Internet Appendix for
"Equity Term Structures without Dividend Strips Data"

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In this appendix, we provide additional results mentioned in the paper but not reported there for brevity. The appendix is organized as follows. In Section I, we illustrate how our synthetic term structures can be used to evaluate asset pricing models. We calibrate and test five models: the Bansal and Yaron (2004) (BY) and Bansal, Kiku and Yaron (2012) (BKY) models, the habit formation model of Campbell and Cochrane (1999), the model of Lettau and Wachter (2007), and the rare disaster model of Gabaix (2012). Section II discusses issues related to measuring duration in equities. We argue that for risky assets, duration is economically less informative than looking separately at exposures to the different shocks. Our estimated model can deliver these insights for any asset and any type of risk. Section III provides additional tables and plots mentioned in the paper.

I. Model Calibrations and Evaluation

In this section we illustrate how our synthetic term structures can be used to evaluate asset pricing models. We propose two different tests of the models. The first test follows the standard procedure in the literature (e.g., Beeler and Campbell (2012)): it simulates a model many times (specifically, 10,000 times) generating samples as long as the actual data sample X. Each simulation of the model produces a simulated dataset $\tilde{X}$. A particular moment $g()$ is computed using the actual data sample, $g(X)$, and using the various simulated datasets, producing a distribution of statistics $g(\tilde{X})$ across simulated samples. The first test then computes how likely the observed moment $g(X)$ is to be generated by the model. For example, we generate the average slope of the term structure of discount rates in the Bansal and Yaron (2004) model in many samples, and ask how often it is

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as low as we measure it in the data using our reduced-form estimate. The test takes the entire model as a null, and therefore uses the calibrated model parameters (and assumptions about shocks distributions) when generating the simulated data. Note that this test does take into account the time-series component of uncertainty, that is the fact that a time-series average is used to estimate an unconditional expectation of the realized moments in the sample (through the resampling of the data). However, this procedure does *not* take into account the fact that the realized moment we measure in the data (e.g., the term structure of discount rates at each point in time) is not actually *observed* from traded prices, but rather it is estimated using our reduced-form model, which, as discussed in Section I.D of the main article, adds another component of uncertainty.

We therefore propose an alternative way to test asset pricing models using our estimated moments, that explicitly takes into account both the time-series uncertainty and the uncertainty coming from estimating our reduced-form model. In this test, we compute for each model the *population* value of each moment, and then use our point estimate and GMM standard errors (which account for both types of uncertainty) to test the null that the moment of interest is what is implied by the model in population.

We calibrate and test five models: the Bansal and Yaron (2004) (BY) and Bansal, Kiku and Yaron (2012) (BKY) models, the habit formation model of Campbell and Cochrane (1999), the model of Lettau and Wachter (2007), and the rare disaster model of Gabaix (2012). Model calibrations and simulations are implemented as follows. For the solution and calibration of the BY and BKY models, we follow Beeler and Campbell (2012). We build equity yields (EY) and forward equity yields (FEY) as in van Binsbergen, Brandt and Koijen (2012a) and bond yields as in Beeler and Campbell (2012). For the estimation and calibration of Campbell and Cochrane (1999) model, we follow Gonçalves (2021), who also computes equity yields, basing our code on the one he kindly shares; in this model, the term structure of bond yields is flat and constant, so that the EY and FEY curves are the same. For the estimation and calibration of Lettau and Wachter (2007), we follow Gormsen (2021), who also computes equity yields, basing our code on the one he kindly shares; in this model, the term structure of bond yields is flat and constant, so that the EY and FEY curves are the same. For the rare disaster model in Gabaix (2012), we use the closed-form expressions (for equity yields and bonds) provided in the paper, and simulate the model based on the procedure detailed in the appendix of that paper.

Table IA.I reports results for two different time periods. In the top panel, it considers only the period 2004 to 2020. In the bottom panel, all results are reported for the full sample (1976 to 2020). Each panel is divided horizontally in two parts. The left part performs the first test (simulating the model and comparing the results with our point estimates of each moment). The right part performs the second test (using our GMM standard errors to test the null imposed by the population values of each model). Each of the two parts reports the results for all five models mentioned above.

We consider a variety of moments (one in each row), motivated by the recent literature. First, we consider the average slope of the term structure of EY and FEY. Note that we use the two year maturity as the short end when computing the slope, because as discussed by van Binsbergen, Brandt and Koijen (2012a) the exact assumptions about the payment of dividends within the year matter for the return of the strips (especially the one-year strips whose return is directly determined by the dividend paid out); in addition, the models are calibrated at different frequencies (some monthly, some quarterly), and therefore imply different timing of the dividend payments of a one-year strip. In previous versions of this paper, we had used the one-year strip as the short end of the curve, and all results were qualitatively and quantitatively similar. Second, we study the risk premia (average excess returns for a one-year holding period) of strips and forward strips at different maturities, two, seven, and fifteen years. Finally, we test the coefficient of a regression of the slope of the equity yield term structures on the log price-dividend ratio, capturing the cyclicality of the term structure of equity yields.

On the left side of the table, the numbers report the fraction of model simulated samples for which the moment is *lower* than the one we estimate in the data. On the right side, the table reports the one-sided p-value for the hypothesis that, given our point estimates and the uncertainty in our estimates, the true population moment is equal to (or higher than) the one implied by the model. Therefore, in both cases, when the number reported is close to zero, the model is rejected because we estimate an empirical moment *lower* than what the model implies, and when the number is close to one the model is rejected because we estimate a moment *higher* than what the model implies. For example, for the BY model, the slope of the term structure of FEY is too steep: the p-values reported in the table are close to zero (for the 15-2 slope, 0.03 and 0.04 with the two tests respectively).

Looking across the left and right parts of the table, we note that the two tests give similar evaluations of the models, even if the right side (that incorporates the uncertainty from the estimation of the moments) has, as expected, less power in most cases.

The table presents a rich evaluation of the models. Overall, it appears that each model succeeds in some dimensions and fails in others. While this exercise is illustrative, it gives an example of how these additional moments can help the calibration and evaluation of the economic forces at play in the models. For example, the table shows that the BY model does a better job explaining the slope of the EY curve than that of the FEY curve. Given that the difference in the two curves depends on the term structure of interest rates, this reinforces the point made by Beeler and Campbell (2012) that the BY model has counterfactual implications about the term structure of interest rates.

More specifically, the BY model tends to generate term structures of FEY that are too steep, and, as pointed out by Beeler and Campbell (2012), it also generates term structures of interest rates that are downward-sloping (and therefore not steep enough compared to the data). Given that the EY are the sum of the FEY and the bond yields, the two errors in matching FEY and bond yields cancel out, and the model actually generates an EY term structure much more consistent with the data. This illustrates that looking jointly at different moments can be quite informative about the various mechanisms at play in the model.

When we look at the individual risk premia on strips (and forwards) of different maturity, we find that the risk premia for long maturity forwards are too high in the BY and BKY model. Interestingly, the individually estimated short-maturity risk premia are not rejected statistically (partly because of low power, but partly because they do not differ dramatically from those predicted by the model). While we don't have direct evidence on the very short end of the curve, when we look at the risk premia of the two-year strips we do not find them to be exceedingly high, which makes the results similar to the predictions of BY and BKY. Finally, we estimate a procyclical slope of the EY and FEY term structures (the slope is high when the PD ratio is high). This is in line with the prediction of the BY and BKY model in the post-2004 sample. In the full sample, we actually estimate a much lower degree of procyclicality, lower than what we find after 2004 and than what the models predict. The cyclicality of the term structure of equity yields and risk premia is an interesting moment to study, as it reveals interesting features of the dynamics of the variables driving the slope of the term structure. Our analysis allows us to expand the sample significantly, including many more business cycle compared to the analysis that uses traded strips only and that starts in 2004.

The LW model is known to generate downward-sloping term structures. Given that our estimated term structures are somewhat upward-sloping, it should not be surprising that the LW model is rejected as having *too low* a slope in our sample. The LW model generates risk premia on EY and FEY that are too high at the short term, both in the full sample and the post-2004 sample. This again highlights the fact that estimated short-term risk premia are relatively low in our estimate (and therefore not consistent with models where the term structure of risk premia is steeply downward-sloping as in LW). Finally, the LW model also generates procyclical term structures, about in line with our post-2004 estimates, and higher than our full-sample estimates (which are much closer to zero).

The habit formation model generates EY slopes that are broadly in line with our estimates and FEY slopes that are too steep. The model cannot be rejected statistically on many of the individual maturity risk premia (partly because risk premia are estimated with less power than term structure slopes). Interestingly, the model predicts that the slope of the EY and FEY term structure is countercyclical, which is at odds with the data.

Finally, the rare disaster model implies a flat term structure of discount rates for EY and FEY, so it tends to predict a slope that is too low compared to the data. The rare disaster model is the model that best matches the slope of the FEY term structure. The calibration of the model gets the risk premia off by a few percentage points (in other words, it predicts the level of risk premia higher than we find in the data), so it is rejected on the level of risk premia dimension. Finally, it gets the procyclicality about right, at least in the full sample.

To sum up, the table shows that different models match some aspects of the data well and others less so. Overall, the rare disaster model appears to be the one that matches the data the best, except for the level of the risk premium which is calibrated to be too high. Beyond these illustrative examples, the moments we provide in this paper can be useful to help guide and refine the calibrations of future models (taking into account, of course, that there is substantial estimation error in our estimated term structures).

II. Duration

Following the work of van Binsbergen, Brandt and Koijen (2012b), documenting the declining term structure of discount rates in equity dividend derivatives, subsequent work has studied the term structure of discount rates in equities in reduced form, by sorting firms by measures of duration and studying the cross-sectional patterns that emerge. For example, Weber (2018), Gonçalves (2019), and Gormsen and Lazarus (2023) all show that low-duration portfolios appear to command higher risk premia (or CAPM alphas) compared to high-duration portfolios, obtaining therefore results that are consistent with the analysis of dividend derivatives.

Given that our model is estimated from equities, but also matches the prices of dividend strips, we can look at duration sorts through the lens of this model, to gain a better understanding of what duration-sorted portfolios are capturing.

The measure of duration typically used in this literature (Macaulay duration) is derived from the bond literature. In that context, it is clear that duration captures a specific risk exposure: exposure to shocks to the level of the yield curve. Applying this notion of duration to equities, however, raises an important issue: equities are exposed to a multiplicity of different shocks, to both dividends and discount rates, both long term and short term. For a general risky asset, Macaulay duration *may* line up with exposure to long-term discount rate shocks (similarly to the case of bonds), but it may also line up with exposure to long-term dividend (cash flow) shocks, or, for example, to a combination of the two.

For risky assets, therefore, duration is economically less informative than looking separately at exposures to the different shocks, which is something that our estimated model can deliver for any asset and for any type of risk. For example, if one is interested in understanding the risk premium associated with long-term discount rate shocks, one can use a model to build a portfolio that is directly exposed to that shock.

To illustrate the issues related to the interpretation of duration-sorted portfolio, we build, using our model, portfolios sorted monthly by duration and by exposure to different types of shocks: level and slope of the term structure of discount rates, and level and slope of the term structure of cash flow.[1] We then check empirically which exposures the duration-sorted portfolios line up with.

Table IA.II reports the correlation between the returns of portfolios sorted on different variables: duration (MD), level and slope of the discount rate curve ($\mathbb{E}(r_l)$ and $\mathbb{E}(r_s)$, respectively), level and slope of the expected dividends curve ($\mathbb{E}(\Delta g_l)$ and $\mathbb{E}(\Delta g_s)$ respectively), exposures to shocks u_{t+1} (denoted as $\beta_1 - \beta_4$), CAPM alphas (α_l and α_s), and on D/P (a value sort).

Two interesting results emerge from this table. First, Macaulay duration is strongly correlated with both the expected return and the dividend term structures. Sorts on Macaulay duration are also highly correlated with sorts on measures of value (D/P) and betas with respect to the first principal component of long-short anomalies (the dominant risk priced in the cross-section – β_2), with correlation coefficients of 0.84 and 0.75, respectively. Therefore, Macaulay duration cannot be clearly interpreted as pure exposure to discount rate shocks, as in the case of bonds.[2]

Second, while (consistent with the existing literature) Macaulay duration is associated with a positive Sharpe ratio (0.37), sorts based on the other variables also produce similar (or larger) Sharpe ratios. In particular, sorts by the level of the term structure of discount rates command a Sharpe ratio of 0.65, and sorts by the level of the expected dividend term structure command a Sharpe ratio of 0.29. Sharpe ratio of the sort on betas with respect to the first PC of anomalies, β_2, is 0.71. Interestingly, Sharpe ratio of the portfolio weighted by the stocks' loadings on the market orthogonalized with respect to the cross-sectional factors yields the highest Sharpe ratio of 1.27.

These results have interesting implications for investors. An investor who wants to tailor her exposure to long-term discount rate or cash flow shocks can do better than sorting on Macaulay duration. The alternative sorts presented in this section offer more targeted and interpretable exposures (to discount rates vs. cash-flow shocks), and achieve higher Sharpe ratios.

[1] After estimating the model, we approximate duration for each stock by taking the average of durations of all portfolios this given stock directly enters.

[2] There are other interesting correlations in this table: for example, portfolios sorted on level and slope shocks are positively correlated with correlation of 0.55, whereas portfolios sorted level and slope dividend growth shocks are highly negatively correlated, -0.9. These patterns reflect a combination of the dynamics of the underlying shocks to dividends and returns, as well as the cross-sectional correlation of exposures to the different shocks.

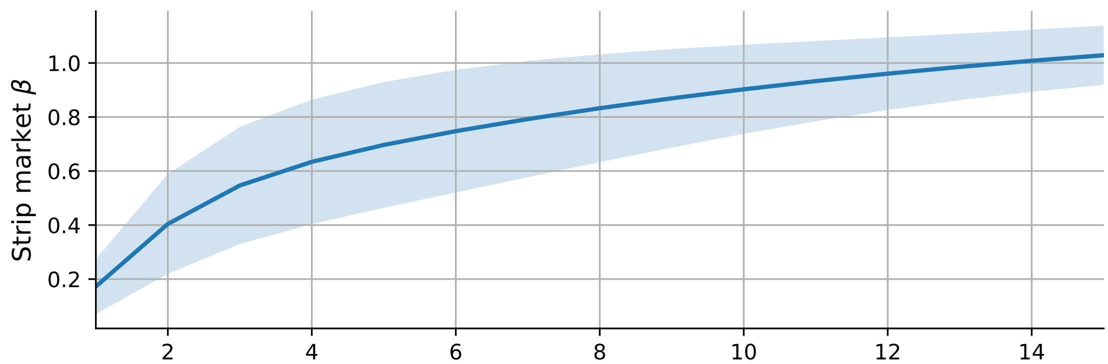


Figure IA.1. Average market beta of dividend strips by maturity. We plot average betas between returns on a dividend strip of any given maturity and the aggregate market index. Shaded areas depict two-standard-deviation bands around point estimates.

In addition, note that the portfolio sorted by the level of expected returns is highly correlated (0.55) with the portfolio sorted by exposure to the second factor in the model (β_2), which carries the Sharpe ratio of 0.71. So these results suggest that an investor who wants to obtain exposure to the second factor, can do so by buying assets sorted on the level of the term structure of discount rates. In fact, one can do even better by sorting on the level of CAPM alphas, α_l, because this sort has an even higher correlation with the second PC, 0.65, and delivers effectively the same Sharpe ratio as the second factor itself, 0.74. Whereas these were obtained within the model, using a long time series, going forward an investor can simply look at the term structure from dividend strips to form portfolios exposed to this highly priced risk factor.

Finally, portfolios like the ones we present in this section can also be used as a moment to evaluate and test asset pricing models: compared to duration-based portfolios, they provide a more powerful test, because they allow the researcher to distinguish between the different types of shocks (long-term vs. short-term, cash flow shocks vs. discount rate shocks).

III. Additional Results

A. Properties of Anomaly Portfolio Returns

Table IA.III shows annualized mean excess returns on the fifty anomaly long-short portfolios as well as the underlying characteristic-sorted tercile portfolios.

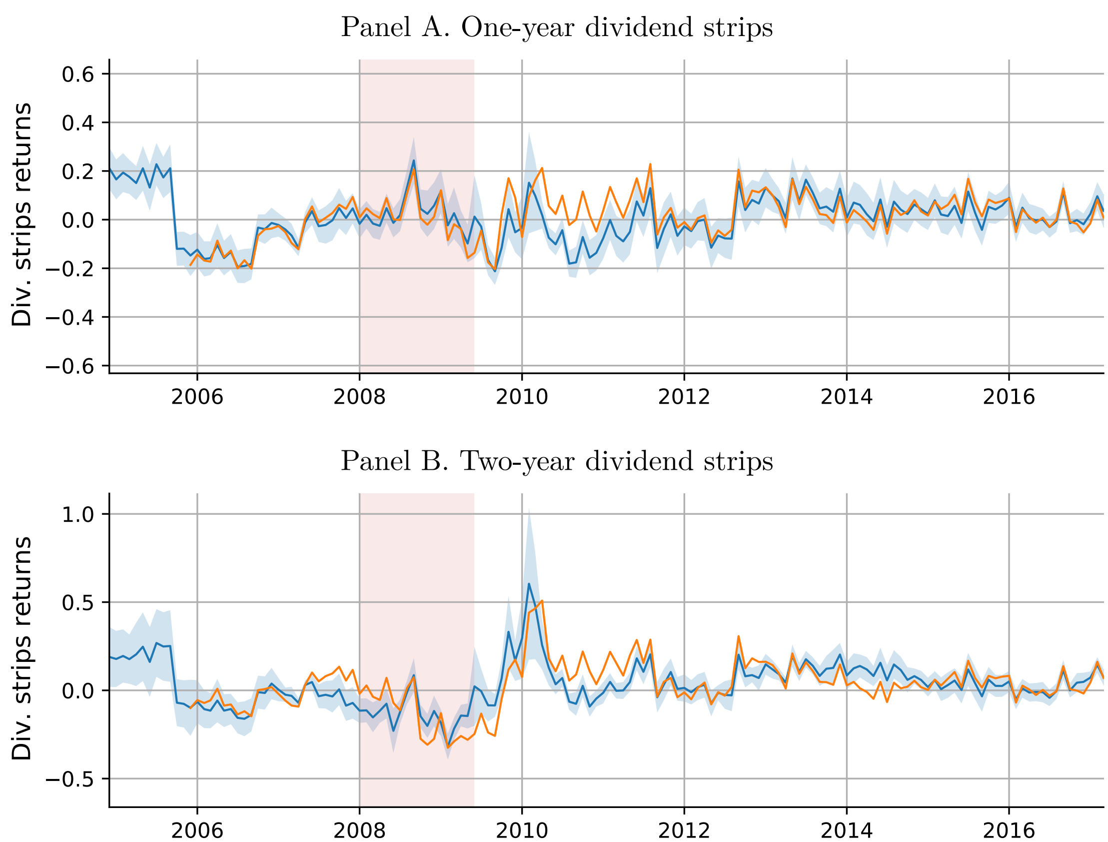


Figure IA.2. One-year returns of the one and two-year dividend strips in the data and in our model. We compare our model-implied returns on dividend strips to their empirical counterparts based on Bansal et al. (2021). Shaded areas depict two-standard-deviation bands around point estimates. Model parameters are estimated using the full sample.

Table IA.I
Model-Implied Term Structures

We simulate five models and compare the model simulations to the data moments: the long-run risk models of Bansal and Yaron (2004) (BY) and Bansal, Kiku and Yaron (2012) (BKY), the habit-formation model of Campbell and Cochrane (1999) (habit), the model of Lettau and Wachter (2007) (LW), and the rare-disaster model of Gabaix (2012) (disaster). Each row corresponds to a different moment. The numbers in the left side of the table correspond to the fraction of simulated samples (from the models) in which the moments are lower than the one we estimate. The numbers in the right side of the table are the one-sided p-value for the hypothesis that the true population moment is higher than the population moment implied by the models; the test uses our point estimate and GMM standard errors. So both tests reports numbers close to zero when the estimated moment is below the model-implied moment, and close to one when the estimated moment is above the model-implied moment. The table reports results for two time periods: post-2004 (top panel) and full sample (bottom panel).

Panel A. Post-2004

	Test 1: via model simulation					Test 2: using SE from data				
Moments	BY	BKY	LW	Habit	Disaster	BY	BKY	LW	Habit	Disaster
EY slope, 7-2	0.16	0.54	0.91	0.96	1.00	0.26	0.46	1.00	0.61	0.76
EY slope, 15-2	0.31	0.60	0.95	0.52	1.00	0.36	0.55	1.00	0.43	0.90
FEY slope, 7-2	0.02	0.00	0.85	0.00	0.49	0.04	0.11	0.99	0.35	0.51
FEY slope, 15-2	0.03	0.00	0.90	0.00	0.71	0.04	0.08	1.00	0.15	0.67
Avg. ret. EY, 2	0.34	0.51	0.02	0.49	0.02	0.29	0.19	0.00	0.48	0.00
Avg. ret. EY, 7	0.50	0.60	0.12	0.93	0.19	0.48	0.50	0.04	0.87	0.13
Avg. ret. EY, 15	0.70	0.66	0.62	0.98	0.51	0.72	0.70	0.62	0.93	0.46
Avg. ret. FEY, 2	0.22	0.45	0.02	0.42	0.01	0.15	0.10	0.00	0.41	0.00
Avg. ret. FEY, 7	0.13	0.41	0.03	0.61	0.03	0.08	0.09	0.01	0.57	0.03
Avg. ret. FEY, 15	0.14	0.06	0.19	0.62	0.09	0.10	0.07	0.18	0.54	0.11
7-2 EY slope on PD	0.99	0.92	0.83	1.00	1.00	0.67	0.94	0.62	0.95	0.89
15-2 EY slope on PD	0.87	0.56	0.35	1.00	1.00	0.59	0.97	0.48	0.99	0.89
7-2 FEY slope on PD	0.97	0.85	0.98	1.00	1.00	0.67	0.98	0.73	0.98	0.94
15-2 FEY slope on PD	0.82	0.51	0.78	1.00	1.00	0.59	0.99	0.65	1.00	0.96

Panel B. Full sample

	Test 1: via model simulation					Test 2: using SE from data				
Moments	BY	BKY	LW	Habit	Disaster	BY	BKY	LW	Habit	Disaster
EY slope, 7-2	0.24	0.63	0.98	0.99	1.00	0.26	0.69	1.00	0.90	0.99
EY slope, 15-2	0.23	0.59	0.99	0.46	1.00	0.23	0.60	1.00	0.35	1.00
FEY slope, 7-2	0.01	0.28	0.97	0.86	0.98	0.01	0.08	1.00	0.55	0.82
FEY slope, 15-2	0.01	0.00	0.97	0.00	0.94	0.00	0.01	1.00	0.05	0.89
Avg. ret. EY, 2	0.51	0.53	0.00	0.80	0.01	0.46	0.20	0.00	0.83	0.00
Avg. ret. EY, 7	0.60	0.60	0.01	1.00	0.12	0.58	0.62	0.00	0.99	0.05
Avg. ret. EY, 15	0.74	0.62	0.61	0.99	0.38	0.74	0.71	0.57	0.99	0.32
Avg. ret. FEY, 2	0.25	0.45	0.00	0.67	0.00	0.13	0.05	0.00	0.68	0.00
Avg. ret. FEY, 7	0.08	0.41	0.00	0.92	0.01	0.03	0.04	0.00	0.83	0.00
Avg. ret. FEY, 15	0.07	0.33	0.08	0.87	0.03	0.07	0.04	0.17	0.72	0.07
7-2 EY slope on PD	0.00	0.40	0.00	1.00	0.75	0.06	0.94	0.03	0.95	0.70
15-2 EY slope on PD	0.00	0.43	0.00	1.00	0.64	0.03	0.97	0.01	1.00	0.69
7-2 FEY slope on PD	0.00	0.33	0.00	1.00	0.65	0.01	0.94	0.02	0.93	0.65
15-2 FEY slope on PD	0.00	0.34	0.00	1.00	0.50	0.00	0.97	0.00	1.00	0.62

Table IA.II
Correlations of Returns and Sharpe Ratios of Sorted Portfolios

The table reports selected columns of the correlation matrix and the annualized Sharpe ratios (last column) of portfolios sorted by Macaulay duration (MD), level and slope of the discount rate curve ($\mathbb{E}(r)$), and level and slope of the expected dividends curve ($\mathbb{E}(g)$).

	Correlations							Sharpe
	MD	$\mathbb{E}[r_l]$	$\mathbb{E}[r_s]$	$\mathbb{E}[\Delta g_l]$	$\mathbb{E}[\Delta g_s]$	β_1	β_2	
MD	-	0.37	0.26	-0.50	0.51	-0.15	0.75	0.37
$\mathbb{E}[r_l]$	0.37	-	0.55	-0.49	0.58	0.13	0.55	0.65
$\mathbb{E}[r_s]$	0.26	0.55	-	-0.27	0.42	0.12	0.30	0.01
$\mathbb{E}[\Delta g_l]$	-0.50	-0.49	-0.27	-	-0.90	0.20	-0.48	0.29
$\mathbb{E}[\Delta g_s]$	0.51	0.58	0.42	-0.90	-	-0.03	0.64	0.03
β_1	-0.15	0.13	0.12	0.20	-0.03	-	0.08	1.27
β_2	0.75	0.55	0.30	-0.48	0.64	0.08	-	0.71
β_3	-0.01	0.36	0.05	-0.16	0.34	0.10	0.61	0.31
β_4	-0.27	-0.02	-0.12	0.28	-0.21	0.14	-0.19	0.81
α_l	0.42	0.94	0.52	-0.55	0.66	0.10	0.65	0.74
α_s	0.42	0.68	0.87	-0.47	0.62	0.08	0.54	0.19
D/P	0.84	0.56	0.29	-0.81	0.78	-0.11	0.68	0.33

Table IA.III
Anomaly portfolios mean excess returns, %, annualized

This table shows mean annualized returns (in %) on each anomaly portfolio long (P3) and short ends (P1) of a sort, respectively, net of risk-free rate. The column L-S lists mean returns on the strategy which is long portfolio 3 and short portfolio 1. Portfolios include all NYSE, AMEX, and NASDAQ firms; however, the breakpoints use only NYSE firms. Monthly data from February 1973 to December 2020.

	Short	Long	L-S		Short	Long	L-S
Accruals	4.3	7.4	3.0	Momentum (12m)	2.2	8.6	6.4
Asset Growth	5.3	8.4	3.1	Momentum (6m)	6.7	6.6	-0.1
Asset Turnover	5.0	6.9	1.9	Momentum-Reversals	5.6	7.1	1.5
Beta Arbitrage	3.9	7.2	3.3	Net Issuance (A)	5.0	7.9	2.9
Cash Flows/Price	5.2	8.1	2.9	Net Issuance (M)	5.2	7.6	2.3
Composite Issuance	4.2	8.0	3.8	Net Operating Assets	4.3	7.2	2.9
Debt Issuance	5.5	7.0	1.5	Price	5.0	5.8	0.9
Dividend Growth	6.2	5.8	-0.4	Return on Assets (A)	4.9	6.1	1.3
Dividend/Price	5.1	6.7	1.6	Return on Assets (Q)	3.0	6.5	3.5
Duration	5.6	7.8	2.1	Return on Book Equity (A)	5.1	6.2	1.1
Earnings/Price	4.5	7.8	3.3	Return on Book Equity (Q)	3.1	6.7	3.6
F-score	5.1	6.6	1.4	Return on Market Equity	2.4	9.5	7.1
Firm's age	5.8	5.4	-0.5	Sales Growth	5.9	6.7	0.8
Gross Margins	5.6	5.8	0.1	Sales/Price	5.0	8.8	3.8
Gross Profitability	4.5	6.8	2.3	Seasonality	4.0	7.9	3.9
Growth in LTNOA	5.9	6.6	0.7	Share Repurchases	5.4	6.9	1.5
Idiosyncratic Volatility	3.7	6.5	2.7	Share Volume	4.8	5.8	1.0
Ind. Mom-Reversals	4.0	9.0	4.9	Short Interest	3.5	6.8	3.2
Industry Momentum	4.0	6.6	2.6	Short-Term Reversals	4.0	7.4	3.4
Industry Rel. Rev. (L.V.)	3.2	10.9	7.7	Size	5.7	6.5	0.8
Industry Rel. Reversals	2.6	9.8	7.2	Value (A)	5.5	7.4	2.0
Investment Growth	5.4	7.4	2.0	Value (M)	5.3	7.3	2.0
Investment/Assets	5.2	7.2	2.0	Value-Momentum	5.7	7.3	1.5
Investment/Capital	5.6	7.0	1.5	Value-Momentum-Prof.	5.9	9.1	3.3
Leverage	5.4	6.3	0.9	Value-Profitablity	4.3	9.1	4.8
Long Run Reversals	6.0	7.3	1.2				

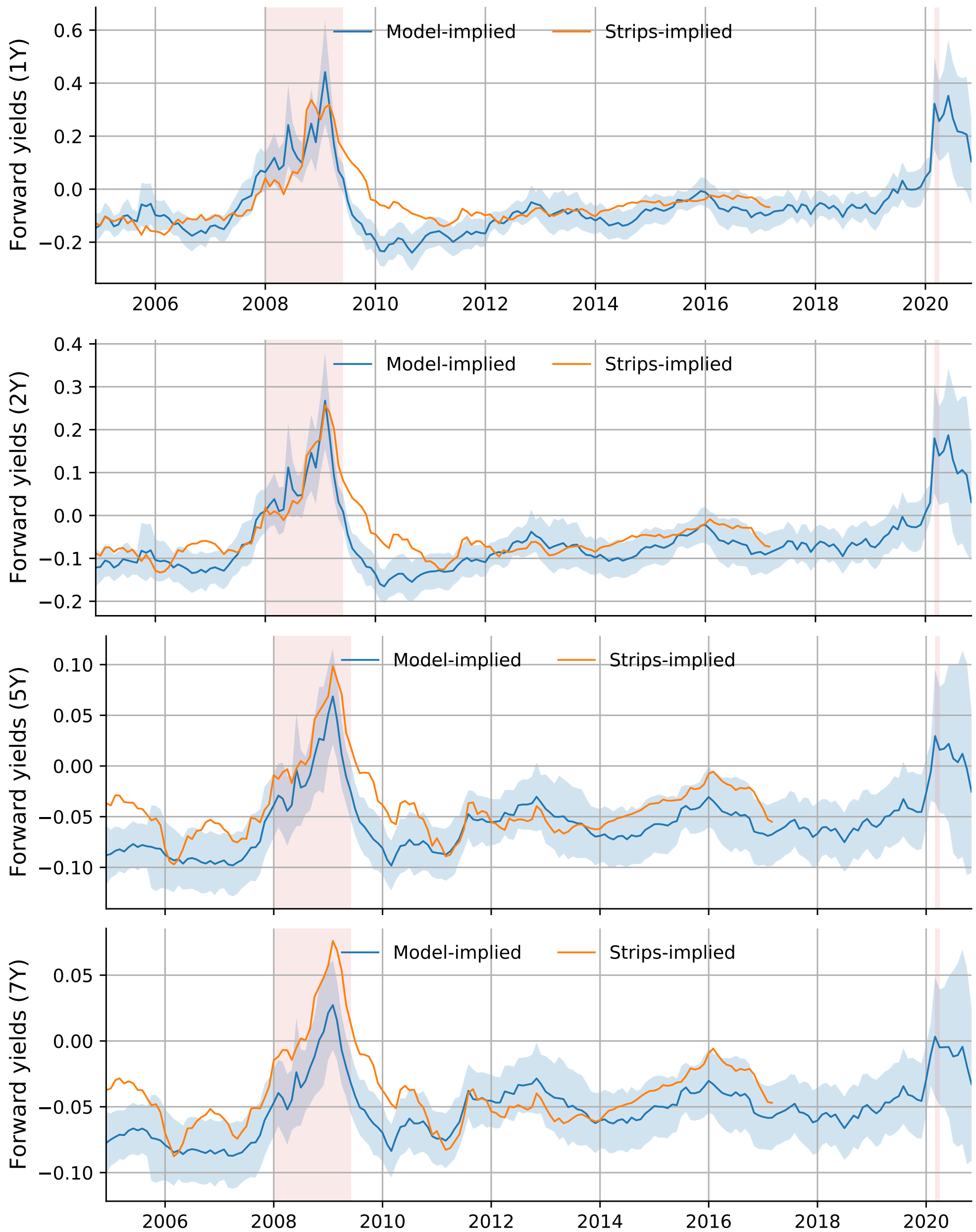


Figure IA.3. Model-implied forward equity yields vs. forward equity yield data (GHZ RPS). We compare our model-implied forward yields to their empirical counterparts in Bansal et al. (2021). Shaded areas depict two-standard-deviation bands around point estimates. Model parameters are estimated using the full sample.

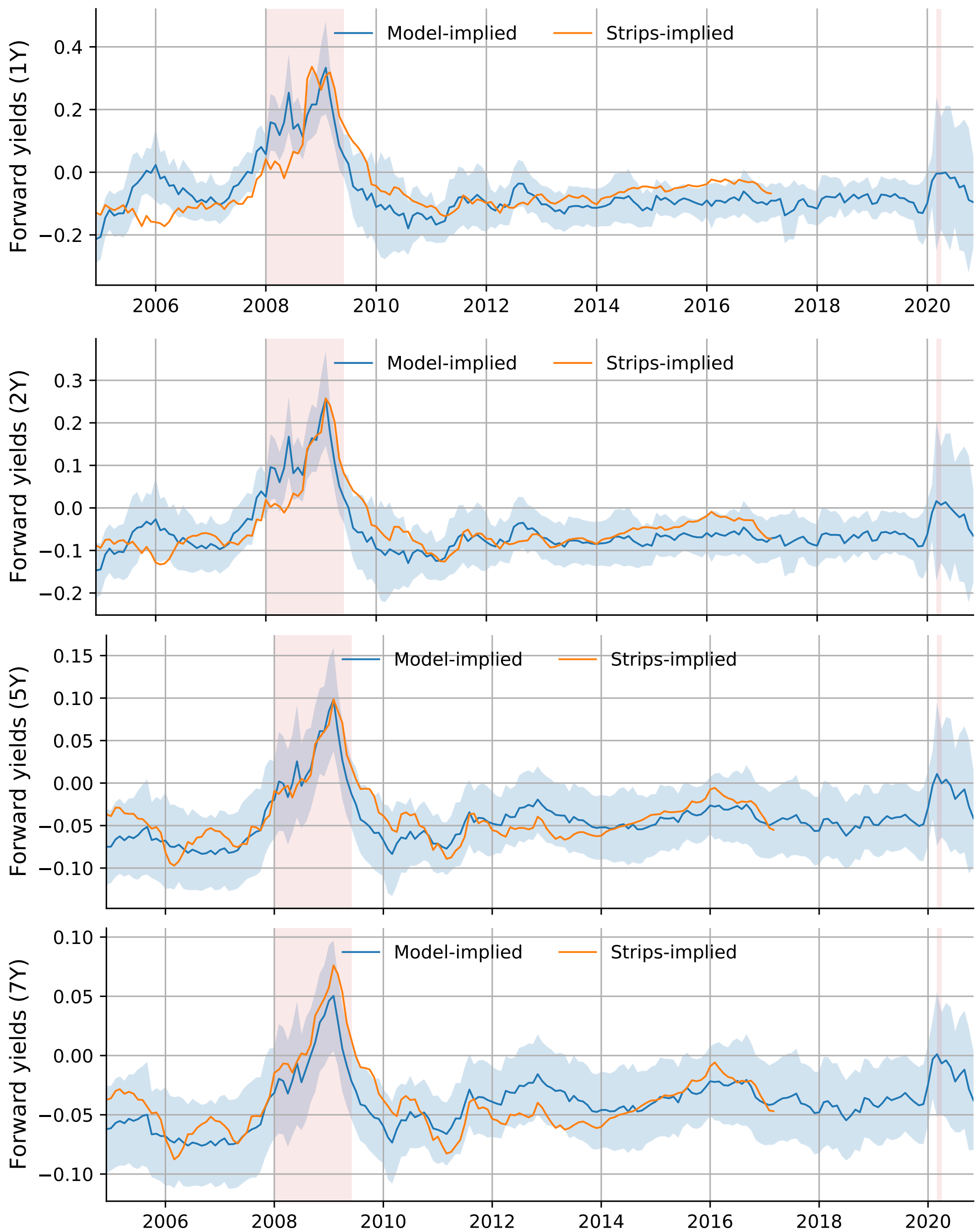


Figure IA.4. Model-implied forward equity yields vs. forward equity yield data (WRDS financial ratios). We compare our model-implied forward yields to their empirical counterparts in Bansal et al. (2021). Shaded areas depict two-standard-deviation bands around point estimates. Model parameters are estimated using the full sample.

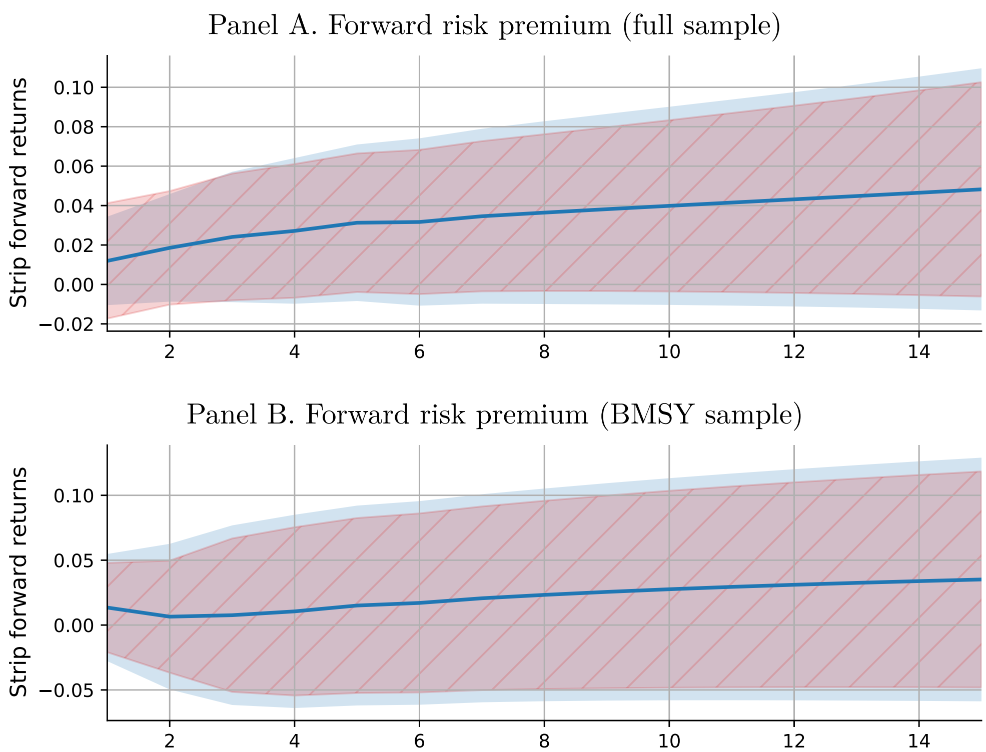
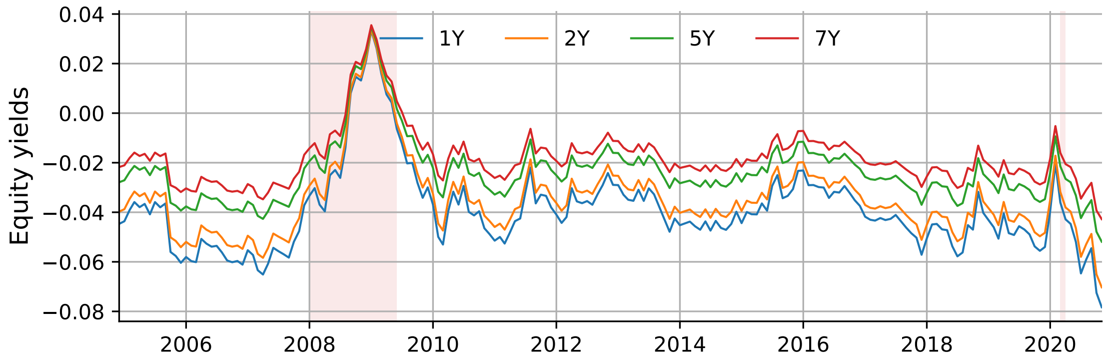


Figure IA.5. Comparison of standard errors for forward risk premia by maturity. The figure compares model-implied GMM two-standard-error bounds which incorporate model parameter and sampling uncertainty (blue) to HAC robust standard error bounds reflecting only sampling uncertainty (red).

Panel A. CAPM



Panel B. Fama-French five-factor + Momentum

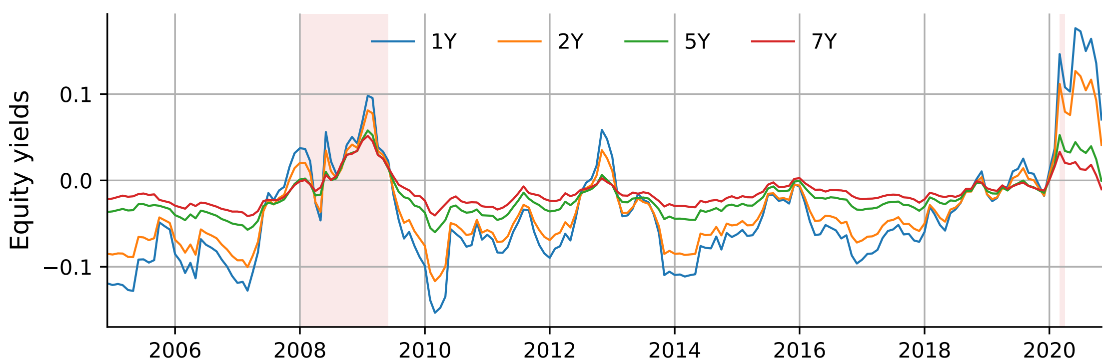


Figure IA.6. Dynamics of benchmark-implied equity strip yields for the aggregate market for different maturities. The figure plots dynamics of yields implied by the CAPM (Panel A) and Fama-French five-factor model supplemented with the momentum factor (Panel B) for maturities one, two, five, and seven years.

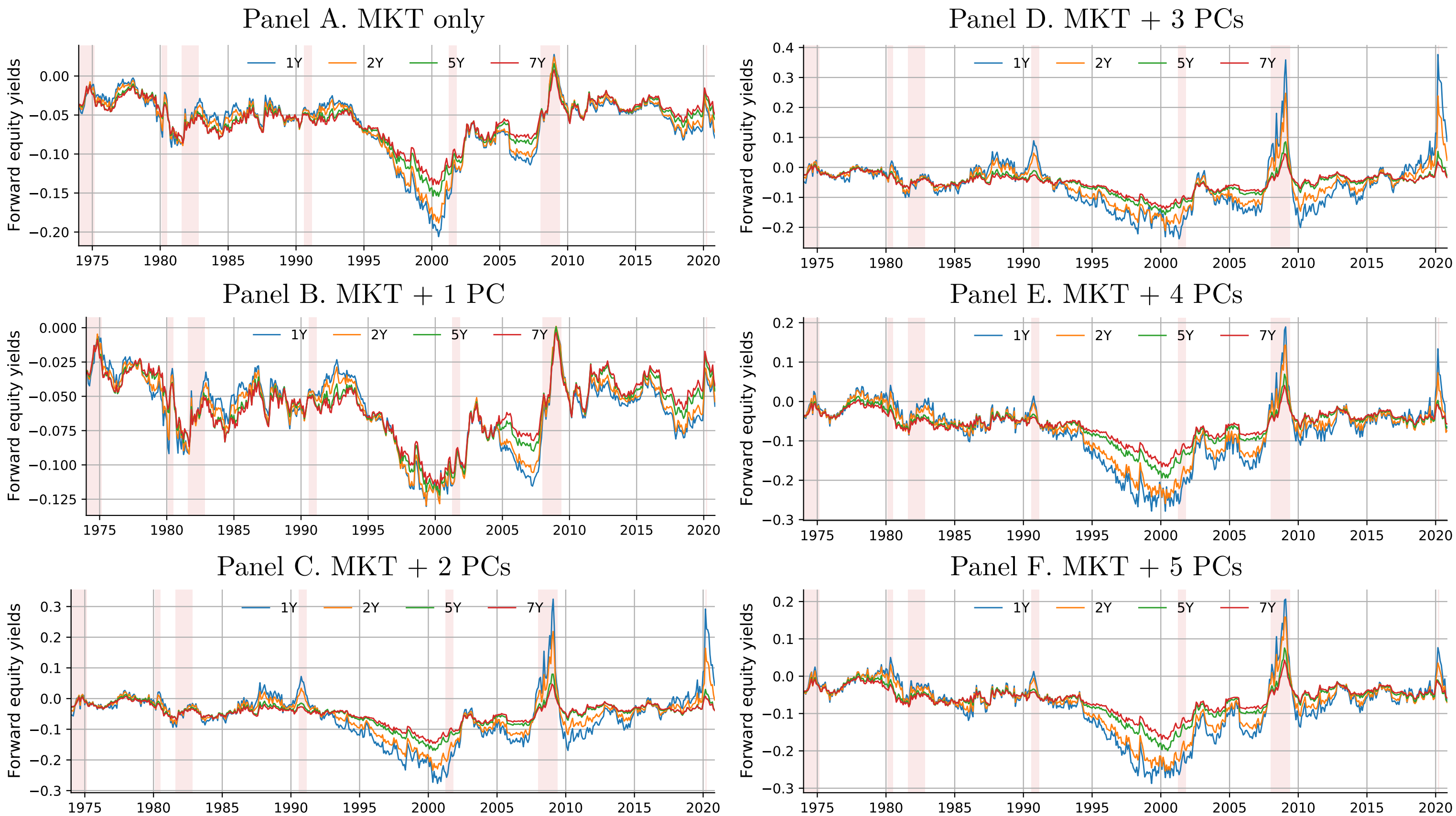
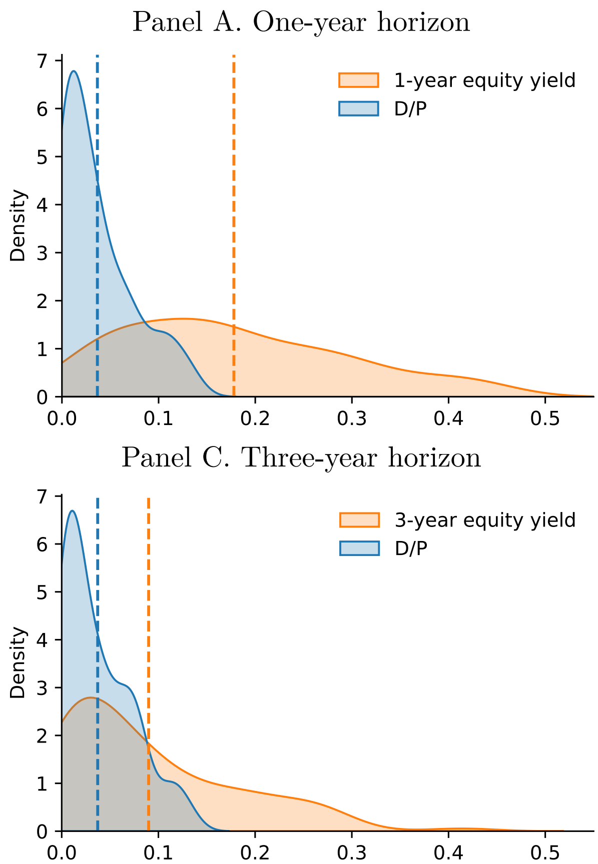


Figure IA.7. Model-implied forward equity yields for models with varying number of PCs. We compare forward equity yields for models fitted using: the market only (Panel A), and the market plus one to five PCs of long-short anomaly returns (Panels B to F).

Table IA.IV
Bootstrap versus Model-Implied Standard Errors

The table reports time-series averages of standard errors (in %) for forward equity yields of maturities of one to seven years. The top row of each panel uses model-implied GMM standard errors. The bottom row reports standard errors based on the nonparametric bootstrap method. Results for the post-2004 (BMSY) sample are reported in Panel A and for the full sample in Panel B.

	1-year	2-year	5-year	7-year
		Panel A. Post-2004 sample		
model	4.37	3.17	1.67	1.21
bootstrap	4.24	3.28	2.08	1.70
		Panel B. Full sample		
model	4.21	3.18	1.88	1.47
bootstrap	4.22	3.50	2.50	2.11



Horizon:	1-year	2-year	3-year	4-year	5-year	6-year	7-year
p-value	0.00	0.00	0.00	0.00	0.10	0.28	0.35

Figure IA.8. Distributions of dividend growth predictability R^2. This figure shows cross-sectional distribution empirical densities of R^2 of 102 portfolios from two regressions of an n-year dividend growth on: (i) the equity's own dividend-to-price (D/P) ratio, and (ii) the model-implied dividend yield on an n-year dividend strip. Panels A to D correspond to $n = 1, 2, 3, 4$, respectively. Dashed lines depict means of their corresponding distributions. The table under the graph reports p-values of a one-sided t-test of the equality of the means of the R^2 distributions.

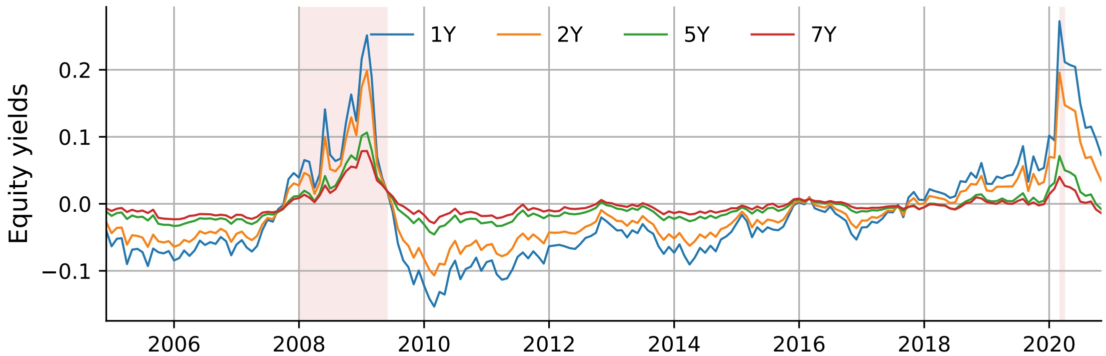


Figure IA.9. Out-of-sample dynamics of model-implied yields in the Bansal et al. (2021) **sample**. Equity yields are constructed using the trailing 12-month dividend. Model parameters are estimated in the 1975–2004 sample and held constant throughout the rest of the sample.

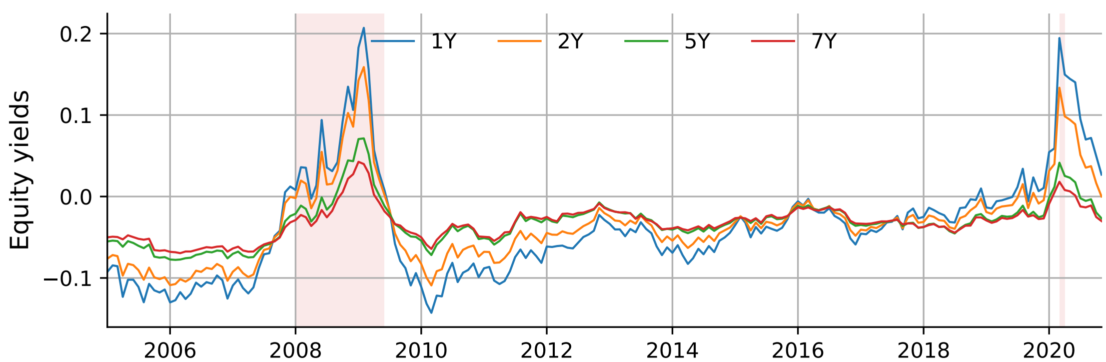


Figure IA.10. Dynamics of model-implied forward equity yields for the aggregate market for different maturities (rolling). The figure plots dynamics of model-implied forward equity yields of maturities 1, 2, 5, and 7 years. Equity yields are constructed using the trailing 12-month dividend.

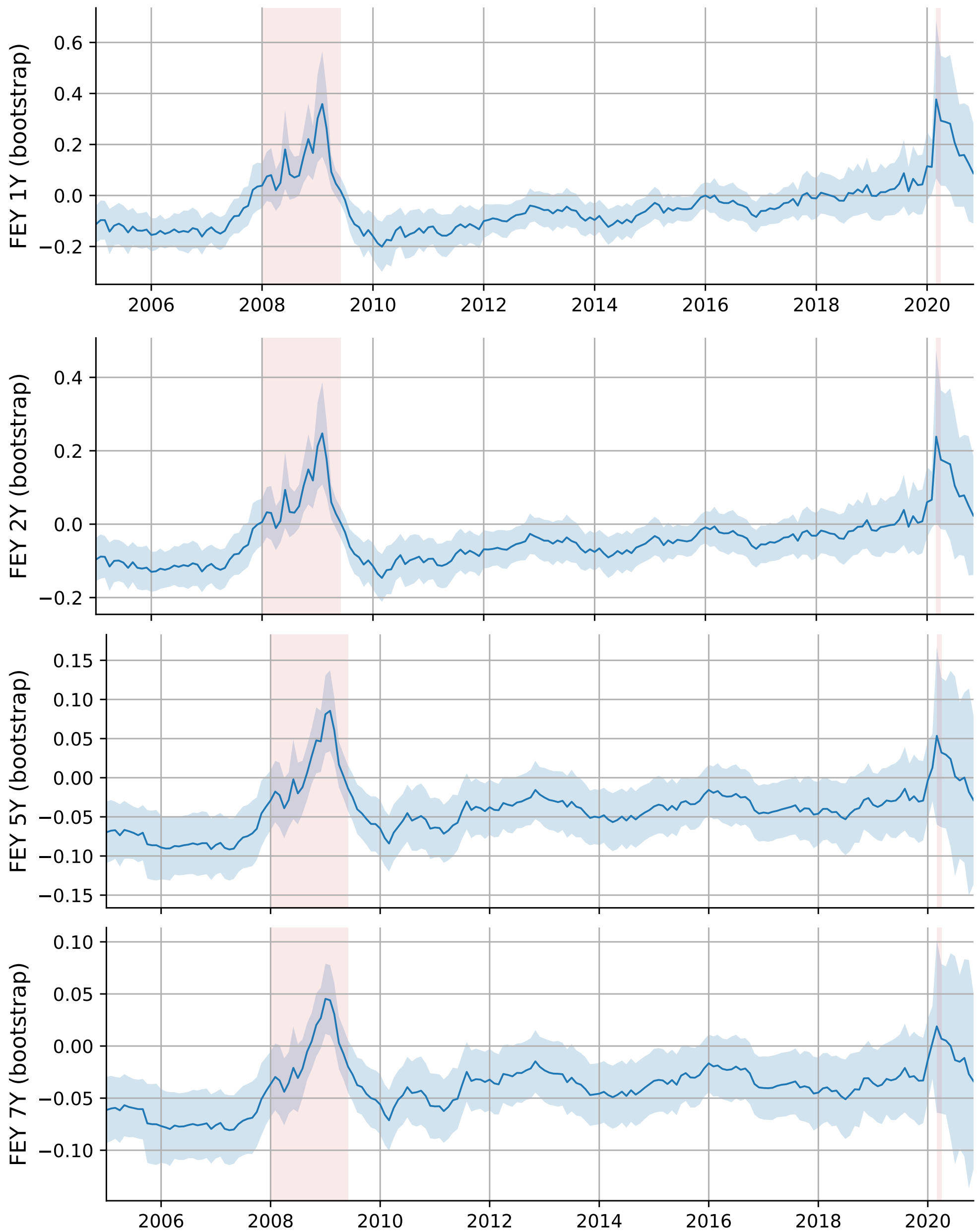


Figure IA.11. Model-implied forward equity yields with bootstrapped standard errors. The figure replicates Figure 3 in the main text but uses non-parametric bootstrap based standard errors instead of model-implied GMM standard errors.

Table IA.V
SDF Spanning of Duration Portfolio Returns

We regress returns on the long-short duration-sorted portfolio on the return factors included in the SDF. *p<0.1; **p<0.05; ***p<0.01.

	Dependent variable
const	0.026***
	(0.005)
MKT	-0.042***
	(0.014)
DP_{MKT}	-1.449***
	(0.235)
PC1	0.218***
	(0.005)
DP_{PC1}	0.234**
	(0.091)
PC2	-0.217***
	(0.006)
DP_{PC2}	-0.114
	(0.129)
PC3	0.078***
	(0.008)
DP_{PC3}	-0.180
	(0.110)
Observations	563
R^2	0.920
Adjusted R^2	0.918
Residual Std. Error	0.040(df = 554)
F Statistic	791.398*** (df = 8.0; 554.0)

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