

This table reports the in-sample predictability test results for the 10 book-to-market sorted portfolios based on the following regression model: $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for book-to-market sorted portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). BM1, …, BM10 represent deciles in ascending order for portfolios sorted on book-to-market value. We employ the following Westerlund and Narayan (2012, 2014) FQGLS-based t-statistic for testing $\beta = 0$:

$$t_{FQGLS} = \frac{\sum_{t=q_m+2}^{T} \pi_t^2 x_{t-1}^d r_t^d}{\sqrt{\sum_{t=q_m+2}^{T} \pi_t^2 (x_{t-1}^d)^2}}$$

where $\pi_t = 1/\sigma_{\eta_t}$ is the FQGLS weight, and $x_t^d = x_t - \sum_{s=2}^{T} x_s/T$ with a similar definition of r_t^d, where T is the sample size, and $q = \max\{q_x, q_{r,x}\}$. We report the 95% confidence interval for β based on both the sub-sample FQGLS test (t_{FQGLS}^{sub}) and the asymptotic FQGLS test (t_{FQGLS}). The estimation covers the sample period 1992:07-2007:01. When the confidence interval includes the value zero, we cannot reject the null of no predictability.

	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}
	BM		DE		DP	
BM1	[0.000 -0.004]	[-0.006 -0.004]	[0.010 0.009]	[0.008 0.007]	[0.025 0.014]	[0.014 0.015]
BM2	[0.000 -0.001]	[-0.002 -0.001]	[0.001 0.000]	[0.000 0.000]	[0.002 -0.002]	[-0.003 0.000]
BM3	[-0.001 -0.004]	[-0.004 -0.003]	[0.004 0.003]	[0.003 0.003]	[0.001 -0.004]	[-0.003 -0.001]
BM4	[-0.001 -0.005]	[-0.006 -0.004]	[0.002 0.002]	[0.002 0.002]	[0.000 -0.007]	[-0.005 -0.003]
BM5	[0.001 -0.005]	[-0.003 -0.002]	[0.001 0.000]	[0.000 0.000]	[0.002 -0.002]	[-0.001 0.001]
BM6	[0.001 -0.009]	[-0.008 -0.005]	[0.002 0.003]	[0.002 0.002]	[0.003 -0.003]	[-0.002 0.000]
BM7	[0.009 -0.003]	[-0.003 0.000]	[0.003 0.004]	[0.003 0.002]	[0.007 0.000]	[0.001 0.003]
BM8	[-0.001 -0.015]	[-0.013 -0.008]	[0.003 0.003]	[0.002 0.003]	[0.001 -0.005]	[-0.004 -0.002]
BM9	[0.009 -0.021]	[-0.013 -0.008]	[0.003 0.004]	[0.003 0.003]	[0.008 -0.008]	[-0.004 -0.001]
BM10	[0.024 -0.020]	[-0.022 0.000]	[0.002 0.002]	[0.002 0.002]	[0.010 0.001]	[0.001 0.002]

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Table A.XXII: Continued

	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}
	DY		EP		CFP	
BM1	[0.021 0.014]	[0.016 0.015]	[0.003 -0.002]	[-0.002 0.001]	[0.002 0.000]	[0.000 0.000]
BM2	[0.004 0.000]	[0.000 0.000]	[-0.001 -0.005]	[-0.005 -0.003]	[0.000 0.000]	[0.000 0.000]
BM3	[0.002 -0.004]	[-0.001 -0.001]	[0.000 -0.007]	[-0.005 -0.004]	[0.000 -0.001]	[-0.001 0.000]
BM4	[0.003 -0.007]	[-0.003 -0.003]	[-0.003 -0.009]	[-0.008 -0.006]	[0.000 -0.001]	[-0.001 -0.001]
BM5	[0.004 -0.002]	[0.001 0.000]	[0.000 -0.006]	[-0.006 -0.003]	[0.000 -0.001]	[-0.001 0.000]
BM6	[0.008 0.000]	[0.001 0.001]	[-0.002 -0.007]	[-0.007 -0.005]	[0.000 -0.002]	[-0.002 -0.001]
BM7	[0.008 0.002]	[0.004 0.003]	[0.003 -0.003]	[-0.002 0.000]	[0.001 0.000]	[0.000 0.001]
BM8	[0.001 -0.004]	[-0.002 -0.001]	[-0.002 -0.010]	[-0.008 -0.006]	[0.001 -0.001]	[-0.001 0.000]
BM9	[0.007 -0.006]	[-0.001 0.000]	[0.002 -0.010]	[-0.006 -0.003]	[0.002 0.000]	[-0.001 -0.001]
BM10	[0.008 0.002]	[0.002 0.001]	[0.003 -0.007]	[-0.004 -0.002]	[0.002 0.000]	[0.000 0.001]
	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}		
	INF		SVAR			
BM1	[0.007 0.006]	[0.005 0.006]	[0.000 0.000]	[0.000 0.000]		
BM2	[-0.002 -0.005]	[-0.005 -0.005]	[0.000 0.000]	[0.000 0.000]		
BM3	[-0.001 -0.003]	[-0.004 -0.004]	[0.000 0.000]	[0.000 0.000]		
BM4	[0.000 -0.002]	[-0.004 -0.003]	[0.000 0.000]	[0.000 0.000]		
BM5	[-0.002 -0.004]	[-0.005 -0.005]	[0.000 0.000]	[0.000 0.000]		
BM6	[-0.003 -0.005]	[-0.006 -0.005]	[0.000 0.000]	[0.000 0.000]		
BM7	[-0.004 -0.005]	[-0.006 -0.006]	[0.000 0.000]	[0.000 0.000]		
BM8	[-0.002 -0.004]	[-0.005 -0.005]	[0.000 0.000]	[0.000 0.000]		
BM9	[-0.002 -0.004]	[-0.005 -0.004]	[0.000 0.000]	[0.000 0.000]		
BM10	[0.000 0.000]	[-0.002 -0.001]	[0.000 0.000]	[0.000 0.000]		

Table A.XXIII: In- sample predictability test results for size portfolio excess returns over the pre-crisis period

This table reports the in-sample predictability test results for the 10 market capitalization sorted portfolios based on the following regression model: $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for market capitalization sorted portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), and stock variance (SVAR). S1, …, S10 represent deciles in ascending order for portfolios sorted on market capitalization. We employ the following Westerlund and Narayan (2012, 2014) FQGLS-based t-statistic for testing $\beta = 0$:

$$t_{FQGLS} = \frac{\sum_{t=q_m+2}^{T} \pi_t^2 x_{t-1}^d r_t^d}{\sqrt{\sum_{t=q_m+2}^{T} \pi_t^2 (x_{t-1}^d)^2}}$$

where $\pi_t = 1/\sigma_{\eta_t}$ is the FQGLS weight, and $x_t^d = x_t - \sum_{s=2}^{T} x_s/T$ with a similar definition of r_t^d, where T is the sample size, and $q = \max\{q_x, q_{r,x}\}$. We report the 95% confidence interval for β based on both the sub-sample FQGLS test (t_{FQGLS}^{sub}) and the asymptotic FQGLS test (t_{FQGLS}). The estimation covers the sample period 1992:07-2007:01. When the confidence interval includes the value zero, we cannot reject the null of no predictability.

	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}	t_{FQGLS}^{sub}	t_{FQGLS}
	BM		DE		DP	
S1	[0.010 -0.011]	[-0.013 -0.006]	[0.002 0.002]	[0.002 0.001]	[0.002 -0.002]	[-0.001 0.000]
S2	[0.019 -0.011]	[-0.012 -0.002]	[0.002 0.003]	[0.002 0.002]	[0.010 0.007]	[0.004 0.005]
S3	[0.011 -0.008]	[-0.005 0.000]	[0.003 0.003]	[0.003 0.003]	[0.005 -0.003]	[-0.003 -0.001]
S4	[0.005 -0.012]	[-0.009 -0.006]	[0.003 0.002]	[0.002 0.002]	[0.001 -0.010]	[-0.007 -0.005]
S5	[0.009 -0.016]	[-0.010 -0.006]	[0.001 0.001]	[0.000 0.000]	[0.000 -0.004]	[-0.004 -0.003]
S6	[-0.004 -0.012]	[-0.010 -0.007]	[0.002 0.002]	[0.001 0.001]	[0.007 -0.002]	[0.000 0.002]
S7	[0.001 -0.008]	[-0.008 -0.005]	[0.002 0.002]	[0.001 0.002]	[0.005 0.001]	[0.001 0.003]
S8	[-0.001 -0.005]	[-0.004 -0.003]	[0.005 0.004]	[0.004 0.004]	[0.002 -0.002]	[-0.002 0.001]
S9	[0.001 -0.002]	[-0.003 -0.002]	[0.001 0.002]	[0.000 0.000]	[0.002 -0.004]	[-0.005 -0.003]
S10	[-0.003 -0.006]	[-0.006 -0.004]	[0.006 0.005]	[0.005 0.005]	[0.002 -0.003]	[-0.001 0.000]

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Table A.XXIII: Continued

	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}
	DY		EP		CFP	
S1	[0.004 -0.002]	[0.001 0.001]	[0.000 -0.008]	[-0.005 -0.003]	[0.009 0.006]	[0.005 0.005]
S2	[0.012 0.008]	[0.007 0.006]	[0.001 -0.007]	[-0.006 -0.003]	[-0.001 -0.004]	[-0.003 -0.002]
S3	[0.005 0.000]	[0.001 0.001]	[0.001 -0.004]	[-0.003 -0.001]	[0.001 -0.001]	[0.000 0.000]
S4	[0.003 -0.008]	[-0.005 -0.005]	[-0.005 -0.009]	[-0.008 -0.006]	[0.000 -0.002]	[-0.001 -0.001]
S5	[0.001 -0.002]	[-0.001 -0.001]	[0.002 -0.004]	[-0.003 -0.002]	[0.001 -0.001]	[-0.001 0.000]
S6	[0.009 0.000]	[0.004 0.004]	[0.001 -0.004]	[-0.003 -0.001]	[-0.001 -0.001]	[-0.001 -0.001]
S7	[0.008 0.000]	[0.003 0.002]	[0.000 -0.004]	[-0.005 -0.002]	[0.001 0.000]	[0.000 0.000]
S8	[0.003 -0.003]	[0.000 0.000]	[-0.001 -0.005]	[-0.006 -0.003]	[0.000 0.000]	[0.000 0.000]
S9	[0.003 -0.004]	[-0.002 -0.003]	[0.002 -0.004]	[-0.005 -0.003]	[0.001 0.000]	[0.000 0.000]
S10	[0.006 -0.001]	[0.001 0.001]	[-0.001 -0.005]	[-0.004 -0.003]	[0.000 -0.001]	[0.000 0.000]
	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}	t^{sub}_{FQGLS}	t_{FQGLS}
	INF		SVAR			
S1	[-0.001 -0.001]	[-0.003 -0.002]	[0.000 0.000]	[0.000 0.000]		
S2	[-0.003 -0.003]	[-0.005 -0.004]	[0.000 0.000]	[0.000 0.000]		
S3	[-0.002 -0.003]	[-0.004 -0.004]	[0.000 0.000]	[0.000 0.000]		
S4	[-0.002 -0.004]	[-0.005 -0.005]	[0.000 0.000]	[0.000 0.000]		
S5	[-0.001 -0.002]	[-0.003 -0.002]	[0.000 0.000]	[0.000 0.000]		
S6	[-0.002 -0.004]	[-0.005 -0.004]	[0.000 0.000]	[0.000 0.000]		
S7	[-0.003 -0.003]	[-0.006 -0.005]	[0.000 0.000]	[0.000 0.000]		
S8	[0.000 -0.002]	[-0.004 -0.003]	[0.000 0.000]	[0.000 0.000]		
S9	[-0.001 -0.001]	[-0.004 -0.003]	[0.000 0.000]	[0.000 0.000]		
S10	[0.001 0.001]	[-0.001 -0.001]	[0.000 0.000]	[0.000 0.000]		

Table A.XXIV: Out-of-sample forecast evaluation results for market and industry excess returns over longer out-of-sample period

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the historical mean model for the out-of-sample period 2001:05-2014:06 (60% of full-sample period). The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the aggregate market or industry portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 60% of the full sample. One-step ahead out-of-sample forecasts are generated recursively. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz R^2(RMZ), and relative success ratio (RSR). $RMAE$ and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that predictive regression model out-performs historical mean model. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	BM						DE					
Market	0.999	1.005	0.195	0.705	9.543	1.000	0.989	0.988	2.246	1.545*	2.383	1.200
Basic Materials	1.002	1.001	-0.429	-0.735	6.862	0.972	1.006	1.007	-1.204	-1.456	5.914	0.958
Consumer Goods	0.996	0.996	0.781	0.853	0.013	1.070	1.005	0.999	-0.928	-0.201	8.412	1.211
Consumer Services	1.028	1.019	-5.761	-1.761	6.377	0.955	1.018	1.007	-3.644	0.679	0.374	1.194
Financials	1.001	0.998	-0.129	-0.006	2.215	1.037	1.006	1.004	-1.126	-1.591	9.678	0.938
Health Care	1.003	0.999	-0.555	0.204	1.783	1.000	1.002	1.008	-0.359	-0.306	4.242	0.878
Industrials	1.003	0.999	-0.519	-0.738	8.014	1.172	1.007	1.025	-1.477	0.294	2.537	1.069
Oil and Gas	1.000	1.007	-0.083	0.591	0.037	1.092	0.995	0.990	0.983	1.256	1.278	1.308
Technology	1.003	1.001	-0.583	-0.884	5.156	1.000	1.007	1.005	-1.469	-1.323	5.228	1.000
Telecommunication	1.005	1.008	-1.098	0.038	0.004	0.988	1.016	1.001	-3.213	1.085	8.797	1.111
Utilities	1.000	1.009	-0.084	0.426	6.009	1.104	0.999	0.992	0.212	0.514	2.378	1.224
	DP						DY					
Market	0.965	0.951	6.823	3.193*	2.360	1.338	0.960	0.946	7.877	3.423*	1.659	1.323
Basic Materials	0.998	0.999	0.425	0.740	0.125	0.972	0.995	0.997	0.973	1.053	0.277	1.028
Consumer Goods	0.990	1.000	1.967	1.888*	1.058	1.042	0.989	0.999	2.244	2.147*	0.737	1.042
Consumer Services	0.999	0.989	0.253	1.313*	0.085	1.284	1.003	0.993	-0.552	1.173	0.025	1.239
Financials	0.999	0.999	0.193	0.610	0.008	1.099	0.995	0.997	0.966	1.744*	0.137	1.086
Health Care	0.984	0.975	3.141	2.631*	1.522	1.031	0.983	0.976	3.424	2.870*	0.976	1.010
Industrials	0.999	1.013	0.131	0.683	0.030	1.052	0.994	1.013	1.130	1.459*	0.286	1.034
Oil and Gas	0.986	0.980	2.802	2.436*	0.873	1.308	0.983	0.979	3.305	2.591*	0.665	1.431
Technology	1.005	1.003	-0.959	-0.886	1.659	1.000	1.003	1.001	-0.674	-0.926	1.136	1.000
Telecommunication	1.003	0.992	-0.642	0.786	0.185	1.049	1.011	0.998	-2.215	0.561	0.061	1.086
Utilities	1.003	1.014	-0.574	1.607	0.204	1.209	1.000	1.011	-0.050	1.702	0.116	1.284

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Table A.XXIV: Continued

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	EP						CFP					
Market	0.977	0.974	4.504	2.492*	7.748	1.215	0.989	1.004	2.255	2.124*	0.656	1.200
Basic Materials	0.989	0.986	2.128	1.945*	6.159	1.127	0.989	0.987	2.238	2.128*	0.905	1.099
Consumer Goods	0.988	0.984	2.385	1.863*	2.859	1.169	0.994	0.982	1.283	1.370*	0.069	1.239
Consumer Services	0.998	1.004	0.492	0.743	0.333	0.985	0.996	0.997	0.759	0.943	0.103	1.164
Financials	1.002	1.000	-0.344	-0.634	1.375	1.012	0.998	1.000	0.339	0.930	0.020	1.012
Health Care	0.997	0.990	0.549	0.669	0.072	1.031	1.003	1.000	-0.563	0.292	0.031	1.000
Industrials	1.002	1.000	-0.336	-0.559	2.616	1.155	0.999	1.006	0.161	0.631	0.476	1.017
Oil and Gas	0.986	0.988	2.792	2.251*	6.681	1.369	1.017	1.045	-3.501	0.992	0.380	1.154
Technology	1.003	1.004	-0.600	-1.202	7.570	0.989	1.001	0.996	-0.266	-0.149	0.705	1.000
Telecommunication	0.998	0.993	0.449	0.905	1.111	1.025	1.007	1.005	-1.491	-2.024	0.889	0.988
Utilities	0.996	1.016	0.893	1.124	1.452	1.164	0.993	1.012	1.306	1.490*	0.395	1.134
	INF						SVAR					
Market	0.999	0.997	0.286	0.756	0.173	1.046	1.000	0.995	-0.019	0.519	0.331	1.000
Basic Materials	0.999	0.999	0.213	0.643	0.200	1.000	1.001	1.000	-0.147	0.244	0.358	0.901
Consumer Goods	1.005	1.005	-0.960	-0.551	0.061	1.000	1.009	1.015	-1.815	-0.706	0.284	0.958
Consumer Services	1.004	1.004	-0.719	-1.552	5.780	1.000	1.018	1.004	-3.575	0.549	0.078	1.090
Financials	0.995	0.998	0.973	1.458*	0.674	1.062	1.000	1.000	-0.084	0.346	0.201	1.025
Health Care	1.005	1.005	-0.948	-0.476	0.791	0.918	1.003	1.008	-0.534	-0.679	1.055	0.959
Industrials	1.004	1.006	-0.839	-0.928	0.663	1.121	0.999	0.995	0.102	0.846	0.060	1.328
Oil and Gas	0.997	1.001	0.559	0.968	0.029	1.185	1.001	1.000	-0.207	-0.615	2.081	1.092
Technology	1.004	1.003	-0.809	-1.715	9.054	1.000	1.002	1.004	-0.436	0.948	0.128	1.000
Telecommunication	1.000	0.998	-0.020	0.776	0.261	1.123	1.002	1.002	-0.440	-0.333	0.569	0.963
Utilities	0.991	0.983	1.757	1.649*	0.675	1.343	0.999	0.998	0.145	0.529	1.920	1.239

Table A.XXV: Out-of-sample forecast evaluation results for book-to-market portfolio excess returns over longer out-of-sample period

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the benchmark historical mean model for the out-of-sample period 2001:05-2014:06 (60% of full-sample period). The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for book-to-market sorted portfolio and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 60% of the full sample. One-step ahead out-of-sample forecasts are generated recursively. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz R^2(RMZ), and relative success ratio (RSR). $RMAE$ and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that predictive regression model outperforms historical mean model. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
				BM						DE		
BM1	0.996	0.999	0.758	1.279	4.958	1.157	0.995	1.002	0.996	0.973	7.293	1.014
BM2	1.005	1.002	-0.950	0.382	2.522	1.156	1.009	0.989	-1.853	-0.242	8.389	1.094
BM3	1.001	1.000	-0.236	0.073	9.884	1.125	1.005	1.016	-1.034	0.195	9.277	1.047
BM4	1.004	1.004	-0.714	-0.747	3.420	1.044	1.012	1.015	-2.488	-1.132	2.129	0.926
BM5	0.998	0.997	0.385	0.790	6.897	1.132	1.011	1.002	-2.261	-0.400	9.284	1.088
BM6	0.998	1.006	0.306	0.724	6.610	1.030	1.000	1.004	-0.019	0.249	5.137	1.000
BM7	0.997	1.002	0.694	1.133	3.082	1.014	1.007	1.010	-1.377	-0.409	1.076	0.958
BM8	1.000	1.001	0.083	0.451	4.549	1.000	1.004	1.006	-0.821	-0.979	3.719	1.012
BM9	1.000	0.998	-0.024	0.139	4.313	1.075	1.001	1.008	-0.147	0.683	6.142	1.164
BM10	0.997	1.002	0.508	0.963	1.635	0.923	0.999	0.999	0.229	0.760	5.369	1.051
				DP						DY		
BM1	0.995	0.993	0.917	1.212	0.000	1.200	0.993	0.990	1.476	1.613*	0.079	1.200
BM2	0.994	0.996	1.212	1.271	0.029	1.156	0.987	0.991	2.630	1.765*	0.256	1.172
BM3	0.996	0.997	0.852	0.925	0.012	1.031	0.987	0.991	2.553	1.614*	0.301	1.172
BM4	1.001	1.001	-0.221	-0.517	0.697	1.088	0.998	1.000	0.467	1.019	0.114	0.956
BM5	0.996	0.996	0.831	1.610*	0.162	1.118	0.990	0.993	1.900	2.333*	0.078	1.147
BM6	0.995	1.009	1.095	1.475*	0.010	1.119	0.990	1.005	2.060	1.838*	0.097	1.119
BM7	0.993	0.998	1.459	1.583*	0.029	1.127	0.987	0.993	2.518	2.044*	0.191	1.141
BM8	1.000	1.002	-0.004	0.115	0.714	1.000	0.997	1.001	0.516	1.303*	0.159	0.975
BM9	0.994	1.002	1.134	1.420*	0.806	1.090	0.991	1.001	1.696	1.728*	0.123	1.104
BM10	1.002	1.001	-0.463	-1.059	0.714	1.038	1.001	1.000	-0.254	-0.433	0.326	1.013

Continued Overleaf

Table A.XXV: Continued

	RMAE	*RRMSE*	OR^2 (%)	*MSFE-adjusted*	*RMZ*	*RSR*	*RMAE*	*RRMSE*	OR^2 (%)	*MSFE-adjusted*	*RMZ*	*RSR*
	EP						CFP					
BM1	0.989	0.995	2.167	1.478*	3.309	1.114	1.008	1.013	-1.580	-1.053	0.250	1.000
BM2	0.998	0.996	0.335	0.647	1.116	1.109	1.006	1.008	-1.254	0.209	0.285	1.031
BM3	0.999	0.999	0.216	0.437	3.019	0.984	1.001	1.003	-0.117	0.429	0.258	1.063
BM4	1.004	1.003	-0.762	-1.332	2.987	1.074	1.004	1.004	-0.775	-1.555	0.652	0.985
BM5	1.000	0.999	-0.060	-0.083	6.830	1.044	0.996	0.995	0.844	1.156	0.030	1.162
BM6	1.001	1.002	-0.141	-0.175	7.979	1.000	0.999	1.008	0.276	0.691	0.086	1.075
BM7	0.995	0.997	1.044	1.186	0.360	0.986	0.985	0.996	2.922	2.072*	0.350	1.169
BM8	1.001	1.001	-0.243	-1.147	5.150	1.000	0.996	1.004	0.876	1.377*	0.001	0.840
BM9	1.000	0.999	-0.037	-0.037	5.617	1.119	1.002	0.997	-0.491	-0.233	0.366	1.119
BM10	1.003	1.002	-0.565	-1.518	5.283	1.000	1.000	1.000	0.084	0.406	0.270	0.987
	INF						SVAR					
BM1	1.011	1.013	-2.177	-1.033	0.779	1.000	0.999	0.995	0.175	0.600	0.012	1.114
BM2	1.000	1.004	0.009	0.344	0.066	1.156	0.998	0.994	0.480	0.899	0.010	1.141
BM3	1.000	1.000	-0.038	0.227	0.265	1.094	0.996	0.992	0.757	1.199	0.280	1.141
BM4	1.001	1.002	-0.180	0.076	0.128	1.147	0.998	0.991	0.478	1.025	0.014	1.147
BM5	0.997	0.999	0.640	1.117	0.013	1.147	0.998	0.989	0.402	0.788	0.034	1.044
BM6	0.995	0.996	1.082	1.452*	0.156	1.060	0.997	0.989	0.608	1.056	0.077	1.045
BM7	0.995	0.997	0.943	1.308*	0.168	1.127	0.997	0.988	0.573	1.305*	0.016	1.070
BM8	0.996	1.000	0.764	1.238	0.092	1.074	0.999	0.992	0.291	1.103	0.085	1.025
BM9	0.995	1.000	0.995	1.494*	0.004	1.269	0.998	0.988	0.497	1.078	0.177	1.179
BM10	1.004	1.002	-0.843	-1.269	2.279	1.038	0.998	0.990	0.403	0.998	0.010	1.051

Table A.XXVI: Out-of-sample forecast evaluation results for size portfolio excess returns over longer out-of-sample period

This table reports the out-of-sample forecast performance for the traditional predictive regression model against the benchmark historical mean model for the out-of-sample period 2001:05-2014:06 (60% of full-sample period). The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the market capitalization sorted portfolio and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 60% of the full sample. One-step ahead out-of-sample forecasts are generated recursively. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz R^2(RMZ), and relative success ratio (RSR). $RMAE$ and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that predictive regression model out-performs historical mean model. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	BM						DE					
S1	1.001	1.001	-0.227	-0.459	9.548	0.976	1.002	1.005	-0.386	-0.339	3.877	0.905
S2	1.000	0.997	0.043	0.376	7.378	1.059	0.998	0.995	0.307	1.163	4.887	1.118
S3	0.996	1.000	0.758	1.271	5.074	0.987	0.994	1.002	1.184	1.219	3.569	1.026
S4	0.999	1.001	0.131	0.467	2.465	0.943	1.003	1.000	-0.537	-0.480	2.434	1.043
S5	1.001	1.002	-0.207	-0.647	7.701	1.078	1.008	0.996	-1.664	-0.555	4.168	1.188
S6	0.998	1.005	0.381	0.763	6.893	1.074	1.007	1.022	-1.492	-0.182	2.530	1.000
S7	1.002	1.004	-0.330	-0.172	9.508	0.985	1.010	1.009	-1.938	-1.278	8.645	1.000
S8	0.997	1.002	0.676	1.159	0.025	1.103	1.007	1.005	-1.372	-0.450	8.284	0.985
S9	1.001	0.999	-0.253	-0.089	4.658	1.029	1.011	1.010	-2.137	-1.218	8.745	1.100
S10	0.997	1.000	0.689	1.319*	1.000	1.106	0.998	0.996	0.468	0.686	1.000	0.970
	DP						DY					
S1	1.010	1.009	-2.077	-1.872	0.389	0.952	1.009	1.008	-1.880	-1.991	0.271	0.952
S2	0.992	0.995	1.495	1.821*	0.065	1.250	0.989	0.992	2.108	2.184*	0.000	1.235
S3	0.992	1.003	1.598	1.745*	0.018	1.026	0.988	0.999	2.304	2.022*	0.112	1.013
S4	1.001	1.005	-0.259	0.047	2.110	0.929	1.000	1.005	0.020	0.467	0.675	0.929
S5	0.994	1.004	1.126	1.977*	0.069	1.063	0.987	1.001	2.511	2.622*	0.856	1.078
S6	0.986	0.999	2.691	2.168*	0.756	1.176	0.978	0.993	4.338	2.704*	1.161	1.191
S7	0.995	1.001	0.916	1.086	0.018	1.000	0.989	0.997	2.175	1.710*	0.213	1.029
S8	0.987	1.001	2.515	2.008*	0.639	1.118	0.978	0.995	4.417	2.482*	1.145	1.132
S9	0.996	0.997	0.711	0.953	0.001	1.086	0.987	0.988	2.567	1.831*	0.427	1.143
S10	0.980	0.985	3.984	2.357*	1.000	1.182	0.972	0.975	5.474	2.723*	1.000	1.182

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Table A.XXVI: Continued

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	EP						CFP					
S1	1.001	1.001	-0.241	-0.656	2.676	0.988	1.005	1.008	-0.954	-0.075	0.704	0.952
S2	1.002	1.001	-0.310	-0.937	6.462	1.015	1.002	0.999	-0.443	0.109	0.554	1.088
S3	0.999	1.003	0.196	0.570	5.771	0.821	0.993	0.988	1.330	1.612*	0.022	1.026
S4	1.000	1.001	-0.079	0.196	7.876	0.943	0.999	1.005	0.189	0.607	0.522	0.971
S5	1.001	1.001	-0.262	-0.733	4.867	0.969	1.002	1.006	-0.429	-0.449	0.493	1.000
S6	0.997	0.999	0.536	0.845	4.411	0.985	0.997	1.000	0.555	0.853	0.217	1.088
S7	0.999	1.002	0.160	0.392	2.885	0.897	0.996	1.004	0.886	1.060	0.008	1.000
S8	0.998	1.001	0.356	0.578	1.733	0.971	1.000	1.014	-0.079	0.638	0.001	1.015
S9	0.996	0.997	0.699	0.945	0.004	1.086	0.988	0.995	2.289	1.999*	0.553	1.143
S10	0.994	0.997	1.269	1.757*	1.000	1.045	0.990	1.010	2.040	1.895*	1.000	1.106
	INF						SVAR					
S1	1.002	1.002	-0.491	-0.849	1.784	0.964	0.996	0.986	0.892	1.449*	0.258	1.060
S2	0.996	1.001	0.876	1.307*	0.136	1.221	0.995	0.989	1.015	1.622*	0.237	1.103
S3	0.998	1.001	0.328	0.805	0.061	1.090	0.997	0.987	0.654	1.188	0.038	1.013
S4	0.998	0.999	0.394	0.866	0.025	1.186	0.995	0.985	1.063	1.493*	0.070	1.086
S5	1.004	1.005	-0.825	-0.932	1.052	1.109	0.996	0.987	0.757	1.316*	0.314	1.250
S6	0.997	0.999	0.546	0.997	0.065	1.044	0.999	0.993	0.282	0.680	0.407	1.015
S7	0.998	0.998	0.380	0.820	0.013	1.029	1.003	1.005	-0.538	-0.301	0.481	0.971
S8	1.000	1.002	0.027	0.344	0.200	1.088	0.998	0.995	0.407	1.038	0.114	1.118
S9	0.998	0.999	0.307	0.775	0.003	1.100	1.000	0.999	0.061	0.422	0.051	1.071
S10	1.003	1.003	-0.666	-1.279	1.000	0.985	1.001	0.998	-0.188	-0.438	1.000	1.015

Table A.XXVII: Out-of-sample forecast evaluation results for combination forecast returns over longer out-of-sample period

This table reports the out-of-sample forecast performance results for the combination forecasts against the benchmark historical mean model for the out-of-sample period 2001:05-2014:06 (60% of full-sample period). We employ a simple forecast combining method, the mean of eight individual predictive regression model forecasts. The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the aggregate market or its component portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 60% of the full sample. One-step ahead out-of-sample forecasts are generated recursively and then the average of these eight individual forecasts gives the mean combination forecasts. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz $R^2(RMZ)$, and relative success ratio (RSR). $RMAE$ and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that combination forecasts out-performs historical average forecasts. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE-adj$	RMZ	RSR		$RMAE$	$RRMSE$	OR^2 (%)	$MSFE-adj$	RMZ	RSR
Panel A: Aggregate market and industry portfolios													
Market	0.976	0.973	4.658	3.229*	1.172	1.262							
Basic Mat.	0.995	0.994	1.005	1.536*	1.475	1.000	Industrials	0.999	1.006	0.299	0.758	1.478	1.034
Cons. Goods	0.993	0.994	1.314	1.617*	0.284	1.169	Oil Gas	0.990	0.992	1.965	1.921*	2.187	1.323
Cons. Serv.	0.998	0.989	0.444	0.848	2.726	1.090	Technology	1.002	0.999	-0.469	-0.775	4.984	1.000
Financials	0.998	0.997	0.335	1.118	1.643	1.012	Telecom.	0.998	0.991	0.365	0.858	0.576	1.062
Healthcare	0.992	0.988	1.553	2.504*	3.557	1.000	Utilities	0.989	0.992	2.191	2.157*	2.921	1.209
Panel B: Book-to-market portfolios													
BM1	0.995	0.996	0.935	1.673*	1.076	1.143	BM6	0.993	0.999	1.414	1.887*	2.510	1.000
BM2	0.995	0.993	0.960	1.254	1.138	0.984	BM7	0.991	0.992	1.856	2.136*	2.038	1.085
BM3	0.995	0.997	0.993	1.568*	1.511	1.047	BM8	0.998	0.998	0.496	1.628*	2.078	1.037
BM4	1.002	1.001	-0.323	-0.557	1.533	1.074	BM9	0.996	0.998	0.854	1.673*	2.607	1.149
BM5	0.996	0.994	0.821	2.051*	2.413	1.088	BM10	1.000	0.998	0.025	0.234	2.762	1.026
Panel C: Size portfolios													
S1	1.001	1.001	-0.298	-0.697	2.324	0.988	S6	0.992	0.999	1.513	2.346*	2.872	1.000
S2	0.994	0.992	1.254	2.143*	2.060	1.059	S7	0.997	1.001	0.575	1.194	1.368	1.000
S3	0.992	0.995	1.571	2.287*	2.549	0.910	S8	0.992	0.998	1.577	2.014*	1.594	0.971
S4	0.998	0.999	0.424	1.132	2.406	1.014	S9	0.996	0.997	0.847	1.797*	1.099	0.986
S5	0.997	0.997	0.579	1.920*	2.223	1.141	S10	0.988	0.991	2.392	2.639*	1.000	1.091

Table A.XXVIII: Out-of-sample forecast evaluation results for market and industry excess returns over smaller out-of-sample period

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the benchmark historical mean model for the out-of-sample period 2005:09-2014:06 (40% of full-sample period). The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the aggregate market or industry portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 40% of the full sample. One-step ahead out-of-sample forecasts are generated recursively. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz R^2(RMZ), and relative success ratio (RSR). $RMAE$ and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that predictive regression model outperforms historical mean model. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	BM						DE					
Market	1.000	1.008	-0.014	0.227	2.925	1.000	0.994	0.997	1.219	0.855	3.250	1.136
Basic Materials	1.002	1.002	-0.331	-1.357	6.760	0.961	1.007	1.007	-1.396	-1.500	6.682	0.941
Consumer Goods	1.000	0.998	0.072	0.315	0.664	1.021	1.009	1.002	-1.842	-0.462	3.982	1.229
Consumer Services	0.998	1.005	0.463	0.781	0.178	1.000	1.043	1.042	-8.706	-0.306	0.294	1.042
Financials	0.998	0.997	0.331	1.369*	2.543	1.036	1.003	1.001	-0.523	-0.667	2.347	1.000
Health Care	1.000	1.000	-0.011	-0.238	6.533	1.000	1.000	1.007	-0.056	0.162	0.377	0.866
Industrials	1.001	0.996	-0.299	-0.473	3.574	1.256	1.018	1.048	-3.715	-0.645	2.847	1.051
Oil and Gas	1.003	1.009	-0.622	0.022	2.222	1.087	0.998	0.996	0.450	0.711	0.105	1.261
Technology	1.002	1.001	-0.475	-0.953	1.678	1.000	1.002	1.001	-0.392	-0.859	1.555	1.000
Telecommunication	1.002	1.001	-0.419	-0.622	0.998	0.980	0.991	1.005	1.858	1.611*	3.860	1.078
Utilities	1.003	1.014	-0.562	-0.380	3.971	1.021	1.003	0.994	-0.505	-0.354	1.020	1.298
	DP						DY					
Market	0.981	0.980	3.807	1.630*	4.306	1.250	0.972	0.974	5.604	2.095*	1.972	1.250
Basic Materials	1.006	1.010	-1.215	-0.051	0.061	0.961	1.005	1.011	-0.941	0.215	0.054	0.980
Consumer Goods	0.994	1.008	1.185	1.094	2.657	0.979	0.992	1.006	1.588	1.413*	0.988	1.021
Consumer Services	1.018	1.019	-3.712	-0.078	0.231	1.083	1.017	1.022	-3.415	0.198	0.001	1.104
Financials	0.997	0.997	0.651	1.365*	0.193	1.107	0.992	0.995	1.501	2.136*	0.806	1.071
Health Care	0.987	0.978	2.675	2.101*	4.575	1.015	0.987	0.981	2.645	2.301*	1.277	0.985
Industrials	1.004	1.027	-0.715	-0.189	0.415	1.051	1.000	1.032	0.000	0.571	0.691	1.051
Oil and Gas	0.993	0.990	1.467	1.468*	2.188	1.196	0.991	0.992	1.837	1.696*	0.827	1.326
Technology	1.001	1.002	-0.251	-1.229	1.356	1.000	1.001	1.000	-0.282	-0.983	0.444	1.000
Telecommunication	0.990	0.998	1.915	1.543*	2.353	1.078	0.991	1.000	1.786	1.509*	0.618	1.078
Utilities	1.028	1.033	-5.630	0.335	0.633	1.170	1.021	1.026	-4.173	0.524	0.310	1.234

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Table A.XXVIII: Continued

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	EP						CFP					
Market	0.990	0.997	1.943	1.164	2.178	1.023	1.006	1.044	-1.177	0.651	0.480	1.068
Basic Materials	0.990	0.990	1.929	1.571*	3.550	1.157	0.991	0.997	1.752	1.492*	1.358	1.078
Consumer Goods	0.993	0.988	1.399	1.023	0.749	1.229	1.000	0.988	-0.065	0.587	0.019	1.250
Consumer Services	0.999	1.014	0.258	0.630	0.268	1.000	0.997	1.011	0.652	0.727	0.315	1.000
Financials	0.999	0.998	0.258	0.719	0.273	1.018	0.998	1.003	0.481	1.003	0.020	0.929
Health Care	1.002	0.994	-0.462	0.015	0.371	1.045	1.000	1.000	0.019	0.278	2.558	1.000
Industrials	1.001	0.998	-0.177	-0.298	4.118	1.231	1.001	1.012	-0.213	-0.143	0.630	1.026
Oil and Gas	0.994	1.002	1.123	1.165	2.109	1.239	1.045	1.075	-9.225	0.018	0.000	1.130
Technology	1.002	1.003	-0.446	-0.718	1.410	0.983	1.002	0.997	-0.484	-0.296	0.599	1.000
Telecommunication	1.003	1.006	-0.659	0.133	0.361	0.980	1.001	1.001	-0.128	-1.041	0.219	1.000
Utilities	1.003	1.027	-0.621	0.371	0.021	1.064	1.006	1.031	-1.142	0.155	0.316	1.021
	INF						SVAR					
Market	1.000	1.001	-0.037	0.290	0.006	1.091	1.000	0.993	-0.097	0.416	0.011	1.000
Basic Materials	0.999	0.998	0.238	0.584	0.000	1.000	1.001	1.000	-0.289	0.156	0.030	0.863
Consumer Goods	1.001	1.000	-0.200	0.084	0.442	1.000	1.004	1.007	-0.875	-0.925	1.198	0.958
Consumer Services	1.002	1.003	-0.372	-0.654	0.534	1.000	0.997	0.993	0.617	1.263	0.761	1.042
Financials	0.999	1.004	0.254	0.865	0.069	1.054	1.001	1.001	-0.272	0.180	0.017	1.036
Health Care	1.001	0.996	-0.115	0.226	0.032	1.015	1.004	1.012	-0.719	-0.695	0.357	0.940
Industrials	0.999	1.002	0.111	0.425	0.043	1.179	0.999	0.991	0.273	0.836	0.071	1.487
Oil and Gas	1.000	1.012	-0.098	0.459	0.007	1.130	1.001	1.003	-0.281	-1.343	1.218	1.109
Technology	1.003	0.999	-0.514	-0.579	0.275	1.000	1.016	1.009	-3.263	-0.606	0.187	1.000
Telecommunication	0.999	1.009	0.246	0.815	0.039	1.118	1.001	0.998	-0.179	0.266	0.010	1.078
Utilities	0.995	0.990	0.905	1.371*	0.185	1.340	1.003	1.001	-0.549	-0.623	0.461	1.298

Table A.XXIX: Out-of-sample forecast evaluation results for book-to-market portfolio excess returns over smaller out-of-sample period

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the benchmark historical mean model for the out-of-sample period 2005:09-2014:06 (40% of full-sample period). The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for book-to-market sorted portfolio and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 40% of the full sample. One-step ahead out-of-sample forecasts are generated recursively. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz R^2(RMZ), and relative success ratio (RSR). $RMAE$ and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that predictive regression model out-performs historical mean model. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	BM						DE					
BM1	1.007	0.999	-1.331	0.034	0.338	1.174	1.002	1.005	-0.434	0.003	0.150	0.978
BM2	1.004	1.010	-0.767	0.079	2.389	1.087	1.010	0.985	-2.034	-0.142	0.261	1.130
BM3	1.000	0.999	-0.002	0.222	4.322	1.178	1.011	1.028	-2.229	-0.122	0.457	1.022
BM4	1.001	1.000	-0.131	-0.250	3.221	1.061	1.006	1.006	-1.269	-0.352	0.916	0.898
BM5	0.998	0.998	0.471	0.676	1.185	1.146	1.023	1.013	-4.586	-1.297	3.970	1.083
BM6	0.997	1.004	0.527	0.836	0.788	1.042	1.002	1.006	-0.342	0.019	0.169	1.000
BM7	0.994	1.003	1.265	1.321*	1.900	1.020	1.005	1.005	-0.905	-0.838	2.486	0.960
BM8	0.997	1.004	0.503	1.030	0.161	1.035	1.003	1.002	-0.568	-0.588	2.657	1.035
BM9	1.000	1.000	-0.045	-0.052	8.004	1.083	0.995	1.005	0.992	1.113	0.915	1.083
BM10	0.995	1.001	1.004	1.648*	7.418	0.926	0.999	0.997	0.298	0.678	0.009	1.074
	DP						DY					
BM1	1.000	0.993	-0.010	0.199	0.736	1.261	0.998	0.990	0.482	0.595	0.092	1.283
BM2	1.006	1.016	-1.107	0.033	0.131	1.087	0.998	1.014	0.311	0.701	0.104	1.109
BM3	1.001	1.007	-0.148	0.193	0.042	1.044	0.991	1.002	1.709	0.921	0.431	1.089
BM4	1.001	1.001	-0.258	-0.510	2.550	1.122	0.998	1.002	0.456	0.783	0.002	0.939
BM5	0.995	0.996	1.050	1.642*	1.433	1.167	0.988	0.992	2.369	2.278*	1.423	1.208
BM6	0.997	1.007	0.500	0.776	0.415	1.083	0.993	1.003	1.463	1.141	0.373	1.104
BM7	0.994	1.006	1.207	1.166	1.066	1.120	0.988	1.002	2.337	1.615*	0.724	1.140
BM8	0.999	1.002	0.130	0.515	2.289	1.053	0.996	1.002	0.702	1.301*	0.140	1.053
BM9	0.996	0.997	0.722	1.168	0.567	1.188	0.994	0.997	1.188	1.527*	0.465	1.146
BM10	1.000	0.999	-0.001	0.095	2.034	1.037	0.999	0.998	0.238	0.717	0.021	1.000

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Table A.XXIX: Continued

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	EP						CFP					
BM1	0.991	0.996	1.848	1.093	3.661	1.130	1.005	1.001	-1.069	-1.138	1.458	0.957
BM2	1.003	1.007	-0.561	0.031	0.383	1.087	1.012	1.023	-2.503	-0.412	0.599	0.935
BM3	1.001	1.002	-0.134	0.058	0.887	0.978	1.000	1.008	-0.021	0.213	0.019	1.000
BM4	1.003	1.000	-0.545	-1.298	4.229	1.102	1.003	1.003	-0.638	-1.401	2.080	0.980
BM5	1.001	1.000	-0.172	-0.333	9.299	1.063	0.995	0.998	1.089	1.067	0.397	1.146
BM6	1.001	1.003	-0.199	-0.324	7.376	1.000	0.999	1.011	0.216	0.520	0.018	1.104
BM7	0.998	1.004	0.426	0.526	0.090	0.980	0.996	1.015	0.780	0.953	0.416	1.040
BM8	1.001	1.001	-0.246	-0.959	4.645	1.018	0.994	1.006	1.282	1.459*	0.523	0.860
BM9	1.002	0.999	-0.449	-1.043	4.739	1.104	1.002	1.000	-0.435	-0.940	0.797	1.083
BM10	1.003	1.002	-0.625	-1.421	3.837	0.981	0.998	0.998	0.389	0.765	0.034	0.944
	INF						SVAR					
BM1	1.003	0.997	-0.633	-0.290	0.294	1.000	1.000	0.992	0.078	0.459	0.002	1.174
BM2	1.000	1.006	-0.081	0.221	0.007	1.174	0.997	0.991	0.581	0.838	0.109	1.196
BM3	1.001	1.001	-0.135	0.096	0.056	1.111	0.996	0.987	0.759	1.005	0.260	1.156
BM4	1.000	1.001	0.061	0.349	0.002	1.143	0.998	0.988	0.417	0.849	0.121	1.163
BM5	0.999	1.004	0.134	0.528	0.003	1.188	0.999	0.986	0.294	0.624	0.060	1.083
BM6	1.003	1.006	-0.615	0.229	0.001	1.063	0.997	0.983	0.509	0.811	0.108	1.063
BM7	1.006	1.009	-1.113	-0.053	0.016	1.080	0.999	0.983	0.239	0.845	0.113	1.060
BM8	1.001	1.007	-0.269	0.284	0.025	1.035	1.000	0.988	-0.044	0.727	0.103	1.000
BM9	1.002	1.006	-0.344	0.233	0.010	1.208	1.000	0.989	-0.076	0.472	0.010	1.125
BM10	1.001	1.001	-0.119	-0.086	0.340	1.037	1.001	0.989	-0.118	0.524	0.024	1.000

Table A.XXX: Out-of-sample forecast evaluation results for size portfolio excess returns over smaller out-of-sample period

This table reports the out-of-sample forecast performance results for the traditional predictive regression model against the benchmark historical mean model for the out-of-sample period 2005:09-2014:06 (40% of full-sample period). The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the market capitalization sorted portfolio and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 40% of the full sample. One-step ahead out-of-sample forecasts are generated recursively. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz $R^2(RMZ)$, and relative success ratio (RSR). $RMAE$ and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that predictive regression model out-performs historical mean model. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	BM						DE					
S1	1.000	0.999	0.071	0.428	7.337	1.000	1.003	1.002	-0.508	-1.298	1.951	0.964
S2	0.999	1.004	0.133	0.388	2.087	0.980	1.002	0.993	-0.321	0.724	0.921	1.102
S3	0.995	1.001	1.083	1.548*	9.870	0.945	0.996	1.002	0.801	0.695	0.115	1.055
S4	0.998	1.000	0.363	0.988	3.296	0.925	1.005	0.999	-1.024	-0.975	2.566	0.981
S5	1.000	0.999	0.072	0.438	7.416	1.114	1.017	0.999	-3.360	-1.152	1.964	1.159
S6	0.995	1.003	0.957	1.220	8.291	1.104	1.006	1.029	-1.247	0.101	0.250	1.000
S7	1.001	1.004	-0.201	-0.204	6.382	0.979	1.008	1.008	-1.707	-0.841	2.821	1.000
S8	0.995	1.006	0.921	0.939	6.827	1.109	1.011	1.008	-2.152	-0.575	1.987	1.000
S9	0.999	0.997	0.273	0.608	1.452	1.041	1.008	1.001	-1.645	-0.810	2.696	1.122
S10	0.997	1.000	0.621	1.081	1.000	1.159	1.003	1.004	-0.582	-0.304	1.000	1.023
	DP						DY					
S1	1.005	1.006	-0.957	-1.468	2.869	0.929	1.004	1.004	-0.738	-2.084	0.781	0.929
S2	0.999	1.005	0.110	0.739	0.532	1.184	0.998	1.005	0.362	0.950	0.277	1.143
S3	0.994	1.003	1.216	1.218	0.931	1.000	0.990	1.001	1.967	1.542*	0.534	0.964
S4	1.000	1.001	-0.050	-0.102	4.516	0.906	0.998	1.001	0.418	0.929	0.006	0.868
S5	0.993	1.004	1.344	1.810*	2.057	1.091	0.986	1.003	2.793	2.245*	1.637	1.091
S6	0.993	1.010	1.383	1.087	1.381	1.104	0.985	1.008	2.902	1.576*	1.125	1.083
S7	0.997	1.006	0.573	0.636	0.161	1.000	0.990	1.002	2.070	1.318*	0.735	1.063
S8	0.995	1.015	0.999	0.893	0.787	1.000	0.984	1.010	3.128	1.528*	1.198	1.022
S9	0.996	0.998	0.722	0.789	0.387	1.061	0.987	0.991	2.633	1.494*	1.143	1.041
S10	0.993	1.009	1.306	0.883	1.000	1.045	0.983	0.995	3.381	1.427*	1.000	1.091

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Table A.XXX: Continued

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE$-$adjusted$	RMZ	RSR
	EP						CFP					
S1	1.000	1.000	-0.055	-0.088	2.263	1.000	1.002	1.003	-0.389	-0.875	1.819	0.982
S2	1.003	1.003	-0.505	-1.482	6.527	1.000	1.000	1.004	0.079	0.310	1.556	1.020
S3	0.998	1.005	0.350	0.627	0.454	0.818	0.991	0.995	1.887	1.923*	1.387	0.964
S4	1.001	1.003	-0.120	-0.007	2.085	0.925	0.997	1.000	0.677	1.123	0.126	0.981
S5	1.001	1.000	-0.230	-0.511	8.349	0.955	1.001	1.005	-0.177	-0.064	0.807	1.000
S6	1.000	1.003	-0.072	0.118	0.651	0.979	0.997	1.006	0.528	0.659	0.094	1.104
S7	1.001	1.006	-0.255	-0.006	0.915	0.854	0.999	1.014	0.179	0.501	0.051	1.000
S8	1.000	1.007	-0.009	0.172	0.196	0.957	1.007	1.033	-1.497	0.043	0.036	0.891
S9	0.997	0.999	0.584	0.653	0.154	1.000	0.990	0.999	2.059	1.443*	1.201	1.102
S10	0.995	1.002	0.950	1.095	1.000	1.068	0.998	1.029	0.450	0.912	1.000	1.068
	INF						SVAR					
S1	1.002	1.003	-0.370	-0.529	0.590	0.964	1.000	0.980	0.019	0.805	0.142	1.036
S2	1.003	1.009	-0.687	0.151	0.021	1.163	0.998	0.983	0.321	0.960	0.213	0.980
S3	1.001	1.004	-0.124	0.301	0.037	1.091	0.999	0.986	0.230	0.787	0.110	0.945
S4	1.001	1.004	-0.272	0.202	0.009	1.151	0.998	0.983	0.487	0.915	0.184	0.962
S5	1.001	1.003	-0.155	-0.003	0.135	1.136	0.995	0.973	0.956	1.075	0.381	1.273
S6	1.002	1.004	-0.361	0.131	0.017	1.104	0.999	0.991	0.208	0.505	0.017	1.042
S7	1.001	1.002	-0.284	0.108	0.006	1.021	1.002	0.999	-0.303	-0.303	0.256	1.000
S8	1.000	1.003	-0.083	0.184	0.021	1.109	0.999	0.992	0.275	0.792	0.129	1.196
S9	0.999	1.001	0.102	0.438	0.002	1.143	1.000	0.999	0.028	0.373	0.001	1.061
S10	1.000	1.000	-0.100	-0.357	1.000	0.977	1.002	1.000	-0.301	-0.758	1.000	1.000

Table A.XXXI: Out-of-sample forecast evaluation results for combination forecast returns over smaller out-of-sample period

This table reports the out-of-sample forecast performance of the combination forecasts against the benchmark historical mean model for the out-of-sample period 2005:09-2014:06 (40% of full-sample period). We employ a simple forecast combining method, the mean of eight individual predictive regression model forecasts. The predictive regression model is given by $r_t = \alpha + \beta x_{t-1} + \varepsilon_{r,t}$. Here, r_t is excess return for the aggregate market or its component portfolio, and x_t is the predictor variable, which takes the form of one of the eight economic variables, namely, book-to-market (BM), dividend-payout (DE), dividend-price (DP), dividend yield (DY), earnings-price (EP), cash flow-to-price (CFP), inflation (INF), or stock variance (SVAR). The out-of-sample period is 40% of the full sample. One-step ahead out-of-sample forecasts are generated recursively and then the average of these eight individual forecasts gives the mean combination forecasts. We report six forecast evaluation metrics, namely, relative mean absolute error ($RMAE$), relative root mean squared error ($RRMSE$), Campbell and Thompson (2008) out-of-sample R^2 (OR^2), Clark and West (2007) $MSFE-adjusted$ statistic, Mincer Zarnowitz $R^2(RMZ)$, and relative success ratio (RSR). $RMAE$ and $RRMSE$ values less than one, RMZ and RSR values greater than one, and $OR^2 > 0$, indicate that combination forecasts out-performs historical average forecasts. The statistical significance of $MSFE-adjusted$ statistic is marked by "*", which indicates significance at 10% level or better.

	$RMAE$	$RRMSE$	OR^2 (%)	$MSFE-adj$	RMZ	RSR		$RMAE$	$RRMSE$	OR^2 (%)	$MSFE-adj$	RMZ	RSR
Panel A: Aggregate market and industry portfolios													
Market	0.988	0.995	2.351	1.783*	0.916	1.136							
Basic Mat.	0.998	0.998	0.494	0.755	0.850	1.000	Industrials	1.001	1.012	-0.161	-0.006	0.730	1.051
Cons. Goods	0.997	0.996	0.645	0.735	0.480	1.146	Oil Gas	0.998	1.004	0.494	0.662	0.836	1.174
Cons. Serv.	0.997	1.000	0.511	0.746	0.470	0.979	Technology	1.003	0.999	-0.515	-1.019	0.225	1.000
Financials	0.997	0.997	0.527	1.481*	0.518	0.946	Telecom.	0.993	0.998	1.464	1.439*	0.036	1.059
Healthcare	0.992	0.988	1.509	1.915*	0.684	1.000	Utilities	0.997	1.000	0.505	0.831	0.333	1.128
Panel B: Book-to-market portfolios													
BM1	0.999	0.994	0.215	0.606	0.680	1.174	BM6	0.996	1.001	0.860	1.216	0.628	1.000
BM2	1.000	1.001	0.054	0.253	0.555	0.978	BM7	0.994	1.000	1.260	1.452*	0.594	1.120
BM3	0.997	1.001	0.612	0.919	0.483	1.067	BM8	0.997	0.999	0.525	1.362*	0.394	1.088
BM4	1.000	0.998	-0.025	0.057	0.471	1.102	BM9	0.997	0.997	0.509	1.570*	0.541	1.208
BM5	0.997	0.996	0.519	1.129	0.389	1.125	BM10	0.998	0.997	0.308	1.004	0.364	1.037
Panel C: Size portfolios													
S1	1.001	0.999	-0.101	-0.155	0.477	1.018	S6	0.994	1.004	1.119	1.508*	0.482	1.010
S2	0.996	0.997	0.728	1.272	0.488	1.082	S7	0.998	1.003	0.340	0.647	0.607	1.000
S3	0.993	0.997	1.369	1.923*	0.329	0.964	S8	0.996	1.006	0.875	1.059	0.570	0.957
S4	0.998	0.998	0.351	1.198	0.476	1.019	S9	0.995	0.997	0.913	1.601*	0.533	0.980
S5	0.997	0.995	0.668	1.805*	0.443	1.205	S10	0.994	1.002	1.186	1.232	1.000	1.091

Figure A.I: Performance of combination forecasts of market and nine industries

These figures plot the performance of the out-of-sample combination forecasts for the aggregate market and for the ten industries over the out-of-sample period 2003:07-2014:06. Specifically, these are the difference between the cumulative squared prediction errors of the historical average forecast and the cumulative squared prediction errors of the combination forecast. As pointed by Welch and Goyal (2008), the units on the plots are not intuitive but the time-series pattern provides a useful visual interpretation.

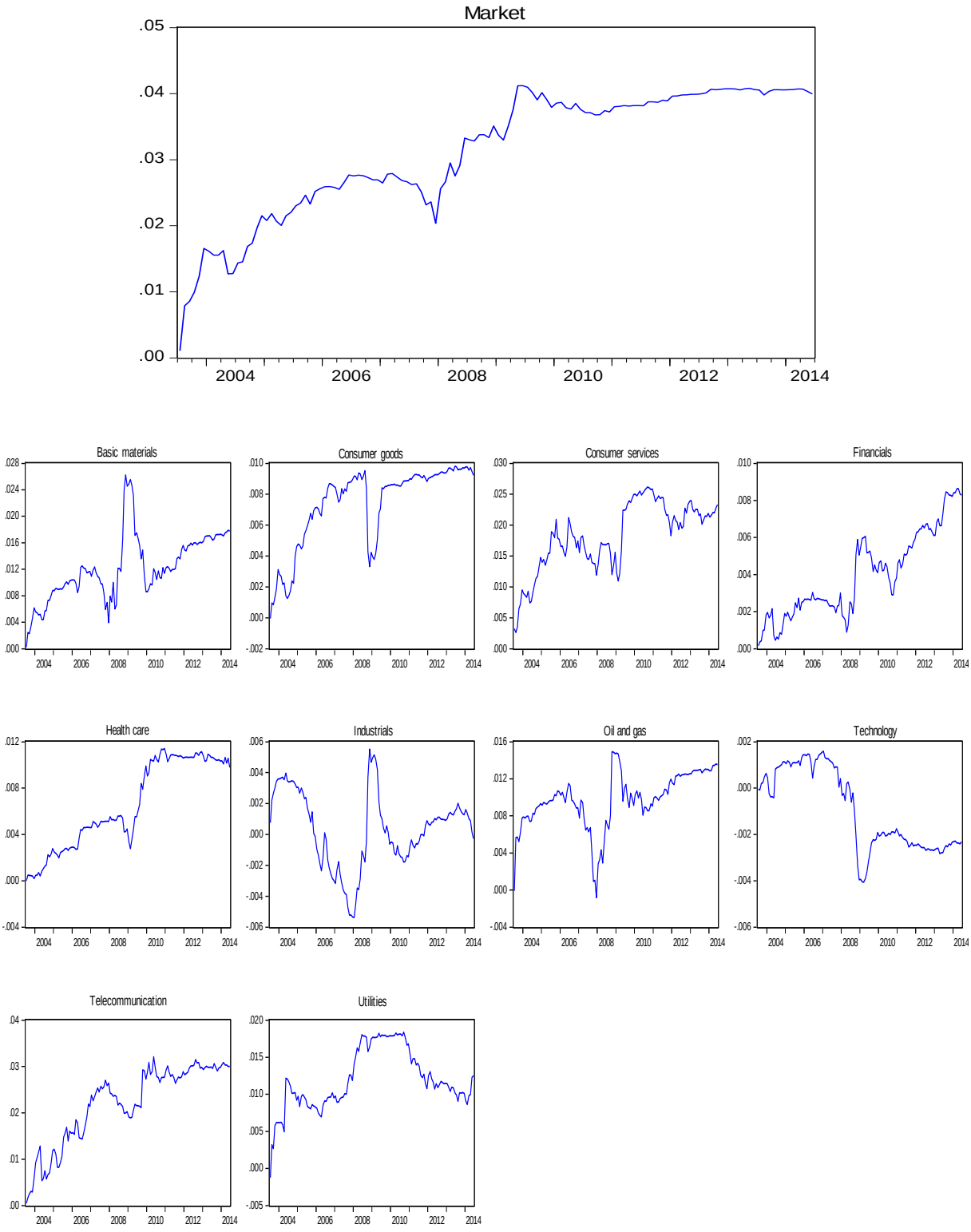

Figure A.II: Performance of out-of-sample combination forecasts of book-to-market and size sorted portfolios

These figures plot the performance of the out-of-sample combination forecasts for the portfolios sorted on book-to-market and size over the out-of-sample period 2003:07-2014:06. Specifically, these are the difference between the cumulative squared prediction errors of the historical average forecast and the cumulative squared prediction errors of the combination forecast. As pointed by Welch and Goyal (2008), the units on the plots are not intuitive but the time-series pattern provides a useful visual interpretation.