Internet Appendix

to accompany

A Single-Factor Consumption-Based Asset Pricing Model[1]

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The Internet Appendix provides additional material to support the results in the main body of the study.

A1. Derivation of the Consumption-Based GDA SDF

To derive the consumption-based generalized disappointment aversion stochastic discount factor (GDA SDF), we combine the linear structure of disappointment aversion with the autoregressive (AR(1)) dynamics for consumption growth. The proof consists of two steps. First, we express the price-dividend ratio of the claim on aggregate consumption as a linear function of consumption growth. Second, we solve the GDA SDF in terms of consumption growth.

Price-Dividend Ratio of a Claim on Aggregate Consumption

From Routledge and Zin (2010), when the representative investor has GDA preferences, the optimal consumption-portfolio problem can be written as

$$V_t = \max_{C_t,\ \{w_{i,t}\}_{i=1}^n} \left[(1-\beta)C_t^{\rho} + \beta\mu_t(V_{t+1})^{\rho}\right]^{\frac{1}{\rho}}, \tag{A.1}$$

where $w_{i,t}$ is the portfolio weight for asset i, and μ_t is the GDA certainty equivalent from equation (2) of the main text. For $\alpha = \rho = 1$ in equation (A.1) above and in equation (2) of the main text, the investor's consumption-portfolio problem reads

$$V_t = \max_{C_t,\ \{w_{i,t}\}_{i=1}^n} \left[(1-\beta)C_t + \beta\mu_t(V_{t+1})\right]. \tag{A.2}$$

Due to the linear homogeneity of the objective function, equation (A.1) can be written as

$$J_t W_t = \max_{C_t,\ \{w_{i,t}\}_{i=1}^n} \left[(1-\beta)C_t + \beta\mu_t(J_{t+1}W_{t+1})\right],$$

where J_t is marginal utility and W_t is wealth.

Using the budget constraint $W_{t+1} = (W_t - C_t)R_{W,t+1}$, in which $R_{W,t+1}$ are wealth returns, the objective function becomes

$$J_t W_t = \max_{C_t,\ \{w_{i,t}\}_{i=1}^{n}} \left[(1-\beta)C_t + \beta(W_t - C_t)\mu_t(J_{t+1}R_{W,t+1})\right],$$

and the first order conditions for C_t imply that

$$(1-\beta) - \beta\mu_t(J_{t+1}R_{W,t+1}) = 0. \tag{A.3}$$

Along an optimal consumption path, the following holds:

$$J_t W_t = (1-\beta)C_t + \beta(W_t - C_t)\mu_t(J_{t+1}R_{W,t+1}).$$

Dividing by W_t, we get that

$$J_t = (1-\beta)\Big(\frac{C_t}{W_t}\Big) + \beta\Big(1 - \frac{C_t}{W_t}\Big)\mu_t(J_{t+1}R_{W,t+1}). \tag{A.4}$$

Equations (A.3) and (A.4) imply that

$$J_t = (1-\beta). \tag{A.5}$$

We can substitute the above relation into equation (A.3) to get

$$(1-\beta) - \beta(1-\beta)\mu_t\big(R_{W,t+1}\big) = 0,$$

which simplifies into

$$\beta\mu_t\big(R_{W,t+1}\big) = 1. \tag{A.6}$$

Let $P_{C,t} = W_t - C_t$ be the price for a claim on aggregate consumption. We can use the price-dividend identity for wealth returns

$$R_{W,t+1} = \frac{C_{t+1}}{C_t} \frac{P_{C,t+1}/C_{t+1} + 1}{P_{C,t}/C_t}, \tag{A.7}$$

to recast equation (A.6) as

$$\frac{1}{\beta} \frac{P_{C,t}}{C_t} = \mu_t \Big(\frac{C_{t+1}}{C_t} \Big(\frac{P_{C,t+1}}{C_{t+1}} + 1 \Big) \Big). \tag{A.8}$$

Following Campbell and Shiller (1988), the log-linear approximation for the price-dividend identity of equation (A.7) around the average log price-dividend ratio of the economy $\overline{pc}$ is

$$r_{W,t+1} \approx \kappa_{c,0} + \kappa_{c,1} pc_{t+1} - pc_t + \Delta c_{t+1}, \tag{A.9}$$

where $r_{W,t+1} = log R_{W,t+1}$, $pc_t = log \frac{P_{C,t}}{C_t}$, $\kappa_{c,1} = \frac{e^{\overline{pc}}}{e^{\overline{pc}}+1} < 1$, and $\kappa_{c,0} = log(e^{\overline{pc}} + 1) - \kappa_{c,1}\overline{pc}$.

Next, we conjecture that the log price-dividend ratio is linear in consumption growth:

$$pc_t = \mu_v + \phi_v \Delta c_t,$$

with $1 + \kappa_{c,1}\phi_v > 0$. Using the definition of the GDA certainty equivalent from equation (2) of the main text with $\alpha = \rho = 1$, equation (A.8) becomes

$$\begin{aligned} &- log\beta + pc_t = \\ &log \mathbb{E}_t \Big[\frac{ e^{\Delta c_{t+1} + (\kappa_{c,0} + \kappa_{c,1} pc_{t+1})} \Big(1 + \theta \mathbf{1}\big\{ \frac{C_{t+1}}{C_t} \big(\frac{P_{C,t+1}}{C_{t+1}} + 1 \big) \ \leq \ \delta \mu_t \big(\frac{C_{t+1}}{C_t} \big(\frac{P_{C,t+1}}{C_{t+1}} + 1 \big) \big) \big\} \Big) }{ 1 - \theta(\delta - 1)\mathbf{1}\{\delta > 1\} + \theta\delta\mathbb{E}_t \big[\mathbf{1}\big\{ \frac{C_{t+1}}{C_t} \big(\frac{P_{C,t+1}}{C_{t+1}} + 1 \big) \ \leq \ \delta \mu_t \big(\frac{C_{t+1}}{C_t} \big(\frac{P_{C,t+1}}{C_{t+1}} + 1 \big) \big) \big\} \big] } \Big]. \end{aligned} \tag{A.10}$$

We can pin down the GDA certainty equivalent μ_t from equation (A.8), and use the log-linearized price-dividend identity in equation (A.9) to simplify the expression inside the disappointment indicator above. Further, the partial moments property for a standard normal variable $\epsilon_{c,t+1}$ and real numbers $\left[\kappa_{c,1}, \phi_v, \phi_c, \sigma_c, d_2\right]$ implies that

$$\mathbb{E}_t\left[e^{(\kappa_{c,1}\phi_v+1)\sqrt{1-\phi_c^2}\sigma_c\epsilon_{c,t+1}}\mathbf{1}\{\epsilon_{c,t+1} \ \leq \ d_2\}\right] = e^{\frac{1}{2}\left((\kappa_{c,1}\phi_v+1)\sqrt{1-\phi_c^2}\sigma_c\right)^2} N\left(d_2 - \left(\kappa_{c,1}\phi_v + 1\right)\sqrt{1-\phi_c^2}\sigma_c\right).$$

Using the above result, the conjectures that $pc_t = \mu_v + \phi_v \Delta c_t$ with $1 + \kappa_{c,1}\phi_v > 0$, and the AR(1) dynamics for consumption growth, equation (A.10) becomes

$$\begin{aligned} \text{(A.11)} \quad & -log\beta + \mu_v + \phi_v \Delta c_t = \mu_c(1-\phi_c) + \phi_c \Delta c_t + \kappa_{c,0} + \kappa_{c,1}\mu_v \\ & +\kappa_{c,1}\phi_v\mu_c(1-\phi_c) + \kappa_{c,1}\phi_v\phi_c\Delta c_t + log\Big(1 + \theta N\big(d_2 - (\kappa_{c,1}\phi_v + 1)\sqrt{1-\phi_c^2}\sigma_c\big)\Big) \\ & -log\Big(1 - \theta(\delta - 1)\mathbf{1}\{\delta > 1\} + \theta\delta N(d_2)\Big) + \frac{1}{2}\big((\kappa_{c,1}\phi_v + 1)\sqrt{1-\phi_c^2}\sigma_c\big)^2, \end{aligned}$$

where $N()$ is the standard normal c.d.f., and d_2 is the threshold for disappointment given by

$$\text{(A.12)} \quad d_2 = \frac{log\delta - log\beta + \mu_v + \phi_v\Delta c_t - \kappa_{c,0} - \kappa_{c,1}\mu_v - (\kappa_{c,1}\phi_v + 1)(\mu_c(1-\phi_c) + \phi_c\Delta c_t)}{(\kappa_{c,1}\phi_v + 1)\sqrt{1-\phi_c^2}\sigma_c}.$$

We can now use the method of undetermined coefficients to find the values for μ_v and ϕ_v. First, we collect consumption growth terms ignoring the terms $log\Big(1 + \theta N\big(d_2 - (\kappa_{c,1}\phi_v + 1)\sqrt{1-\phi_c^2}\sigma_c\big)\Big)$ and $log\Big(1-\theta(\delta-1)\mathbf{1}\{\delta > 1\}+\theta\delta N(d_2)\Big)$ in equation (A.11). Then, we solve for ϕ_v to get

$$\text{(A.13)} \qquad \phi_v = \frac{\phi_c}{1 - \kappa_{c,1}\phi_c}.$$

For the above value of ϕ_v, all Δc_t terms in equation (A.12) vanish, and d_2 becomes a function of constant terms alone. Also, for the above value of ϕ_v and stationary consumption growth process, that is, $-1 < \phi_c < 1$, our conjecture $1+\kappa_{c,1}\phi_v > 0$ is satisfied since $\kappa_{c,1} = \frac{e^{\overline{pc}}}{1+e^{\overline{pc}}} < 1$.

Collecting constant terms in equation (A.11), the solution for μ_v is given by

$$\mu_v = \frac{1}{1-\kappa_{c,1}}\Big[log\beta + \kappa_{c,0} + (\kappa_{c,1}\phi_v + 1)\mu_c(1-\phi_c) + \frac{1}{2}\big((\kappa_{c,1}\phi_v+1)\sqrt{1-\phi_c^2}\sigma_c\big)^2$$
$$+log\Big(1+\theta N\big(d_2 - (\kappa_{c,1}\phi_v+1)\sqrt{1-\phi_c^2}\sigma_c\big)\Big) - log\Big(1-\theta(\delta-1)\mathbf{1}\{\delta>1\} + \theta\delta N(d_2)\Big)\Big],$$

and d_2 in equation (A.12) becomes the solution to the fixed point problem

$$d_2 = \frac{log\delta}{(\kappa_{c,1}\phi_v+1)\sqrt{1-\phi_c^2}\sigma_c} + \frac{1}{2}(\kappa_{c,1}\phi_v+1)\sqrt{1-\phi_c^2}\sigma_c + \frac{log\Big(\frac{1+\theta N\big(d_2-(\kappa_{c,1}\phi_v+1)\sqrt{1-\phi_c^2}\sigma_c\big)}{1-\theta(\delta-1)\mathbf{1}\{\delta>1\}+\theta\delta N(d_2)}\Big)}{(\kappa_{c,1}\phi_v+1)\sqrt{1-\phi_c^2}\sigma_c}.$$

Using the solution for ϕ_v in equation (A.13), the fixed point problem for d_2 becomes

$$d_2 = \frac{(1-\phi_c\kappa_{c,1})log\delta}{\sqrt{1-\phi_c^2}\sigma_c} + \frac{1}{2}\frac{1}{1-\kappa_{c,1}\phi_c}\sqrt{1-\phi_c^2}\sigma_c + \frac{log\Big(\frac{1+\theta N\big(d_2-\frac{1}{1-\kappa_{c,1}\phi_c}\sqrt{1-\phi_c^2}\sigma_c\big)}{1-\theta(\delta-1)\mathbf{1}\{\delta>1\}+\theta\delta N(d_2)}\Big)}{\frac{1}{1-\kappa_{c,1}\phi_c}\sqrt{1-\phi_c^2}\sigma_c}, \tag{A.14}$$

and we can rewrite μ_v as

$$\mu_v = \frac{1}{1-\kappa_{1,c}}\big[log\beta + \kappa_{0,c} + (\kappa_{1,c}\phi_v+1)\mu_c(1-\phi_c) + d_2(\kappa_{1,c}\phi_v+1)\sqrt{1-\phi_c^2}\sigma_c - log\delta\big].$$

Explicit Solutions for the GDA SDF

From Routledge and Zin (2010), the GDA stochastic discount factor with $\alpha = \rho = 1$ can be written as

$$M_{t+1}^{GDA} = \beta\frac{1+\theta\mathbf{1}\big\{\beta R_{W,t+1} \le \delta\big\}}{\mathbb{E}_t\big[1-\theta(\delta-1)\mathbf{1}\{\delta>1\} + \theta\delta\mathbf{1}\big\{\beta R_{W,t+1}\le\delta\big\}\big]}.$$

Using the log-linearized price-dividend identity for returns on total wealth (equation (A.9)), the GDA stochastic discount factor can be further expressed as

$$M_{t+1}^{GDA} = \frac{\beta\big(1+\theta\mathbf{1}\{log\beta+\kappa_{c,0}+\kappa_{c,1}\mu_v+(\kappa_{c,1}\phi_v+1)\Delta c_{t+1}-(\mu_v+\phi_v\Delta c_t)\leq log\delta\}\big)}{1-\theta(\delta-1)\mathbf{1}\{\delta>1\}+\theta\delta\mathbb{E}_t[\mathbf{1}\{log\beta+\kappa_{c,0}+\kappa_{c,1}\mu_v+(\phi_v\kappa_{c,1}+1)\Delta c_{t+1}-(\mu_v+\phi_v\Delta c_t)\leq log\delta\}]}.$$

Finally, using the solutions for ϕ_v and μ_v, we conclude that

$$M_{t+1}^{GDA} = \beta\frac{1+\theta\mathbf{1}\{\Delta c_{t+1}\leq\mu_c(1-\phi_c)+\phi_c\Delta c_t+d_2\sqrt{1-\phi_c^2}\sigma_c\}}{1-\theta(\delta-1)\mathbf{1}\{\delta>1\}+\theta\delta\mathbb{E}_t[\mathbf{1}\{\Delta c_{t+1}\leq\mu_c(1-\phi_c)+\phi_c\Delta c_t+d_2\sqrt{1-\phi_c^2}\sigma_c\}]}.$$

Disappointment threshold for the DA-I SDF with $\delta = 1$

When the GDA parameter δ is set equal to 1, as in the original disappointment aversion (DA) framework of Gul (1991), then from equation (A.14), the disappointment threshold d_2^{DA-I} becomes

$$\text{(A.15)}\qquad d_2^{DA-I} = \frac{1}{2}\frac{1}{1-\kappa_{c,1}\phi_c}\sqrt{1-\phi_c^2}\sigma_c + \frac{log\left(\frac{1+\theta N\left(d_2^{DA-I}-\frac{1}{1-\kappa_{c,1}\phi_c}\sqrt{1-\phi_c^2}\sigma_c\right)}{1+\theta N(d_2^{DA-I})}\right)}{\frac{1}{1-\kappa_{c,1}\phi_c}\sqrt{1-\phi_c^2}\sigma_c}.$$

In Section VI of the paper, we estimate the Disappointment Aversion-Indicator (DA-I) model and back out the DA disappointment threshold d_2^{DA-I}. To do this, we need to specify the value of the log-linearization constant $\kappa_{c,1}$ in the price-dividend ratio of the consumption claim. Because the consumption claim is not a traded asset, we specify the value of $\kappa_{c,1} = e^{\overline{pc}}/(1+e^{\overline{pc}})$ by setting the average log price-dividend ratio of the economy $\overline{pc}$ equal to 3.32, which is the average log price-dividend ratio of the S&P500 index over the 1933-2012 period from Robert Shiller's webpage. For $\overline{pc}$ equal to 3.32, $\kappa_{c,1}$ is 0.96, which is consistent with the values used in Campbell and Shiller (1988) and Basal and Yaron (2004). The choice of this parameter may affect the magnitude of the estimated DA coefficient but not the empirical fit of the DA-I model.

A2. Great Depression and the GDA-I Model

Our benchmark analysis in the main body of the study utilizes the post-Great Depression sample period, 1933-2012. However, aggregate consumption growth data are available from the Bureau of Economic Analysis (BEA) since 1930, i.e., for three more years during the Great Depression. The reason why our benchmark analysis uses a post-Great Depression sample period is to account for a potential structural break in the consumption growth process.

To examine this issue, we use consumption growth data for the period 1891-2009 from Robert Shiller's website, and conduct formal tests for a structural break in the consumption growth process in 1933. The time series of Shiller's real per capita consumption growth rates is plotted in Panel A of Figure A1. A visual inspection of this graph reveals that the average consumption growth rate has been higher post-1933. Even more importantly for our Generalized Disappointment Aversion-Indicator (GDA-I) model, consumption growth has been much less volatile in the post-1933 period. In addition, Panel B of Figure A1 fits an AR(1) model for the consumption growth process pre- and post-1933, respectively. Interestingly, we find that the autoregressive coefficient estimate changes signs across the two sample periods.

Table A1 reports these sample consumption growth moments pre- and post-1933, confirming the conclusions from the visual inspection of Figure A1. We also formally test for a structural break in 1933, in the mean, standard deviation, and autocorrelation of consumption growth, respectively. The *p*-values from the corresponding tests reported in Table A1 indicate that there is indeed a structural break in the standard deviation of the consumption growth process, supporting our choice to begin our sample period in 1933.

Nevertheless, in this section, we repeat our benchmark analysis using the entire sample period for which consumption growth data are available from the BEA. To this end, we re-examine the performance of the competing pricing models for the 25 size/book-to-market

(25 SIZE/BM) portfolios during the period 1930-2012, and for the 10 long-term reversal (10 LTR) portfolios since 1931, i.e., when their returns become available on Kenneth French's website.[1] The corresponding results for the extended sample period are shown in Table A2.

Comparing the results in Table A2 with those reported in Table 2 in the main body of the study, we derive the following set of conclusions. First, the GDA-I model can successfully explain the level and cross-sectional variation in equity portfolio premia, but its goodness of fit is slightly worse relative to the one in the post-1933 sample period. Moreover, the outperformance of the GDA-I model relative to the competing single-factor models becomes even more impressive in the extended sample period. Second, the DA coefficient estimate is somewhat lower, but of the same order of magnitude as the one in the post-1933 sample period. In fact, including the Great Depression years, which are associated with huge losses across all portfolios, allows us to explain their (lower) premia in the extended sample period with an even lower price of disappointment risk. To the contrary, the second-order risk aversion coefficient estimated from the Consumption-based Capital Asset Pricing Model (CCAPM) remains implausibly high.

Third, the disappointment threshold coefficient estimate maintains its natural economic interpretation but it is now smaller in absolute value relative to the post-1933 sample period results. This is because the inclusion of the Great Depression years considerably increases the annual consumption growth volatility from 1.59% in the benchmark 1933-2012 sample period to 2.05% in the 1930-2012 period (and 1.98% in the 1931-2012 period). Hence, a lower (in absolute value) disappointment threshold coefficient d_2 is sufficient to generate the necessary disappointment events that explain portfolio premia.[2] Finally, the inclusion of these Great Depression years dramatically changes the factor coefficient estimates of the Fama-French model, undermining their interpretation in a consistent way.

Concluding, even though our benchmark analysis examines the post-Great Depression

[1]The 25 size/operating profitability (25 SIZE/OP) and the 25 size/investment (25 SIZE/INV) portfolios are available since 1964. Similarly, the Robust-minus-Weak (RMW) and Conservative-minus-Aggressive (CMA) factors for the five-factor Fama-French model are available since 1964.

[2]See the definition of the disappointment threshold in equation (5) in the main body of the study.

period due to concerns for a structural break in the consumption growth process in 1933, the results in Table A2 confirm that the performance of the GDA-I model would not be materially affected if one alternatively uses the entire period for which aggregate consumption data are available from the BEA.

A3. Two-Stage GMM Estimation

Our benchmark analysis in the main body of the study relies on a first-stage Generalized Method of Moments (GMM) estimation approach, using an identity weighting matrix for the moment conditions of the excess portfolio returns. As suggested by Liu, Whited, and Zhang (2009) and Cochrane ((2001), pp. 193-194), the identity weighting matrix preserves the economic content of the GMM system. Particularly for the GDA-I model, where we also fit the empirical consumption growth moments, the corresponding diagonal elements of the weighting matrix are large numbers (10^8) to account for the different scale of these moments (see Cochrane ((2001), p. 194)). Finally, this benchmark estimation approach is also motivated by the argument that, in small samples, a pre-specified weighting matrix is more likely to address the issue of a noisy variance estimator (see Hayashi ((2000), p. 215)).

In this section, we alternatively use a two-stage GMM estimation approach to address the potential concern that our benchmark results may be driven by the choice of the weighting matrix. In particular, the second-stage weighting matrix is the diagonal of the optimal weighting matrix, i.e., the diagonal of the inverse of the spectral density matrix. This weighting matrix also takes into account the scaling differences between consumption growth moments and excess portfolio returns in the augmented GMM system for the GDA-I model.

The estimation results for the GDA-I model in Table A3 are very similar to the ones reported in Table 2 in the main body of the study. In fact, the pricing ability of the GDA-I model with respect to the four sets of portfolios remains almost identical. Moreover, the DA and disappointment threshold coefficient estimates are also very similar to the ones derived using a first-stage GMM estimation approach. The GDA-I model still outperforms the competing single-factor pricing models, whereas its goodness of fit is at least as good as the one of the multi-factor Fama-French models. In conclusion, these results convincingly show that the successful performance of the GDA-I model reported in the main body of the study is not driven by the choice of a pre-specified GMM weighting matrix.

A4. Recursive Estimation Approach

The benchmark results presented in the main body of the study are based on the full sample estimation of the GDA-I model. In this section, we alternatively follow a recursive estimation approach. In particular, we recursively estimate the GMM system specified in equation (13) of the paper, starting from an initial window of 30 years. As a result, starting in 1963 (1994 for the profitability and investment portfolios), we recursively estimate μ_c, σ_c, ϕ_c, $\tilde{\theta}$, and d_2, obtaining a new set of disappointment events and the corresponding model fit based on the available filtration every year. This recursive estimation approach basically examines the stability of the benchmark results for different sample periods, using "real-time" information.

The results from this recursive estimation approach are reported in Table A4. In particular, we report the time-series averages of the recursively estimated $\tilde{\theta}$ and d_2 coefficients, and the goodness of fit statistics. Overall, these results are in line with the full-sample estimates reported in Table 2 of the paper. The average $\tilde{\theta}$ coefficient takes values between 3 and 4.6 across the various sets of portfolios, confirming its subsample stability, even when quite short sample periods are considered. Equally importantly, the average values for the disappointment threshold coefficient d_2 are also close to their corresponding full sample estimates. Moreover, the average R^2s of the model are quite high and the root-mean-square errors (RMSEs) are quite low, if one takes into account that these average values also reflect the initial short sample periods, which omit a considerable number of subsequent disappointment events. In fact, with the exception of the 25 SIZE/INV portfolios, the R^2 of the GDA-I model is never lower than 66%, whereas its maximum level surpasses the full sample values reported in Table 2 of the paper.

Overall, these results point to the conclusion that by estimating the GDA-I model using information available in real time, an econometrician would have found this model performing very well already in much earlier periods. This finding also addresses the potential concern that the success of the GDA-I model may be solely driven by the disappointment events that occurred during the recent crisis period.

A5. Monthly Returns

In our benchmark analysis, the sample frequency is annual and disappointment events last for a year. However, discrete time models provide no guideline as to how often investors should evaluate their wealth and adjust their consumption. If an optimal consumption rebalancing frequency exists, then it will undoubtedly affect the empirical performance of consumption-based asset pricing models. To address this concern, this section examines the performance of the GDA-I model at the monthly frequency.

We define monthly disappointment events as follows: if year t is a disappointment year, then all months in year t are disappointment months; if year t is not a disappointment year, then none of the months in year t are disappointment months. Arguably, this measure of monthly disappointment events is rather coarse, and hence the reported results in this section can be viewed as the most conservative estimates of the empirical fit of the GDA-I model at the monthly frequency.

A5.1. Model Fit

Table A5 reports the GMM results for the examined asset pricing models and sets of equity portfolios at the monthly frequency. Overall, these results are consistent with the ones reported in Table 2 of the paper for the annual frequency. Specifically, the fit of the single-factor GDA-I model is superior to those of the CCAPM, the Capital Asset Pricing Model (CAPM), and the National Bureau of Economic Research (NBER) recession indicator across all sets of portfolios. In fact, the CAPM and CCAPM perform very poorly at the monthly frequency.

Moreover, the goodness of fit of the GDA-I model is comparable to the fit of the Fama-French three- and five-factor models. Interestingly, the GDA-I model yields the lowest RMSE and the highest R^2 for the 25 SIZE/BM portfolios across all models, including the five-factor Fama-French specification, while it also outperforms the Fama-French three-factor model across the 25 SIZE/OP portfolios. It should be noted that the flexibility of the Fama-French multi-factor models to fit each cross-section comes again at the expense of yielding strikingly different estimates for the factor coefficients across these sets of portfolios.

The goodness of fit for the various models is illustrated by the scatterplots of sample average versus model-implied portfolio premia in Figure A2. These scatterplots show that the GDA-I model can align fitted with sample premia as accurately as the Fama-French three-factor model across all portfolio sorts. On the other hand, the CCAPM cannot price any of these sets of portfolios at the monthly frequency.

A5.2. Prices of Risk

In addition to model fit, Table A5 also reports the corresponding estimated prices of risk. At the monthly frequency, the estimates of the DA coefficient $\tilde{\theta}$ in the linear GDA-I model range from 3.1 to 3.9. These estimates are very similar to the ones derived from the annual sample, which are reported in Table 2 of the paper. In contrast, the second-order risk aversion coefficients implied by the linearized CCAPM in the monthly sample are very different from the ones derived from annual returns. In particular, the risk aversion estimates reported in Table A5 range from 226 to 283, and they are up to four times larger than the corresponding annual estimates.

These results confirm that the equity premium puzzle becomes even more pronounced if one employs monthly returns, since the representative investor's implied utility function becomes extraordinarily concave. In sum, the prices of risk reported in Table A5 indicate that, unlike the second-order risk aversion parameter, the DA coefficient exhibits the desirable property of being stable across frequencies.

A6. Quarterly Returns

Our benchmark analysis in the main paper utilizes annual portfolio returns, while in the previous section we presented results for the GDA-I SDF at the monthly frequency. For completeness, in this section, we alternatively test the performance of the various asset pricing models using quarterly portfolio returns and consumption growth rates. In particular, for the GDA-I model we estimate quarterly disappointment consumption events using the augmented GMM system specified in equation (13) in the main body of the study. The corresponding results are shown in Table A6. Comparing the results in Table A6 with the corresponding results from annual and monthly portfolio returns (Tables 2 and A5, respectively), we derive the following set of conclusions.

First, the GDA-I model maintains its very good pricing ability at the quarterly frequency. The only exception is the cross-section of the 25 SIZE/INV portfolios. Second, the GDA-I model clearly outperforms the competing single-factor pricing models across all four sets of equity portfolios. In fact, the fit of the CCAPM and the CAPM is quite poor, yielding pricing errors that are almost twice as high as the ones of the GDA-I model. Third, the DA coefficient estimates are of the same order of magnitude and close to the ones derived from annual and monthly portfolio returns. In other words, the GDA-I model exhibits the desirable property of fitting various portfolio cross-sections with a price of disappointment risk that is stable across different sample frequencies. To the contrary, the second-order risk aversion coefficient estimates from the CCAPM are typically three times higher than the corresponding estimates from annual portfolio returns.

Fourth, the disappointment threshold coefficient estimates maintain their intuitive economic interpretation, even though their magnitudes are not directly comparable to the ones estimated at the annual frequency because they correspond to the standard deviation of quarterly consumption growth. In the full sample period, we find that a disappointment consumption quarter occurs when consumption growth falls approximately one standard deviation below its conditional mean. Finally, the goodness of fit of the multi-factor Fama-French models is again associated with factor coefficient estimates that are substantially different across the various portfolio cross-sections and are typically inconsistent with the corresponding estimates derived at the annual or monthly frequencies.

To sum up, the GDA-I model can sufficiently explain the level and cross-sectional variation in equity premia, even when we directly estimate quarterly disappointment consumption events. This goodness of fit is quite remarkable if one takes into account that quarterly consumption data are quite noisy, a feature that is reflected in the poor fit of the traditional CCAPM.

A7. Joint Cross-Section of Equity Portfolios

In this section, we alternatively estimate the augmented GMM system from equation (13) of the paper using the joint set of 85 portfolios (25 SIZE/BM, 25 SIZE/INV, 25 SIZE/OP, and 10 LTR portfolios) for the post-1964 period. As a result, we estimate a unique set of disappointment events (equivalently, $\tilde{\theta}$ and d_2 coefficients) from this joint cross-section of equity portfolios. In this way, we address the potential concern that the goodness of fit of the GDA-I model in our benchmark results may be driven by identifying a different set of disappointment events to fit each cross-section separately. For comparison, we also use this joint cross-section to assess the performance of the competing asset pricing models.

The results from this exercise are reported in Table A7 for the annual (Panel A) and monthly (Panel B) sample, respectively. We find that the estimates for the $\tilde{\theta}$ and d_2 parameters from the joint cross-section are very similar to the ones reported in Table 2 of the paper for the 25 SIZE/INV and 25 SIZE/OP portfolios during the post-1964 period. This finding confirms the stability of these parameter estimates across alternative cross-sections, and indicates that the implied price of disappointment risk is very close to the one derived from the full sample period. To the contrary, the second-order risk aversion coefficient implied by the CCAPM is higher in the post-1964 period, undermining further the validity of this model, especially at the monthly frequency.

Equally importantly, our single-factor GDA-I model yields a comparable fit to the Fama and French (2015) five-factor (FF5) specification (GDA-I R^2 = 80.6%; FF5 R^2 = 80.4%) and outperforms the rest of the models. These results convincingly show that a common set of disappointment events can sufficiently explain the joint cross-section of expected returns both at the annual and at the monthly frequency. In contrast, the fit of the Fama-French multi-factor models deteriorates in the joint cross-section due to the instability in their factor coefficient estimates when fitting each set of portfolios separately.[3]

A8. Additional Tests for Value-Related Cross-Sections

The cross-section of size and value portfolios is the most commonly used laboratory for empirical tests of asset pricing models.[4] To this end, we present here additional results using alternative sets of portfolios that are constructed from size and value sorts.[5]

[3]In unreported tests, we alternatively estimate the coefficients of the various asset pricing models using the cross-section of LTR portfolios, and then examine their goodness of fit in the joint cross-section of the 85 portfolios. In these "out-of-sample" tests, the R^2 of the GDA-I model is 79%, whereas the corresponding R^2 of the Fama-French five-factor model is negative.

[4]See Jagannathan and Wang (1996), Lettau and Ludvigson (2001), Yogo (2006), Malloy, Moskowitz, and Vissing-Jørgensen (2009), Bansal, Kiku, Shaliastovich, and Yaron (2014).

[5]In untabulated results, we also find that the GDA-I model can explain the cross-section of 10 short-term reversal portfolios with an R^2 of 82% (67%) in the annual (monthly) sample.

A8.1. **100 SIZE/BM Portfolios**

In this section, we utilize the set of 100 SIZE/BM portfolios. This is arguably the most challenging size and value cross-section to fit due to its high degree of granularity. Results are reported in Table A8. Panel A reports results for annual portfolio returns, while Panel B reports results for monthly portfolio returns.[6]

According to the results in Panel A of Table A8, the GDA-I model yields the highest R^2 and the lowest RMSE across all examined models (R^2 = 77%, RMSE = 2.1). Its goodness of fit is similar to the one for the Fama-French three-factor model, but superior to the one of the CAPM, CCAPM, Fama-French five-factor, and the NBER models. We also find that the DA coefficient estimate is very similar to the one reported for the 25 SIZE/BM portfolios in Table 2 of the main body of the paper, indicating that the price of disappointment risk is not affected by the degree of granularity of the SIZE/BM portfolios. Moreover, the estimated risk aversion coefficient derived from the CCAPM remains too high, whereas the Small-minus-Big (SMB) and High-minus-Low (HML) factor coefficient estimates are substantially different between the three- and the five-factor Fama-French model specifications.

Similar are the results obtained from monthly portfolio returns. Specifically, the GDA-I model can explain 59% of the cross-sectional variation in the 100 SIZE/BM portfolio premia with an RMSE of 0.185, whereas the R^2 for the Fama-French three-factor model is 62% with an RMSE of 0.179. Consistent with the results from annual portfolio returns, the estimated DA coefficient in the monthly sample is 3.6, while the second-order risk aversion parameter implied by the CCAPM is implausibly large (estimate = 245).

The results reported in Table A8 are illustrated by the scatterplots in Figure A3, which show sample average versus fitted premia for the 100 SIZE/BM portfolios. In fact, the GDA-I model yields a very good cross-sectional fit, which is comparable to that of the Fama-French three-factor model. On the other hand, the CCAPM and the NBER model yield a poor fit,

[6] It should be noted that in the case of few missing portfolio return observations, we replace them with the corresponding unconditional average portfolio return to maintain a balanced panel.

especially at the monthly frequency. Taken together, the results in this section show that the monthly and annual premia of the 100 SIZE/BM portfolios can be sufficiently explained using a single pricing factor, namely the indicator of consumption growth being less than its certainty equivalent.

A8.2. **10 Earnings/Price Portfolios**

Fama and French (1993) use portfolios sorted on earnings/price (E/P) ratios to test their three-factor model. For robustness, we also test the GDA-I model using the cross-section of 10 E/P portfolios for the 1953-2012 period, both at the annual and at the monthly frequency. According to the annual results reported in Panel A of Table A9, the price of disappointment risk in the E/P cross-section (estimate = 4.1) is similar to the estimates reported in Table 2 of the main paper. This finding further supports the consistency of the DA coefficient estimates across test portfolios.

In contrast, the estimate of the second-order risk aversion coefficient is very large (estimate = 98.8), suggesting that the implied equity premium puzzle for the E/P portfolios is even more pronounced than for the SIZE/BM cross-section. Finally, in terms of model fit, the single-factor GDA-I model can very well explain the cross-section of E/P portfolios at the annual frequency ($R^2 = 92\%$, RMSE = 0.86). In relative terms, the GDA-I model yields a better fit than the CCAPM, CAPM and NBER models, but it does not outperform the Fama-French three- and five-factor models, which achieve an almost perfect fit; however, the latter model yields puzzlingly negative factor coefficient estimates.

In the case of monthly returns, the results reported in Panel B of Table A9 show that the GDA-I model yields a much lower RMSE than the CCAPM, CAPM, and NBER models. The CCAPM actually performs very poorly and implies a risk aversion coefficient of 286. The Fama-French three- and five-factor models still yield the best fit, but their factor coefficient estimates are dramatically different relative to the annual sample. To the contrary, the DA coefficient estimate is very similar to the one derived from annual portfolio returns. Overall, the results for the monthly E/P portfolios confirm that the GDA-I model outperforms the traditional CCAPM both in terms of model fit and in terms of plausibility of risk prices.

A9. Price-of-Risk Restrictions for Return-Based SDFs

Our benchmark analysis in the main body of the study considers three return-based SDFs: the CAPM, and the Fama-French three- and five-factor models (Fama and French (1993), (2015)). In fitting these SDFs, the prices of risk are free parameters estimated by GMM. This approach guarantees maximum flexibility for these models, and their prices of risk vary substantially across the alternative test assets (see Tables 2, 3, and 4 of the main paper).

However, the factors in these SDFs are themselves excess returns of traded assets (e.g., R^x_m, SMB, HML). Thus, the prices of risk in these models should be constrained by the expected returns of the factors (e.g., $\mathbb{E}[R^x_m]$), as suggested by Cochrane ((2001), p. 107). To this end, in this section, we repeat our benchmark analysis for annual portfolio returns imposing price-of-risk restrictions on the return-based SDFs. These restrictions are derived from the additional condition that the return-based models should be able to perfectly price their factors.

To fix ideas, consider the Fama-French five-factor model in equation (9) of the main text. Let $\mathbf{b} = [b_m, b_{smb}, b_{hml}, b_{rmw}, b_{cma}]$ be the vector of risk prices of the five-factor model, and $\mathbf{f}_t = [R^x_{m,t}, R_{smb,t}, R_{hml,t}, R_{rmw,t}, R_{cma,t}]$ be the vector of the five factors, with $\mathbb{E}[\mathbf{f}_t]$ and $\mathbf{\Sigma}_f$ the vector of first moments, and the covariance matrix, respectively. If we allow the factors to be the test assets in the left-hand side of equation (12) of the main text, then it follows that

$$\mathbf{b} = \mathbb{E}[\mathbf{f}_t]\mathbf{\Sigma}_f^{-1}.$$

This relation restricts the prices of risk by requiring the five-factor model to perfectly price its return-based factors. Using the above relation, we can alternatively test the return-based models via an augmented GMM system that estimates $\mathbb{E}[\mathbf{f}_t]$ and $\boldsymbol{\Sigma}_f$, and then imposes these price-of-risk restrictions. Specifically, the augmented GMM system for the Fama-French five-factor model reads

$$\text{(A.16)} \qquad \begin{bmatrix} \mathbb{E}\left[\mathbf{f}_t^{FF5}(1-\mathbb{E}[M_t^{FF5}]+M_t^{FF5})\right] \\ \mathbb{E}\left[(R_{i,t}-R_{1y,t})(1-\mathbb{E}[M_t^{FF5}]+M_t^{FF5})\right] \text{ for } i=1,..,n \end{bmatrix} = \mathbf{0},$$

and the first-stage GMM matrix is given by the following block diagonal matrix:

$$\text{(A.17)} \qquad \begin{bmatrix} \mathbf{I}_{5\times5} & \mathbf{0}_{5\times n} \\ \mathbf{0}_{n\times5} & \mathbf{0}_{n\times n} \end{bmatrix},$$

where $\mathbf{I}$ and $\mathbf{0}$ are the identity and zero matrices, respectively. The above weighting matrix ensures that we estimate the prices of risk in the five-factor model by perfectly pricing the five factors, and that we assess the fit of this model for each set of test assets (e.g., 25 SIZE/BM, 25 SIZE/OP). We follow a similar approach for the CAPM and the Fama and French (1993) three-factor model (FF3).

The results from these tests are reported in Table A10. Comparing the cross-sectional R^2s and RMSEs of the restricted return-based SDFs in Table A10 to the unrestricted ones in Table 2 of the main paper, we notice that the cross-sectional fit of the FF3 model marginally deteriorates in the cross-sections of 25 SIZE/BM, 25 SIZE/OP, and 10 LTR portfolios, whereas the deterioration is more pronounced in the cross-section of 25 SIZE/INV portfolios. In addition, the restricted CAPM performs much worse than its unrestricted version. Most interestingly, the restricted FF5 model also performs substantially worse than its unrestricted version, because the restricted prices of risk for this model are very different from the unrestricted ones reported in Table 2 of the main body of the study.

Overall, when we require the return-based SDFs to perfectly price the corresponding factors, their cross-sectional performance considerably deteriorates. This is an alternative way of interpreting the instability of the unrestricted prices of risk of the return-based SDFs across the various test assets. To the contrary, the single-factor GDA-I model can explain the cross-section of expected returns with a price of disappointment risk that remains stable across the alternative cross-sections (see Tables 2, 3, and 4 in the main paper).

A10. Monthly Returns: Alternative Asset Classes

In Section V of the main body of the paper, we tested the GDA-I model using alternative asset classes (corporate bonds, Treasury bonds, and equity index option portfolios) at the annual frequency. The results are similar when we estimate the GDA-I model for these asset classes at the monthly frequency. As in Section A5 of the Internet Appendix, on the basis of the corresponding annual estimates, if year t is a disappointment year, then all months in year t are disappointment months; if year t is not a disappointment year, then none of the months in year t are disappointment months.

The monthly results are presented in Table A11, whereas the models' fit is illustrated in Figure A4. We find that the GDA-I model clearly outperforms the competing single-factor models, whereas the multi-factor Fama-French models only achieve a good fit at the expense of extreme factor coefficient estimates. This limitation becomes evident by the deterioration in their explanatory power when we ask these multi-factor models to price the joint cross-section of equity, corporate bond, Treasury bond, and equity index option portfolios (see Panel D of Table A11). Equally importantly, the DA coefficient estimates are remarkably stable across the different asset classes, and they are consistent with the estimates we derived from the annual portfolio returns.

A11. Constant Disappointment Thresholds and Price of Disappointment Risk Restriction

In Section VIII.B of the main paper, we examined how sensitive is the explanatory ability of the GDA-I model with respect to the disappointment threshold coefficient d_2, which together with the consumption growth moments determines the GDA-I certainty equivalent for consumption growth (see equation (5) in the main text). In this section, we conduct a number of further tests to examine the sensitivity of our findings with respect to key parameters of the GDA-I model.

Specifically, to examine the importance of persistence in consumption growth, we firstly estimate a variant of the GDA-I model, where we impose no persistence in the consumption growth process, i.e., $\phi_c = 0$ in equation (4) of the paper. This assumption yields a constant disappointment threshold ($\mathbf{1}\{\Delta c_{t+1} \leq \mu_c + d_2\sigma_c\}$). Secondly, to assess the importance of the time-variation in the GDA-I threshold, we alternatively estimate indicator models where the disappointment threshold is time-invariant, and it is specified in an ad hoc fashion. In particular, we estimate an indicator model where the disappointment threshold is the unconditional mean of consumption growth ($\mathbf{1}\{\Delta c_{t+1} \leq \mu_c\}$) as well as a model where the threshold is zero consumption growth ($\mathbf{1}\{\Delta c_{t+1} \leq 0\}$). Finally, to highlight the role of the DA parameter $\tilde{\theta}$, we also estimate a variant of the GDA-I model, where we restrict the price of disappointment risk to be equal to 1, i.e., $\tilde{\theta} = 1$ in equation (4) of the main paper. The results from these tests are shown in Table A12 and Figure A5.

In comparison to the proposed GDA-I model, these results underline the poor performance of indicator models with time-invariant disappointment thresholds or a constrained price of disappointment risk. This is particularly true for the cross-sections of the 25 SIZE/OP and SIZE/INV portfolios. Based on these findings, we conclude that the success of the GDA-I model should be attributed to a theoretically consistent time-varying reference point (see equation (5) of the paper) and a DA parameter that is greater than 1.

A12. Stock-Level Analysis and the Disappointing-minus-Elating Factor

A12.1. Disappointing-minus-Elating Factor

To gain additional insight on the economic significance of the GDA-I model, we construct a zero-cost Disappointing-minus-Elating (DME) factor utilizing the 25 equally-weighted SIZE/BM portfolios. Using an initial window of 20 years (240 months), we recursively compute the covariances of these portfolio excess returns with respect to the disappointment indicator (GDA-I factor) extracted from the same cross-section (see estimation results in Panel A of Table 2 in the main body of the study). We then sort these 25 portfolios in ascending order according to the absolute value of their GDA-I covariances, assign them to quintiles, and compute their post-ranking equally-weighted returns. The spread between the two extreme quintiles yields the DME factor return. Results are shown in Table A13 for both annual and monthly samples.

The premia and Sharpe ratios of the GDA-I covariance-sorted quintiles clearly increase as we move from low (in absolute value) to high covariance portfolios. Furthermore, the DME factor premium in the annual sample is as high as 7.17% p.a. (Sharpe ratio = 0.39) and strongly significant (Newey-West t-statistic = 2.99). Similar results hold for the monthly sample (DME premium = 0.40% per month, Newey-West t-statistic = 3.02, Sharpe ratio = 0.11).

A12.2. Stock-Level Analysis

Finally, in this section, we also examine whether the GDA-I factor is priced in the cross-section of individual stock returns. To this end, we utilize all New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and National Association of Securities Dealers Automated Quotations (NASDAQ) common stocks (share codes 10 and 11) that are available at the Center for Research in Security Prices (CRSP) database during the period 1933-2012. The only filters we impose is that the stock price in December of the previous year is greater than $5, and that a stock should have at least 20 years (240 months) of valid return observations so as to estimate reliable factor betas. As a result, our sample consists of 2,724 (2,732) unique stock identifiers (PERMNOS) at the annual (monthly) frequency.

Given the very large cross-section of stocks and the unbalanced nature of this panel, we cannot estimate the GDA-I model using the benchmark GMM approach of the main body of the study. Thus, we employ the Fama and MacBeth (1973) two-pass regression approach. In the first pass, we run full-sample time series regressions of individual stock excess returns on the disappointment indicator (GDA-I factor) extracted from the cross-section of the 25 SIZE/BM portfolios (see estimation results in Panel A of Table 2 in the main body of the study) to estimate the corresponding GDA-I betas.[7] In the second pass, each year (month) we run a cross-sectional regression of stock excess returns on their full-sample GDA-I betas to estimate the price of disappointment risk, which is given by the time-series average of these cross-sectional slope coefficients. Consistent with the functional form of the GDA-I SDF, we impose no intercept in the cross-sectional regression. For comparison, we follow the same approach for the CCAPM, CAPM, Fama-French three-factor, and NBER models. Apart from standard t-statistics for these Fama-MacBeth estimates, we also compute their t-statistics with Shanken-adjusted standard errors to address the potential errors-in-variables (EIV) bias arising from the fact that the factor betas are pre-estimated.

Results are reported in Table A14 for annual (Panel A) and monthly (Panel B) stock returns. In both cases, the price of disappointment risk is highly significant, even when we account for the fact that GDA-I betas are pre-estimated. The Fama-MacBeth estimate of 0.306 (0.307) for annual (monthly) stock returns implies a DA coefficient of 2.22 (2.26), which is lower but of the same order of magnitude as the coefficients estimated using portfolios as test assets. Overall, these results show that the GDA-I factor is priced in the cross-

[7]Results are quantitatively very similar when we instead estimate stock betas with respect to the GDA-I factor extracted from the cross-section of the 100 SIZE/BM portfolios.

section of stock returns, implying a very reasonable degree of disappointment aversion for the representative investor.

With respect to the other models, our conclusions are similar to the ones derived using portfolios as test assets. Regarding the CCAPM, even though consumption growth betas are significant in the cross-section of stock returns, and their explanatory power is comparable to the one of the GDA-I betas, the implied risk aversion coefficient is again implausibly high (46 for annual returns and 192 for monthly returns). Moreover, Fama-French factor betas appear to yield the best explanatory power for stock premia, but this good fit comes at the expense of insignificant prices of risk for the SMB (at the monthly frequency) and HML factors. Even worse, the estimated price of risk for the HML factor turns negative for monthly stock returns, undermining the ability of the Fama-French model to explain the cross-section of stock premia in a theoretically consistent fashion.

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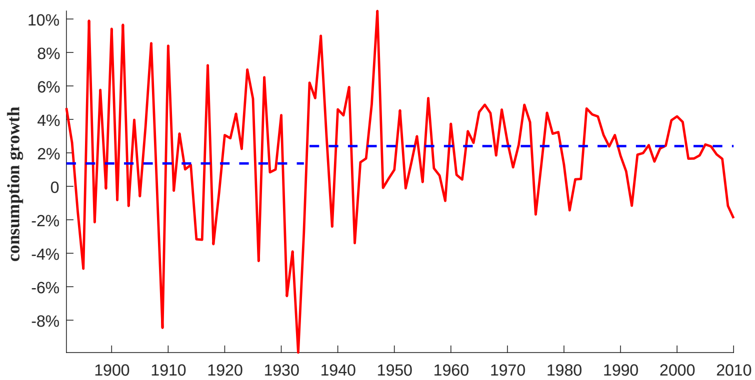
FIGURE A1
Structural Break in the Consumption Growth Process

Panel A in Figure A1 shows annual consumption growth rates from 1891 to 2009. The consumption data are from Robert Shiller's website. The dashed lines in Panel A show the average annual consumption growth rate in the pre- and post-1933 period, respectively. Panel B fits an AR(1) model for annual consumption growth ($\Delta c_{t+1} = \mu_c(1-\phi_c) + \phi_c \Delta c_t + \sqrt{1-\phi_c^2}\sigma_c \epsilon_{c,t+1}$) for the pre- and post-1933 period, respectively.

Panel A. Consumption Growth 1891-2009



Panel B. AR(1) Model for Consumption Growth Pre- and Post-1933

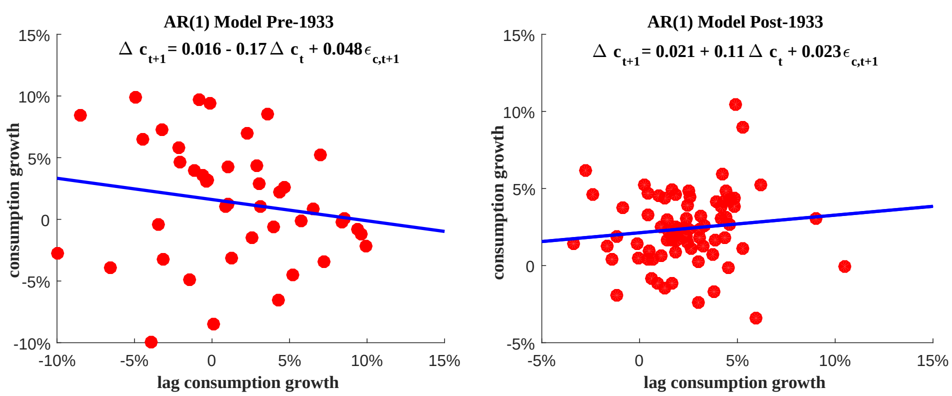
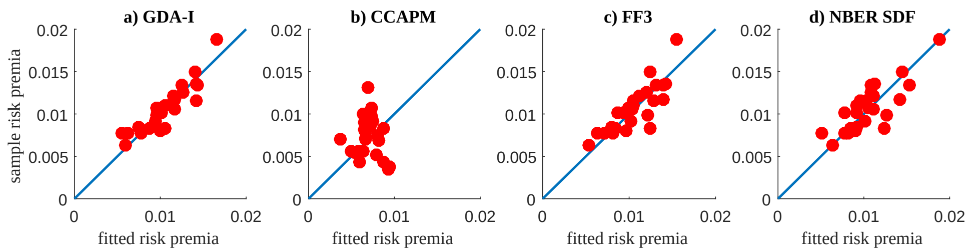


FIGURE A2

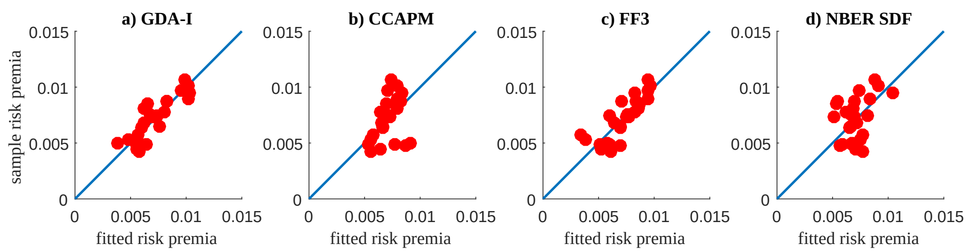
Sample and Fitted Risk Premia for Equity Portfolios: Monthly Returns

Figure A2 shows sample and fitted monthly risk premia for the 25 size/book-to-market portfolios (Panel A), the 25 size/operating profitability portfolios (Panel B), the 25 size/investment portfolios (Panel C), and the 10 long-term reversal portfolios (Panel D). All portfolios are equal-weighted. Fitted risk premia are estimated according to the expression in equation (12) of the paper for the GDA-I, CCAPM, FF3, and NBER discount factors. The corresponding estimation results are shown in Table A5. The sample period is from 1933 to 2012. The sample for the CCAPM starts in 1959, and the sample period for the operating profitability and the investment portfolios is from 1964 to 2012.

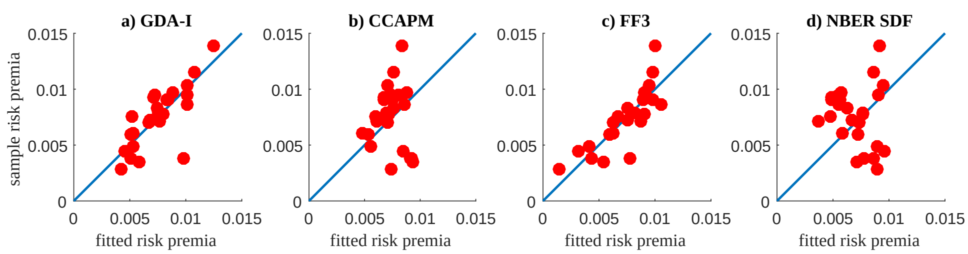
Panel A. 25 SIZE/BM Portfolios



Panel B. 25 SIZE/OP Portfolios



Panel C. 25 SIZE/INV Portfolios



Panel D. 10 LTR Portfolios

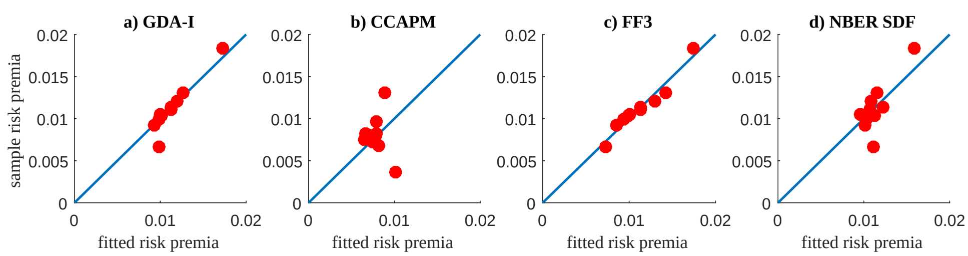
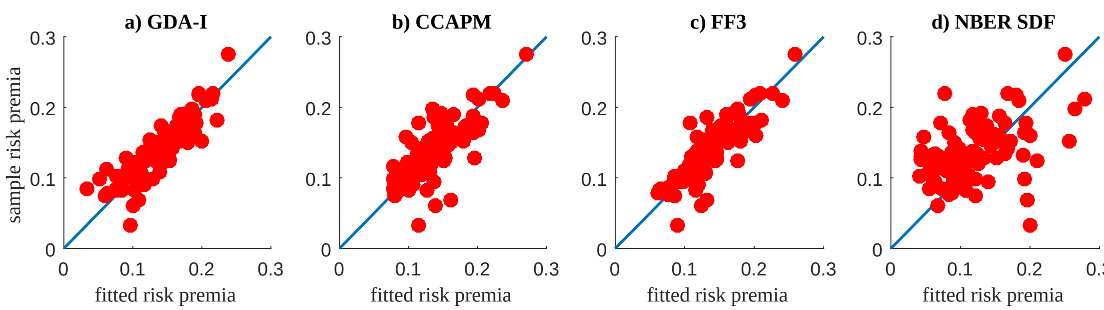


FIGURE A3

Sample and Fitted Risk Premia for 100 SIZE/BM Portfolios

Figure A3 shows sample and fitted risk premia for the 100 size/book-to-market portfolios. Panel A shows results for annual returns while Panel B shows results for monthly returns. Fitted risk premia are estimated according to equation (12) of the paper for the GDA-I, CCAPM, FF3, and NBER discount factors. Estimation results are shown in Table A8. The sample period is from 1933 to 2012, with the exception of the monthly sample for the CCAPM that starts in 1959.

Panel A. Annual Returns



Panel B. Monthly Returns

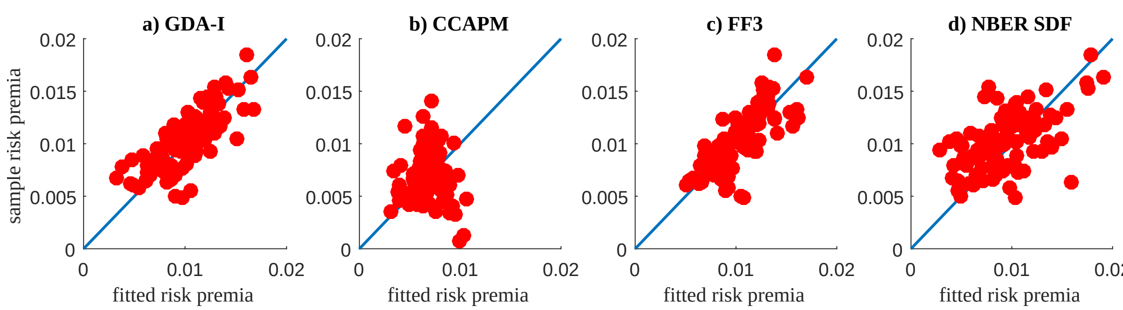
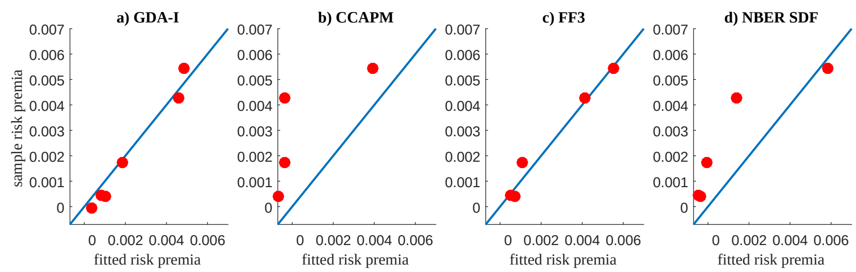


FIGURE A4

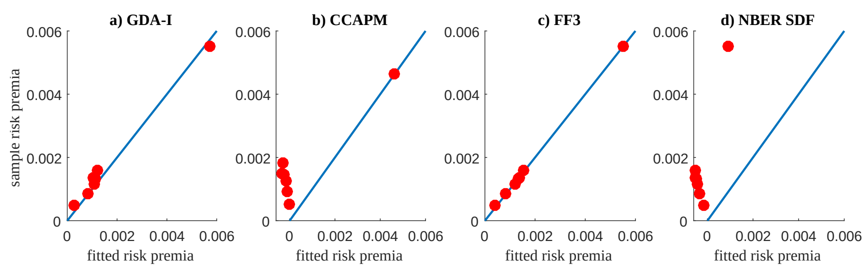
Sample and Fitted Risk Premia for Alternative Asset Classes: Monthly Returns

Figure A4 shows sample and fitted monthly risk premia for the 5 corporate bond portfolios of Nozawa (2012) constructed on the basis of bonds' credit ratings (Panel A), the 6 Fama Treasury bond portfolios sorted on maturity (Panel B), the 6 equity index option portfolios of Constantinides, Jackwerth, and Savov (2013) (Panel C), and the joint cross-section of the above portfolios together with the 6 Fama-French SIZE/BM portfolios (Panel D). Each cross-section also includes the equity market portfolio. Fitted risk premia are estimated according to the expression in equation (12) of the paper for the GDA-I, CCAPM, FF3, and NBER discount factors. The corresponding estimation results are shown in Table A11. The sample period is 1976-2009 for the corporate bond portfolios, 1952-2012 for Treasury bond portfolios, 1987-2011 for the equity index option portfolios, and 1987-2009 for the joint cross-section. Monthly consumption growth data are available since 1959.

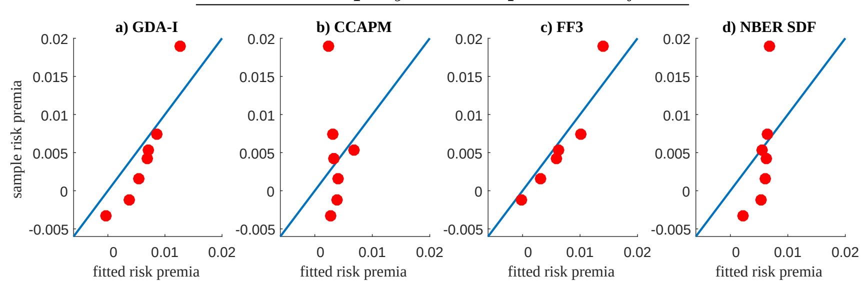
Panel A. 5 Corporate Bond Portfolios



Panel B. 6 Treasury Bond Portfolios



Panel C. 6 Equity Index Option Portfolios



Panel D. Joint Cross-Section

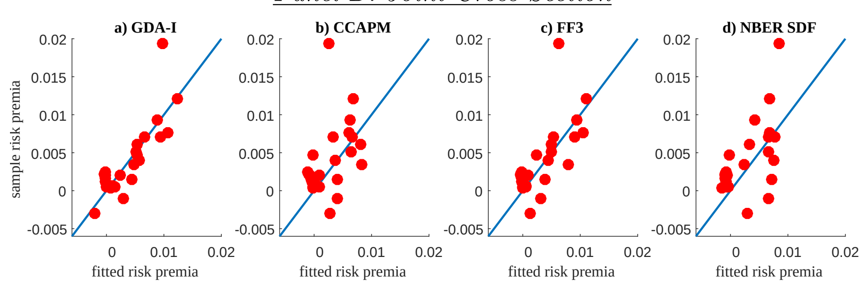
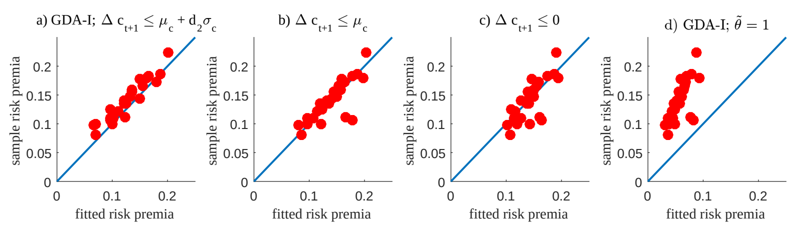


FIGURE A5

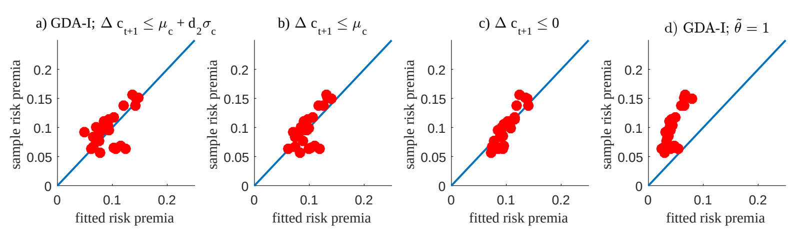
Sample and Fitted Risk Premia for Indicator-Based SDFs with Constant Thresholds and Price of Disappointment Risk Restriction

Figure A5 shows sample and fitted annual risk premia for three indicator-based SDFs with constant thresholds ($M_{t+1}^{Ind} = \tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq \text{constant}\}$) and an indicator-based SDF with a restricted price of disappointment risk. We consider three alternative constant thresholds: i) a GDA threshold derived after imposing no persistence ($\phi_c = 0$) in consumption growth ($\mathbf{1}\{\Delta c_{t+1} \leq \mu_c + d_2\sigma_c\}$), ii) a threshold equal to the unconditional mean of consumption growth ($\mathbf{1}\{\Delta c_{t+1} \leq \mu_c\}$), and iii) a threshold equal to zero consumption growth ($\mathbf{1}\{\Delta c_{t+1} \leq 0\}$). The last column of Figure A5 shows the corresponding sample and fitted premia for a restricted version of the GDA-I model, where the price of disappointment risk $\tilde{\theta}$ is 1 ($M_{t+1}^{GDA-I*} = \mathbf{1}\big\{\Delta c_{t+1} \leq \mu_c(1-\phi_c) + \phi_c \Delta c_t + d_2\sqrt{1-\phi_c^2}\sigma_c\big\}$). The test assets are the 25 size/book-to-market portfolios (Panel A), the 25 size/operating profitability portfolios (Panel B), the 25 size/investment portfolios (Panel C), and the 10 long-term reversal portfolios (Panel D). The corresponding estimation results are shown in Table A12. Fitted risk premia are estimated according to the expression in equation (12) of the paper. The sample period is from 1933 to 2012. The sample period for the operating profitability and the investment portfolios begins in 1964.

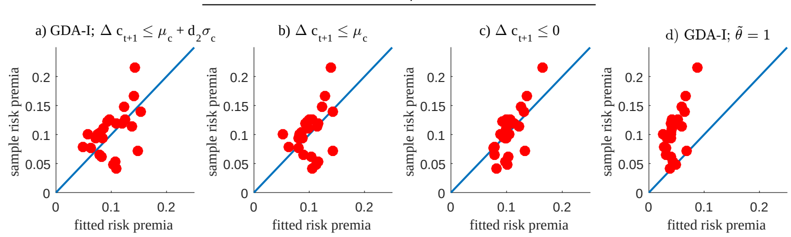
Panel A. 25 SIZE/BM Portfolios



Panel B. 25 SIZE/OP Portfolios



Panel C. 25 SIZE/INV Portfolios



Panel D. 10 LTR Portfolios

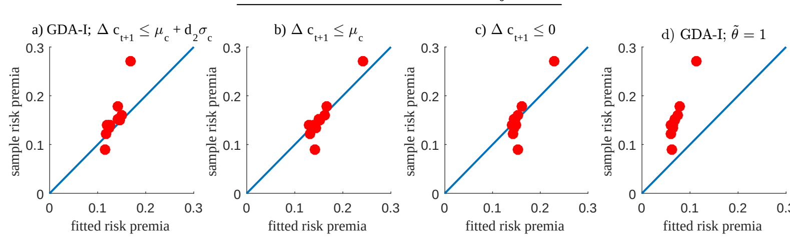


TABLE A1
Structural Break in the Consumption Growth Process

Table A1 shows the mean, standard deviation, and autocorrelation of the annual consumption growth process (Δc_t) pre- and post-1933. Table A1 also shows the p-values of tests for a structural break in 1933 in the mean, standard deviation, and autocorrelation of the annual consumption growth process, respectively. The consumption data are from Robert Shiller's website, and the sample period is 1891-2009.

	Pre-1933	Post-1933	p-value
Mean Δc_t (μ_c)	1.367	2.404	(t-test) 0.196
St. Dev. Δc_t (σ_c)	4.879	2.381	(F-test) 0
Autocorrelation Δc_t (ϕ_c)	-0.171	0.115	(Chow test) 0.154

TABLE A2
GMM Results for Annual Portfolio Returns: Great Depression

Table A2 shows GMM results for different portfolio sorts and asset pricing models at the annual frequency. For this set of tests, we estimate consumption growth moments, the DA coefficient $\tilde{\theta}$, and the disappointment threshold d_2 for the GDA-I model using the augmented GMM system specified in the main body of the study. Table A2 does not report estimation results for the consumption growth moments. For the test assets, we consider two equal-weighted portfolio sorts: the 25 size/book-to-market portfolios (Panel A) and the 10 long-term reversal portfolios (Panel B). GDA-I is the disappointment aversion discount factor and CCAPM is the consumption-based discount factor. CAPM is the market model and FF3 is the Fama-French three-factor model. NBER SDF is the recession-based stochastic discount factor. GDA_IND is the disappointment indicator, CONS is aggregate consumption growth, MKT is the market excess return, SMB is the size factor, HML is the value factor, and NBER_IND is the NBER recession indicator. $\tilde{\alpha}$ is the risk aversion parameter in the CCAPM. t-statistics are shown in parentheses. χ^2, dof, and p are the first-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. RMSE and R^2 are the root-mean-square error ($\times 100$) and cross-sectional R-square, respectively. The sample period is 1930-2012 for the 25 size/book-to-market portfolios and 1931-2012 for the 10 long-term reversal portfolios.

PANEL A. 25 SIZE/BM

	GDA-I	CCAPM	CAPM	FF3	NBER SDF
GDA_IND ($\tilde{\theta}$)	2.523				
	(3.625)				
d_2	−0.229				
	(−3.568)				
CONS ($\tilde{\alpha}$)		36.570			
		(3.102)			
MKT			2.604	0.964	
			(4.381)	(1.170)	
SMB				1.253	
				(1.248)	
HML				3.105	
				(3.364)	
NBER_IND					4.800
					(1.544)
χ^2	35.865	95.370	77.562	59.871	20.314
dof	23	24	24	22	24
p	0.042	0	0	0	0.678
RMSE	1.911	2.813	3.180	1.613	3.222
R^2	0.804	0.575	0.478	0.860	0.443

PANEL B. 10 LTR

	GDA-I	CCAPM	CAPM	FF3	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.222				
	(1.993)				
d_2	−0.321				
	(−1.522)				
CONS ($\tilde{\alpha}$)		47.095			
		(3.114)			
MKT			2.891	0.242	
			(4.578)	(0.186)	
SMB				3.435	
				(1.428)	
HML				2.650	
				(1.195)	
NBER_IND					7.120
					(1.291)
χ^2	12.534	26.824	37.918	15.403	4.685
dof	8	9	9	7	9
p	0.128	0.001	0	0.031	0.860
RMSE	1.836	2.896	2.598	0.835	3.215
R^2	0.847	0.621	0.695	0.968	0.533

TABLE A3
GMM Results for Annual Portfolio Returns: Two-Stage GMM

Table A3 shows two-stage GMM results for different portfolio sorts and asset pricing models at the annual frequency. The second-stage weighting matrix is the diagonal of the optimal weighting matrix, i.e., the diagonal of the inverse of the spectral density matrix. For this set of tests, we estimate consumption growth moments, the DA coefficient $\tilde{\theta}$, and the disappointment threshold d_2 for the GDA-I model using the augmented GMM system specified in the main body of the study. Table A3 does not report estimation results for the consumption growth moments. For the test assets, we consider four equal-weighted portfolio sorts: the 25 size/book-to-market portfolios (Panel A), the 25 size/operating profitability portfolios (Panel B), the 25 size/investment portfolios (Panel C), and the 10 long-term reversal portfolios (Panel D). GDA-I is the disappointment aversion discount factor and CCAPM is the consumption-based discount factor. CAPM is the market model. FF3 and FF5 are the Fama-French three- and five-factor models. NBER SDF is the recession-based discount factor. GDA_IND is the disappointment indicator, CONS is aggregate consumption growth, MKT is the market excess return, SMB is the size factor, HML is the value factor, RMW is the profitability factor, CMA is the investment factor, and NBER_IND is the NBER recession indicator. $\tilde{\alpha}$ is the risk aversion parameter in the CCAPM. t-statistics are shown in parentheses. χ^2, dof, and p are the second-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. RMSE and R^2 are the root-mean-square error ($\times 100$) and cross-sectional R-square, respectively. The sample period is 1933-2012. The sample for the five-factor Fama-French model, the operating profitability, and the investment portfolios starts in 1964.

PANEL A. 25 SIZE/BM

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.762					
	(3.545)					
d_2	−0.667					
	(−3.750)					
CONS ($\tilde{\alpha}$)		57.331				
		(3.444)				
MKT			2.935	2.116	3.022	
			(4.725)	(2.493)	(2.091)	
SMB				0.505	2.006	
				(0.483)	(1.334)	
HML				2.453	−0.693	
				(2.648)	(−0.223)	
RMW					0.345	
					(0.104)	
CMA					9.163	
					(2.054)	
NBER_IND						9.157
						(0.981)
χ^2	34.717	85.644	97.429	65.367	44.792	6.434
dof	23	24	24	22	20	24
p	0.055	0	0	0	0.001	0.999
RMSE	1.376	2.107	2.973	1.726	1.601	2.358
R^2	0.896	0.758	0.519	0.837	0.812	0.697

PANEL B. 25 SIZE/OP

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.316					
	(2.203)					
d_2	−0.542					
	(−2.960)					
CONS ($\tilde{\alpha}$)		88.188				
		(1.664)				
MKT			2.793	2.331	2.400	
			(2.642)	(1.731)	(1.905)	
SMB				1.625	2.216	
				(1.452)	(2.239)	
HML				4.836	1.063	
				(2.034)	(0.347)	
RMW					3.780	
					(2.035)	
CMA					1.489	
					(0.401)	
NBER_IND						4.527
						(1.185)
χ^2	27.510	31.874	75.191	54.566	35.851	35.802
dof	23	24	24	22	20	24
p	0.234	0.130	0	0	0.016	0.057
RMSE	0.880	1.728	2.674	1.353	1.044	3.247
R^2	0.911	0.660	0.187	0.792	0.876	−0.197

PANEL C. 25 SIZE/INV

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.455					
	(2.221)					
d_2	−0.585					
	(−1.098)					
CONS ($\tilde{\alpha}$)		91.068				
		(1.747)				
MKT			2.889	2.982	3.342	
			(2.759)	(2.127)	(2.357)	
SMB				0.939	1.715	
				(0.678)	(1.020)	
HML				7.108	2.286	
				(4.399)	(0.467)	
RMW					1.504	
					(0.429)	
CMA					6.641	
					(1.080)	
NBER_IND						4.642
						(1.246)
χ^2	46.567	49.097	114.097	60.598	58.117	120.701
dof	23	24	24	22	20	24
p	0.002	0.001	0	0	0	0
RMSE	1.953	3.028	3.967	2.046	1.801	4.770
R^2	0.743	0.383	−0.057	0.718	0.781	−0.529

PANEL D. 10 LTR

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.602					
	(3.798)					
d_2	−0.648					
	(−11.051)					
CONS ($\tilde{\alpha}$)		62.493				
		(3.424)				
MKT			3.189	2.416	2.371	
			(4.778)	(1.552)	(0.776)	
SMB				−0.670	7.320	
				(−0.269)	(1.974)	
HML				4.250	−10.816	
				(2.267)	(−1.104)	
RMW					9.245	
					(1.202)	
CMA					26.165	
					(1.445)	
NBER_IND						9.797
						(1.099)
χ^2	57.464	24.897	41.043	21.938	3.900	3.310
dof	8	9	9	7	5	9
p	0	0.003	0	0.002	0.563	0.950
RMSE	1.358	1.658	2.213	1.344	0.885	2.450
R^2	0.909	0.865	0.759	0.911	0.949	0.705

TABLE A4
GMM Results for Annual Portfolio Returns: Recursive Estimation of Disappointment Events

Table A4 shows GMM results for the GDA-I model across different portfolio sorts at the annual frequency. For these tests, disappointment events are estimated every year based on the available information up to that year with an initial period of 30 years. Specifically, every year, we estimate consumption growth moments, the DA coefficient $\tilde{\theta}$, and the disappointment threshold d_2 for the GDA-I model using the augmented GMM system specified in the main body of the study. Table A4 does not report estimation results for the consumption growth moments. We consider four equal-weighted portfolio sorts: the 25 size/book-to-market portfolios, the 25 size/operating profitability portfolios, the 25 size/investment portfolios, and the 10 long-term reversal portfolios. Table A4 shows time-series averages of the recursive GMM estimates. The sample period starts in 1933, with the exception of the operating profitability and investment portfolios that are available since 1964. χ^2, dof, and p are the first-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. RMSE and R^2 are the root-mean-square error ($\times 100$) and cross-sectional R-square, respectively. The numbers in brackets denote the minimum and maximum values for the corresponding time-series of R^2s.

Time-Series Means of the Recursive GMM Estimates

	25 SIZE/BM	25 SIZE/OP	25 SIZE/INV	10 LTR
$\tilde{\theta}$	4.187	4.484	4.559	2.961
d_2	−0.839	−0.921	−0.854	−0.432
χ^2	27.177	24.059	25.971	10.917
dof	23	23	23	8
p	0.377	0.658	0.582	0.248
RMSE	1.951	1.495	2.244	1.705
R^2	0.848	0.773	0.670	0.878
	[0.72, 0.90]	[0.66, 0.89]	[0.35, 0.79]	[0.79, 0.94]

TABLE A5
GMM Results for Monthly Portfolio Returns

Table A5 shows GMM results for different portfolio sorts and asset pricing models at the monthly frequency. In the monthly sample, the only free parameter in the GDA-I model is the DA coefficient $\tilde{\theta}$, since monthly disappointment events are based on annual disappointment events from the corresponding estimation results reported in Table 2 of the paper. Specifically, based on the results in Table 2, if year t is a disappointment year, then we assume that all months in year t are disappointment months. If year t is not a disappointment year, then none of the months in year t are disappointment months. For these tests, we consider four equal-weighted portfolio sorts: the 25 size/book-to-market portfolios (Panel A), the 25 size/operating profitability portfolios (Panel B), the 25 size/investment portfolios (Panel C), and the 10 long-term reversal portfolios (Panel D). GDA-I is the disappointment aversion discount factor and CCAPM is the consumption-based discount factor. CAPM is the market model. FF3 and FF5 are the Fama-French three- and five-factor models. NBER SDF is the recession-based discount factor. GDA_IND is the disappointment indicator, CONS is aggregate consumption growth, MKT is the market excess return, SMB is the size factor, HML is the value factor, RMW is the profitability factor, CMA is the investment factor, and NBER_IND is the NBER recession indicator. $\tilde{\alpha}$ is the risk aversion parameter in the CCAPM. t-statistics are shown in parentheses. χ^2, dof, and p are the first-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. RMSE and R^2 are the root-mean-square error ($\times 100$) and cross-sectional R-square, respectively. The sample period is 1933-2012. The sample for the five-factor Fama-French model, the operating profitability, and the investment portfolios starts in 1964, and the sample for the CCAPM begins in 1959.

PANEL A. 25 SIZE/BM

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.673 (3.293)					
CONS ($\tilde{\alpha}$)		248.151 (2.464)				
MKT			3.579 (4.974)	2.342 (2.847)	3.625 (2.245)	
SMB				0.517 (0.434)	6.724 (3.638)	
HML				4.905 (4.521)	2.138 (0.367)	
RMW					9.490 (1.837)	
CMA					10.265 (0.891)	
NBER_IND						7.786 (1.374)
χ^2	41.296	70.582	121.875	94.856	94.631	9.662
dof	24	24	24	22	20	24
p	0.015	0	0	0	0	0.995
RMSE	0.119	0.283	0.249	0.156	0.142	0.174
R^2	0.818	−0.496	0.178	0.677	0.673	0.601

PANEL B. 25 SIZE/OP

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.514 (1.746)					
CONS ($\tilde{\alpha}$)		226.207 (2.403)				
MKT			3.086 (2.916)	3.697 (2.692)	2.958 (1.927)	
SMB				3.265 (1.869)	4.226 (2.466)	
HML				13.753 (4.199)	10.704 (1.756)	
RMW					4.335 (1.677)	
CMA					−3.329 (−0.330)	
NBER_IND						5.432 (1.008)
χ^2	16.535	27.161	58.037	37.576	32.066	7.492
dof	24	24	24	22	20	24
p	0.867	0.297	0	0.020	0.042	0.999
RMSE	0.094	0.174	0.208	0.106	0.079	0.180
R^2	0.744	0.126	−0.243	0.675	0.817	0.069

PANEL C. 25 SIZE/INV

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.076 (2.147)					
CONS ($\tilde{\alpha}$)		232.939 (2.452)				
MKT			3.195 (3.003)	3.755 (2.865)	3.284 (1.979)	
SMB				3.596 (1.978)	1.473 (0.653)	
HML				14.136 (6.943)	19.445 (2.387)	
RMW					−7.160 (−0.999)	
CMA					−6.898 (−0.664)	
NBER_IND						5.484 (1.026)
χ^2	74.268	146.370	226.658	133.842	125.073	41.850
dof	24	24	24	22	20	24
p	0	0	0	0	0	0.013
RMSE	0.167	0.292	0.314	0.146	0.145	0.333
R^2	0.594	−0.230	−0.425	0.689	0.694	−0.604

PANEL D. 10 LTR

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.854 (3.393)					
CONS ($\tilde{\alpha}$)		283.175 (2.592)				
MKT			3.916 (5.267)	2.602 (2.225)	−2.977 (−0.445)	
SMB				−0.277 (−0.166)	−0.399 (−0.010)	
HML				6.869 (3.211)	57.460 (0.998)	
RMW					−22.229 (−0.324)	
CMA					−70.971 (−0.834)	
NBER_IND						8.265 (1.369)
χ^2	15.084	39.204	52.822	17.187	4.934	4.153
dof	9	9	9	7	5	9
p	0.088	0	0	0	0.423	0.901
RMSE	0.108	0.264	0.209	0.016	0.059	0.182
R^2	0.856	−0.394	0.468	0.945	0.942	0.597

TABLE A6
GMM Results for Quarterly Portfolio Returns

Table A6 shows GMM results for different portfolio sorts and asset pricing models at the quarterly frequency. For this set of tests, we estimate consumption growth moments, the DA coefficient $\tilde{\theta}$, and the disappointment threshold d_2 for the GDA-I model using the augmented GMM system specified in the main body of the study. Table A6 does not report estimation results for the consumption growth moments. For the test assets, we consider four equal-weighted portfolio sorts: the 25 size/book-to-market portfolios (Panel A), the 25 size/operating profitability portfolios (Panel B), the 25 size/investment portfolios (Panel C), and the 10 long-term reversal portfolios (Panel D). GDA-I is the disappointment aversion discount factor and CCAPM is the consumption-based discount factor. CAPM is the market model. FF3 and FF5 are the Fama-French three- and five-factor models. NBER SDF is the recession-based discount factor. GDA_IND is the disappointment indicator, CONS is aggregate consumption growth, MKT is the market excess return, SMB is the size factor, HML is the value factor, RMW is the profitability factor, CMA is the investment factor, and NBER_IND is the NBER recession indicator. $\tilde{\alpha}$ is the risk aversion parameter in the CCAPM. t-statistics are shown in parentheses. χ^2, dof, and p are the first-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. RMSE and R^2 are the root-mean-square error ($\times 100$) and cross-sectional R-square, respectively. The sample period is 1947.Q2-2012.Q4. The sample for the five-factor Fama-French model, the operating profitability, and the investment portfolios starts in 1964.Q1.

PANEL A. 25 SIZE/BM

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	4.527					
	(2.148)					
d_2	−1.061					
	(−4.783)					
CONS ($\tilde{\alpha}$)		224.576				
		(2.427)				
MKT			3.255	3.380	3.464	
			(3.649)	(3.143)	(2.605)	
SMB				0.661	3.620	
				(0.427)	(2.222)	
HML				6.150	−1.454	
				(5.084)	(−0.303)	
RMW					4.348	
					(1.290)	
CMA					12.781	
					(1.518)	
NBER_IND						2.391
						(2.668)
χ^2	41.448	57.752	119.022	83.645	74.102	59.848
dof	23	24	24	22	20	24
p	0.010	0	0	0	0	0
RMSE	0.315	0.637	0.807	0.389	0.392	0.496
R^2	0.775	0.085	−0.464	0.659	0.751	0.446

PANEL B. 25 SIZE/OP

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	7.032					
	(1.655)					
d_2	−2.108					
	(−4.773)					
CONS ($\tilde{\alpha}$)		195.652				
		(1.935)				
MKT			2.617	3.544	3.364	
			(2.798)	(2.217)	(2.375)	
SMB				1.048	2.172	
				(0.563)	(1.279)	
HML				9.746	3.664	
				(2.869)	(0.584)	
RMW					3.234	
					(1.525)	
CMA					4.681	
					(0.488)	
NBER_IND						6.707
						(0.694)
χ^2	42.198	28.030	46.249	31.653	30.886	8.665
dof	23	24	24	22	20	24
p	0.008	0.258	0.004	0.083	0.056	0.998
RMSE	0.379	0.572	0.601	0.283	0.229	0.767
R^2	0.640	0.183	0.098	0.800	0.868	−0.466

PANEL C. 25 SIZE/INV

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	7.812					
	(1.686)					
d_2	−1.584					
	(−4.878)					
CONS ($\tilde{\alpha}$)		199.957				
		(1.990)				
MKT			2.699	3.777	3.753	
			(2.874)	(2.572)	(2.228)	
SMB				0.908	−1.012	
				(0.476)	(−0.391)	
HML				10.203	16.572	
				(5.636)	(2.088)	
RMW					−4.744	
					(−0.978)	
CMA					−7.158	
					(−0.719)	
NBER_IND						7.004
						(0.704)
χ^2	77.874	83.153	168.937	86.850	65.506	20.461
dof	23	24	24	22	20	24
p	0	0	0	0	0	0.670
RMSE	0.641	0.874	0.924	0.409	0.403	0.102
R^2	0.410	−0.095	−0.222	0.759	0.766	−0.511

PANEL D. 10 LTR

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	4.989					
	(2.348)					
d_2	−1.062					
	(−3.376)					
CONS ($\tilde{\alpha}$)		246.744				
		(2.499)				
MKT			3.650	4.031	−1.809	
			(3.934)	(1.951)	(−0.475)	
SMB				0.263	8.675	
				(0.071)	(1.153)	
HML				11.199	16.497	
				(4.967)	(0.733)	
RMW					3.630	
					(0.342)	
CMA					−17.080	
					(−0.481)	
NBER_IND						37.959
						(0.348)
χ^2	4.850	19.797	50.097	13.993	9.251	0.216
dof	8	9	9	7	5	9
p	0.77	0.019	0	0.051	0.099	0.999
RMSE	0.240	0.470	0.606	0.150	0.198	2.579
R^2	0.856	0.474	0.087	0.943	0.944	−3.717

TABLE A7
GMM Results for the Joint Cross-Section of Equity Portfolios

Table A7 shows GMM results for the various asset pricing models at the annual and monthly frequencies using the joint cross-section of equity portfolio returns. For the annual sample in Panel A, we estimate consumption growth moments, the DA coefficient $\tilde{\theta}$, and the disappointment threshold d_2 using the augmented GMM system from equation (13) of the paper. Table A7 does not report estimation results for the consumption growth moments. In the monthly sample of Panel B, the only free parameter in the GDA-I model is the DA coefficient $\tilde{\theta}$, since monthly disappointment events are based on annual disappointment events. Specifically, based on the results from Panel A, if year t is a disappointment year, then we assume that all months in year t are disappointment months. If year t is not a disappointment year, then none of the months in year t are disappointment months. For these tests, we jointly consider four equal-weighted portfolio sorts: the 25 size/book-to-market portfolios, the 25 size/operating profitability portfolios, the 25 size/investment portfolios, and the 10 long-term reversal portfolios. GDA-I is the disappointment aversion discount factor and CCAPM is the consumption-based discount factor. CAPM is the market model. FF3 and FF5 are the Fama-French three- and five-factor models. NBER SDF is the recession-based discount factor. GDA_IND is the disappointment indicator, CONS is aggregate consumption growth, MKT is the market excess return, SMB is the size factor, HML is the value factor, RMW is the profitability factor, CMA is the investment factor, and NBER_IND is the NBER recession indicator. $\tilde{\alpha}$ is the risk aversion parameter in the CCAPM. t-statistics are shown in parentheses. χ^2, dof, and p are the first-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. Panel A does not show t-statistics or p-values for the χ^2-test due to the limited time-series observations relative to the number of portfolios. RMSE and R^2 are the root-mean-square error ($\times 100$) and cross-sectional R-square, respectively. The sample period is 1964-2012.

PANEL A. Annual Returns

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.506					
d_2	−0.532					
CONS ($\tilde{\alpha}$)		91.646				
MKT			2.915	2.377	3.306	
SMB				1.550	2.513	
HML				5.100	−1.593	
RMW					2.929	
CMA					10.831	
NBER_IND						4.739
χ^2	94.490	7,630	283.904	565.240	365.754	14.549
dof	83	84	84	82	80	84
RMSE	1.588	2.387	3.542	1.834	1.598	4.015
R^2	0.806	0.563	0.039	0.742	0.804	−0.379

PANEL B. Monthly Returns

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.159					
	(2.135)					
CONS ($\tilde{\alpha}$)		234.556				
		(2.453)				
MKT			3.233	2.990	4.746	
			(3.021)	(2.443)	(3.693)	
SMB				3.790	5.399	
				(2.279)	(3.207)	
HML				10.133	−1.385	
				(6.157)	(−0.503)	
RMW					6.745	
					(2.421)	
CMA					18.942	
					(4.821)	
NBER_IND						5.509
						(1.027)
χ^2	151.995	246.359	376.476	346.425	302.160	134.894
dof	84	84	84	82	80	84
p	0	0	0	0	0	0
RMSE	0.131	0.262	0.280	0.145	0.129	0.294
R^2	0.695	−0.232	−0.382	0.630	0.706	−0.516

TABLE A8
GMM Results for the 100 SIZE/BM Portfolios

Table A8 shows GMM results for different asset pricing models in the cross-section of 100 size/book-to-market portfolios. For the annual sample in Panel A, we estimate consumption growth moments, the DA coefficient $\tilde{\theta}$, and the disappointment threshold d_2 using the augmented GMM system from equation (13) of the main paper. Table A8 does not report estimation results for the consumption growth moments. For the monthly sample in Panel B, the only free parameter in the GDA-I model is the DA coefficient $\tilde{\theta}$, since monthly disappointment events are based on annual disappointment events. Specifically, based on the results from Panel A, if year t is a disappointment year, then we assume that all months in year t are disappointment months. If year t is not a disappointment year, then none of the months in year t are disappointment months. GDA-I is the disappointment aversion discount factor and CCAPM is the consumption-based discount factor. CAPM is the market model. FF3 and FF5 are the Fama-French three- and five-factor models. NBER SDF is the recession-based discount factor. GDA_IND is the disappointment indicator. CONS is aggregate consumption growth, MKT is the market excess return, SMB is the size factor, HML is the value factor, RMW is the profitability factor, CMA is the investment factor, and NBER_IND is the NBER recession indicator. $\tilde{\alpha}$ is the risk aversion parameter in the CCAPM. t-statistics are shown in parentheses. χ^2, dof, and p are the first-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. Panel A does not show t-statistics or p-values for the χ^2-test due to the limited time-series observations relative to the number of portfolios. RMSE and R^2 are the root-mean-square error ($\times 100$) and cross-sectional R-square, respectively. The sample period is from 1933 to 2012. The sample for the five-factor Fama-French model starts in 1964, and the monthly sample for the CCAPM starts in 1959.

PANEL A. Annual Returns

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	4.031					
d_2	-0.749					
CONS ($\tilde{\alpha}$)		58.273				
MKT			2.978	1.996	2.778	
SMB				0.641	1.991	
HML				2.689	0.953	
RMW					1.651	
CMA					5.618	
NBER_IND						8.161
χ^2	34.089	8,299	6,404	2,200	705.022	7.506
dof	98	99	99	97	95	99
RMSE	2.100	2.731	3.204	2.176	2.155	5.955
R^2	0.769	0.609	0.463	0.752	0.668	−0.854

PANEL B. Monthly Returns

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.578					
	(3.292)					
CONS ($\tilde{\alpha}$)		244.522				
		(2.448)				
MKT			3.573	2.433	3.923	
			(4.944)	(2.996)	(2.883)	
SMB				0.591	5.834	
				(0.524)	(3.443)	
HML				4.467	0.677	
				(4.093)	(0.193)	
RMW					8.254	
					(1.913)	
CMA					12.638	
					(1.972)	
NBER_IND						7.418
						(1.410)
χ^2	125.087	133.184	183.886	66.507	206.415	64.796
dof	99	99	99	97	95	99
p	0.039	0.012	0	0	0	0.996
RMSE	0.185	0.291	0.258	0.179	0.169	0.339
R^2	0.590	−0.501	0.209	0.620	0.562	−0.360

TABLE A9

GMM Results for the 10 Earnings-to-Price Portfolios

Table A9 shows GMM results for different asset pricing models in the cross-section of 10 earnings-to-price portfolios. For the annual sample in Panel A, we estimate consumption growth moments, the DA coefficient $\tilde{\theta}$, and the disappointment threshold d_2 using the augmented GMM system from equation (13) of the main paper. Table A9 does not report estimation results for the consumption growth moments. For the monthly sample of Panel B, the only free parameter in the GDA-I model is the DA coefficient $\tilde{\theta}$, since monthly disappointment events are based on annual disappointment events. Specifically, based on the results from Panel A, if year t is a disappointment year, then we assume that all months in year t are disappointment months. If year t is not a disappointment year, then none of the months in year t are disappointment months. GDA-I is the disappointment aversion discount factor and CCAPM is the consumption-based discount factor. CAPM is the market model. FF3 and FF5 are the Fama-French three- and five-factor models. NBER SDF is the recession-based discount factor. GDA_IND is the disappointment indicator. CONS is aggregate consumption growth, MKT is the market excess return, SMB is the size factor, HML is the value factor, RMW is the profitability factor, CMA is the investment factor, and NBER_IND is the NBER recession indicator. $\tilde{\alpha}$ is the risk aversion parameter in the CCAPM. t-statistics are shown in parentheses. χ^2, dof, and p are the first-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. RMSE and R^2 are the root-mean-square error (×100) and cross-sectional R-square, respectively. The sample period is from 1953 to 2012. The sample for the five-factor Fama-French model starts in 1964.

PANEL A. Annual Returns

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	4.132					
	(1.089)					
d_2	-0.606					
	(-1.387)					
CONS ($\tilde{\alpha}$)		98.838				
		(2.395)				
MKT			3.417	0.864	−0.093	
			(3.567)	(0.420)	(−0.010)	
SMB				3.699	−16.396	
				(1.212)	(−1.089)	
HML				6.367	−12.738	
				(3.626)	(−0.831)	
RMW					14.353	
					(0.690)	
CMA					−1.074	
					(−0.035)	
NBER_IND						8.103
						(0.965)
χ^2	7.593	14.150	23.528	3.868	1.256	2.042
dof	8	9	9	9	5	9
p	0.474	0.117	0.005	0.794	0.939	0.990
RMSE	0.858	1.153	3.085	0.342	0.648	4.020
R^2	0.918	0.853	-0.051	0.987	0.950	-0.785

PANEL B. Monthly Returns

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.848					
	(2.558)					
CONS ($\tilde{\alpha}$)		285.694				
		(2.632)				
MKT			4.373	3.457	−1.661	
			(4.070)	(1.679)	(−0.223)	
SMB				5.500	9.955	
				(1.373)	(0.645)	
HML				15.306	23.813	
				(7.556)	(2.386)	
RMW					13.200	
					(0.595)	
CMA					−33.324	
					(−1.148)	
NBER_IND						10.275
						(0.826)
χ^2	8.815	31.177	76.364	5.584	3.579	3.095
dof	9	9	9	7	5	9
p	0.454	0	0	0.589	0.611	0.960
RMSE	0.061	0.277	0.269	0.023	0.023	0.332
R^2	0.896	−0.961	−0.764	0.987	0.984	−1.683

TABLE A10
GMM Results for Return-Based Models with Price-of-Risk Restrictions

Table A10 shows GMM results for different portfolio sorts and asset pricing models at the annual frequency. For this set of tests, we impose price-of-risk restrictions on the return-based SDFs (CAPM, FF3, FF5) using the augmented GMM system specified in equation (A.16). For the test assets, we consider four equal-weighted portfolio sorts: the 25 size/book-to-market portfolios (Panel A), the 25 size/operating profitability portfolios (Panel B), the 25 size/investment portfolios (Panel C), and the 10 long-term reversal portfolios (Panel D). CAPM is the market model. FF3 and FF5 are the Fama-French three- and five-factor models. MKT is the market excess return, SMB is the size factor, HML is the value factor, RMW is the profitability factor, and CMA is the investment factor. t-statistics are shown in parentheses. χ^2, dof, and p are the first-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. RMSE and R^2 are the root-mean-square error ($\times 100$) and cross-sectional R-square for the test assets excluding the return-based factors. The sample period is 1933-2012. The sample period for the five-factor Fama-French model, the operating profitability, and the investment portfolios starts in 1964.

PANEL A. 25 SIZE/BM

	CAPM	FF3	FF5
MKT	2.462	2.118	4.048
	(3.885)	(2.783)	(3.233)
SMB		0.543	2.114
		(0.557)	(1.338)
HML		2.475	−1.197
		(2.770)	(−0.409)
RMW			7.233
			(2.541)
CMA			9.058
			(2.614)
χ^2	111.123	78.393	59.152
dof	25	25	25
p	0	0	0
RMSE	3.818	1.750	1.969
R^2	0.207	0.833	0.716

PANEL B. 25 SIZE/OP

	CAPM	FF3	FF5
MKT	1.912	2.469	4.048
	(2.021)	(2.118)	(3.233)
SMB		1.032	2.114
		(0.893)	(1.338)
HML		3.624	−1.197
		(3.002)	(−0.409)
RMW			7.233
			(2.541)
CMA			9.058
			(2.614)
χ^2	65.639	76.803	102.793
dof	25	25	25
p	0	0	0
RMSE	4.114	1.518	1.822
R^2	−0.922	0.738	0.622

PANEL C. 25 SIZE/INV

	CAPM	FF3	FF5
MKT	1.912	2.469	4.048
	(2.021)	(2.118)	(3.233)
SMB		1.032	2.114
		(0.893)	(1.338)
HML		3.624	−1.197
		(3.002)	(−0.409)
RMW			7.233
			(2.541)
CMA			9.058
			(2.614)
χ^2	184.454	139.808	75.515
dof	25	25	25
p	0	0	0
RMSE	5.279	2.602	2.249
R^2	−0.873	0.544	0.659

PANEL D. 10 LTR

	CAPM	FF3	FF5
MKT	2.462	2.118	4.048
	(3.885)	(2.783)	(3.233)
SMB		0.543	2.114
		(0.557)	(1.338)
HML		2.475	−1.197
		(2.770)	(−0.409)
RMW			7.233
			(2.541)
CMA			9.058
			(2.614)
χ^2	48.902	49.573	24.472
dof	10	10	10
p	0	0	0.006
RMSE	4.238	1.377	3.069
R^2	0.118	0.906	0.395

TABLE A11
GMM Results for Monthly Portfolio Returns: Alternative Asset Classes

Table A11 shows GMM results for different asset classes and asset pricing models at the monthly frequency. In the monthly sample, the only free parameter in the GDA-I model is the DA coefficient $\tilde{\theta}$, since monthly disappointment events are based on annual disappointment events from the corresponding estimation results reported in Table 4 of the paper. Specifically, based on the results in Table 4, if year t is a disappointment year, then we assume that all months in year t are disappointment months. If year t is not a disappointment year, then none of the months in year t are disappointment months. We consider four sets of portfolios as test assets: the 5 corporate bond portfolios of Nozawa (2012) constructed on the basis of bonds' credit ratings (Panel A), the 6 Fama Treasury bond portfolios sorted on maturity (Panel B), the 6 equity index option portfolios of Constantinides et al. (2013) (Panel C), and a joint cross-section of the above portfolios together with the 6 Fama-French equal-weighted size/book-to-market portfolios (Panel D). In each of these cross-sections, we also include the equity market portfolio as a test asset. GDA-I is the disappointment aversion discount factor and CCAPM is the consumption-based discount factor. CAPM is the market model. FF3 and FF5 are the Fama-French three- and five-factor models. NBER SDF is the recession-based discount factor. GDA_IND is the disappointment indicator, CONS is the aggregate consumption growth, MKT is the excess market return, SMB is the size factor, HML is the value factor, RMW is the profitability factor, CMA is the investment factor, and NBER_IND is the NBER recession indicator. $\tilde{\alpha}$ is the risk aversion parameter in the CCAPM. t-statistics are shown in parentheses. χ^2, dof, and p are the first-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. RMSE and R^2 are the root-mean-square error ($\times 100$) and cross-sectional R-square, respectively. The sample period is 1976-2009 for the corporate bond portfolios, 1952-2012 for the Treasury bond portfolios (1964-2012 in the FF5 model), 1987-2011 for the equity index option portfolios, and 1987-2009 for the joint cross-section.

PANEL A. 5 Corporate Bond Portfolios

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.469					
	(1.631)					
CONS ($\tilde{\alpha}$)		183.881				
		(1.767)				
MKT			2.967	20.817	−13.192	
			(2.417)	(0.315)	(−0.761)	
SMB				−9.328	29.157	
				(−0.100)	(1.023)	
HML				69.877	−12.471	
				(0.328)	(−0.199)	
RMW					−9.135	
					(−0.380)	
CMA					−38.164	
					(−0.689)	
NBER_IND						4.071
						(1.131)
χ^2	0.997	10.183	13.519	0.206	0.175	1.793
dof	5	5	5	3	1	5
p	0.964	0.070	0.018	0.976	0.675	0.876
RMSE	0.045	0.232	0.144	0.032	0.010	0.152
R^2	0.953	−0.239	0.525	0.959	0.997	0.469

PANEL B. 6 Treasury Bond Portfolios

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	4.593					
	(1.972)					
CONS ($\tilde{\alpha}$)		200				
		(2.136)				
MKT			3.009	13.278	13.754	
			(3.284)	(2.543)	(1.245)	
SMB				−11.922	−22.237	
				(−0.796)	(−0.616)	
HML				48.735	6.602	
				(2.103)	(0.152)	
RMW					−26.560	
					(−0.326)	
CMA					47.288	
					(0.704)	
NBER_IND						0.854
						(0.970)
χ^2	17.466	24.462	46.896	4.232	0.412	22.774
dof	6	6	6	4	2	6
p	0.007	0	0	0.375	0.813	0.876
RMSE	0.024	0.142	0.096	0.005	0.003	0.230
R^2	0.976	−0.300	0.624	0.998	0.999	−1.135

PANEL C. 6 Equity Index Option Portfolios

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.873					
	(1.453)					
CONS ($\tilde{\alpha}$)		391.170				
		(1.014)				
MKT			3.001	10.918	−26.864	
			(2.056)	(1.134)	(−0.087)	
SMB				31.099	108.475	
				(1.768)	(1.287)	
HML				70.458	−42.366	
				(1.353)	(−0.384)	
RMW					180.785	
					(0.849)	
CMA					−214.300	
					(−0.145)	
NBER _IND						3.203
						(1.052)
χ^2	21.782	31.685	73.914	13.990	1.341	30.081
dof	6	6	6	4	2	6
p	0.001	0	0	0.007	0.511	0
RMSE	0.380	0.722	0.592	0.271	0.122	0.594
R^2	0.682	−0.141	0.232	0.839	0.966	0.226

PANEL D. Joint Cross-Section

	GDA-I	CCAPM	CAPM	FF3	FF5	NBER SDF
GDA_IND ($\tilde{\theta}$)	3.411					
	(1.596)					
CONS ($\tilde{\alpha}$)		326.996				
		(1.330)				
MKT			3.142	3.652	−15.092	
			(1.986)	(1.970)	(−1.219)	
SMB				4.496	22.278	
				(1.783)	(1.991)	
HML				8.953	66.064	
				(3.982)	(1.681)	
RMW					12.154	
					(0.512)	
CMA					−136.858	
					(−1.749)	
NBER_IND						3.590
						(0.977)
χ^2	71.243	112.666	289.241	265.213	36.605	72.184
dof	23	23	23	21	19	23
p	0	0	0	0	0	0
RMSE	0.264	0.454	0.392	0.344	0.277	0.408
R^2	0.684	0.061	0.302	0.462	0.650	0.242

TABLE A12
GMM Results for Annual Portfolio Returns: Constant Thresholds and Price of Disappointment Risk Restriction

Table A12 shows GMM results from three indicator-based SDFs with constant thresholds ($M_{t+1}^{Ind} = \tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq \text{constant}\}$) and an indicator-based SDF with a restricted price of disappointment risk. We consider three alternative constant thresholds: i) a GDA threshold derived after imposing no persistence ($\phi_c = 0$) in consumption growth ($\mathbf{1}\{\Delta c_{t+1} \leq \mu_c + d_2\sigma_c\}$), ii) a threshold equal to the mean of consumption growth ($\mathbf{1}\{\Delta c_{t+1} \leq \mu_c\}$), and iii) a threshold equal to zero consumption growth ($\mathbf{1}\{\Delta c_{t+1} \leq 0\}$). The last column of Table A12 shows the corresponding results for a restricted version of the GDA-I model, where the price of disappointment risk $\tilde{\theta}$ is equal to 1 ($M_{t+1}^{GDA-I*} = \mathbf{1}\{\Delta c_{t+1} \leq \mu_c(1-\phi_c) + \phi_c\Delta c_t + d_2\sqrt{1-\phi_c^2}\sigma_c\}$). The test assets are the 25 size/book-to-market portfolios (Panel A), the 25 size/operating profitability portfolios (Panel B), the 25 size/investment portfolios (Panel C), and the 10 long-term reversal portfolios (Panel D). t-statistics are shown in parentheses. χ^2, dof, and p are the first-stage χ^2-test, degrees of freedom, and p-value that all moment conditions are jointly zero. RMSE and R^2 are the root-mean-square error ($\times100$) and cross-sectional R-square, respectively. The sample period is from 1933 to 2012. The sample period for the operating profitability and the investment portfolios begins in 1964.

Panel A. 25 SIZE/BM

	GDA Threshold; i.i.d. Δc_t $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq \mu_c + d_2\sigma_c\}$	Mean Threshold $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq \mu_c\}$	Zero Threshold $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq 0\}$	GDA Threshold; $\tilde{\theta}=1$ $\mathbf{1}\{\Delta c_{t+1} \leq \mu_c(1-\phi_c) + \phi_c\Delta c_t + d_2\sqrt{1-\phi_c^2}\sigma_c\}$
$\tilde{\theta}$	2.736	2.072	5.477	1
	(2.559)	(4.441)	(2.413)	
d_2	−0.289			0.111
	(−0.125)			(0.244)
χ^2	26.557	43.527	36.037	81.626
dof	23	24	24	24
p	0.275	0.008	0.054	0
RMSE	2.053	2.227	2.522	9.056
R^2	0.770	0.730	0.653	−3.458

Panel B. 25 SIZE/OP

	GDA Threshold; i.i.d. Δc_t $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq \mu_c + d_2\sigma_c\}$	Mean Threshold $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq \mu_c\}$	Zero Threshold $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq 0\}$	GDA Threshold; $\tilde{\theta}=1$ $\mathbf{1}\{\Delta c_{t+1} \leq \mu_c(1-\phi_c) + \phi_c\Delta c_t + d_2\sqrt{1-\phi_c^2}\sigma_c\}$
$\tilde{\theta}$	4.261	2.540	4.276	1
	(1.189)	(1.925)	(1.601)	
d_2	−0.235			−0.206
	(−0.858)			(−0.349)
χ^2	9.144	24.793	30.328	67.027
dof	23	24	24	24
p	0.995	0.417	0.174	0
RMSE	2.510	2.192	1.464	5.764
R^2	0.284	0.454	0.753	−2.773

Panel C. 25 SIZE/INV

	GDA Threshold; i.i.d. Δc_t $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq \mu_c + d_2\sigma_c\}$	Mean Threshold $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq \mu_c\}$	Zero Threshold $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq 0\}$	GDA Threshold; $\tilde{\theta}=1$ $\mathbf{1}\{\Delta c_{t+1} \leq \mu_c(1-\phi_c) + \phi_c\Delta c_t + d_2\sqrt{1-\phi_c^2}\sigma_c\}$
$\tilde{\theta}$	4.288	2.599	4.429	1
	(1.408)	(1.950)	(1.649)	
d_2	−0.251			−0.206
	(−1.549)			(−0.350)
χ^2	11.546	27.980	40.057	168.046
dof	23	24	24	23
p	0.976	0.260	0.021	0
RMSE	3.540	3.658	2.741	6.528
R^2	0.157	0.100	0.494	−1.864

Panel D. 10 LTR

	GDA Threshold; i.i.d. Δc_t $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq \mu_c + d_2\sigma_c\}$	Mean Threshold $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq \mu_c\}$	Zero Threshold $\tilde{\theta}\mathbf{1}\{\Delta c_{t+1} \leq 0\}$	GDA Threshold; $\tilde{\theta}=1$ $\mathbf{1}\{\Delta c_{t+1} \leq \mu_c(1-\phi_c) + \phi_c\Delta c_t + d_2\sqrt{1-\phi_c^2}\sigma_c\}$
$\tilde{\theta}$	2.954	2.249	5.667	1
	(2.630)	(4.301)	(2.518)	
d_2	−0.240			−0.095
	(−0.100)			(−0.212)
χ^2	12.508	18.762	19.838	33.591
dof	8	9	9	9
p	0.129	0.027	0.018	0
RMSE	3.685	2.003	2.583	8.807
R^2	0.333	0.803	0.672	−2.804

TABLE A13
Portfolios Sorted on the Covariance with the Disappointment Indicator

Table A13 shows the premia and Sharpe ratios for quintile portfolios constructed on the basis of covariances of the 25 SIZE/BM equal-weighted portfolio returns with respect to the disappointment indicator (GDA-I). GDA-I is determined using the estimation results for the 25 SIZE/BM portfolios reported in Panel A of Table 2 in the main body of the study. Starting from an initial time-window of 20 years (240 months), we recursively compute the covariances of the 25 SIZE/BM portfolio returns with respect to GDA-I, sort these portfolios into quintiles according to their GDA-I covariances, and compute their post-ranking equal-weighted returns. The spread between the two extreme quintiles yields the Disappointing-minus-Elating (DME) factor return. t-statistics, which are shown in parentheses, are adjusted for autocorrelation and heteroscedasticity using the Newey-West correction with four lags. Table A13 also reports the time-series average of GDA-I covariances for each quintile portfolio. The sample period is 1933-2012.

Rank	Annual Returns			Monthly Returns		
	Covariance with the GDA-I	Premia	Sharpe	Covariance with the GDA-I	Premia	Sharpe
DISAPPOINTING	−5.53	15.25	0.50	−0.43	0.99	0.16
4	−4.56	13.32	0.52	−0.37	0.91	0.17
3	−3.94	10.07	0.44	−0.32	0.71	0.14
2	−3.28	8.46	0.39	−0.27	0.73	0.14
ELATING	−2.46	8.07	0.40	−0.20	0.59	0.13
DME	−3.08	7.17	0.39	−0.23	0.40	0.11
		(2.99)			(3.02)	

TABLE A14
Fama-MacBeth Results for Individual Stock Returns

Table A14 shows Fama-MacBeth estimation results for individual stock returns using various asset pricing models. Panel A shows annual results, whereas Panel B shows monthly results. GDA-I is the disappointment aversion model consisted of the GDA-I indicator (GDA_IND) only. CCAPM is the standard consumption-based model, CAPM is the market model, FF3 is the Fama-French three-factor model, and NBER SDF is the recession-based stochastic discount factor. GDA_IND is determined using the estimation results for the 25 SIZE/BM portfolios reported in Panel A of Table 2 in the main body of the study. CONS is aggregate consumption growth, MKT is the excess market return, SMB is the size factor, HML is the value factor, and NBER_IND is the NBER recession indicator. $\tilde{\theta}$ and $\tilde{\alpha}$ are the disappointment aversion and risk aversion parameters, respectively, implied by the estimates in Table A14. t-statistics are shown in parentheses, and Shanken (1992) t-statistics are shown in brackets. The sample period is from 1933 to 2012. The monthly sample for the CCAPM begins in 1959.

PANEL A. Annual Returns

	GDA-I	CCAPM	CAPM	FF3	NBER SDF
GDA_IND	0.306				
Implied $\tilde{\theta}$	2.22				
	(3.84)				
	[3.14]				
CONS		0.012			
Implied $\tilde{\alpha}$		45.53			
		(4.38)			
		[3.87]			
MKT			0.116	0.109	
			(4.82)	(4.92)	
			[4.67]	[4.90]	
SMB				0.046	
				(2.56)	
				[2.47]	
HML				0.008	
				(0.42)	
				[0.40]	
NBER_IND					0.367
					(3.77)
					[2.93]
R^2	0.171	0.222	0.265	0.343	0.089

PANEL B. Monthly Returns

	GDA-I	CCAPM	CAPM	FF3	NBER SDF
GDA_IND	0.307				
Implied $\tilde{\theta}$	2.26				
	(5.04)				
	[3.91]				
CONS		0.002			
Implied $\tilde{\alpha}$		192			
		(3.91)			
		[3.31]			
MKT			0.009	0.010	
			(5.38)	(5.93)	
			[5.37]	[5.92]	
SMB				0.002	
				(1.58)	
				[1.57]	
HML				-0.001	
				(-0.72)	
				[-0.72]	
NBER_IND					0.321
					(4.29)
					[3.22]
R^2	0.120	0.131	0.211	0.239	0.077