Appendix to "Dividend yields, dividend growth, and return predictability in the cross-section of stocks"

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Abstract

This appendix to "Dividend yields, dividend growth, and return predictability in the cross-section of stocks" presents supplementary results not included in the paper. Each section below refers to a specific section in the paper.

1 Appendix to Section IV: Delta method for standard errors of long-run coefficients

To compute the asymptotic standard errors of the long-run predictive coefficients, $\mathbf{b}^K \equiv \left(b_r^K, b_d^K, b_{dp}^K\right)'$, we use the delta method:

$$\text{Var}(\mathbf{b}^K) = \frac{\partial \mathbf{b}^K}{\partial \mathbf{b}'} \, \text{Var}(\mathbf{b}) \frac{\partial \mathbf{b}^K}{\partial \mathbf{b}}, \tag{A-1}$$

where $\mathbf{b} \equiv (b_r, b_d, \phi)'$ denotes the vector of VAR slopes. The matrix of derivatives is given by:

$$\frac{\partial \mathbf{b}^K}{\partial \mathbf{b}'} \equiv \begin{bmatrix} \frac{\partial b_r^K}{\partial b_r} & \frac{\partial b_r^K}{\partial b_d} & \frac{\partial b_r^K}{\partial \phi} \\ \frac{\partial b_d^K}{\partial b_r} & \frac{\partial b_d^K}{\partial b_d} & \frac{\partial b_d^K}{\partial \phi} \\ \frac{\partial b_{dp}^K}{\partial b_r} & \frac{\partial b_{dp}^K}{\partial b_d} & \frac{\partial b_{dp}^K}{\partial \phi} \end{bmatrix} = \begin{bmatrix} \frac{(1-\rho^K \phi^K)}{1-\rho\phi} & 0 & \frac{-Kb_r\rho^K\phi^{K-1}(1-\rho\phi)+\rho b_r(1-\rho^K\phi^K)}{(1-\rho\phi)^2} \\ 0 & \frac{(1-\rho^K \phi^K)}{1-\rho\phi} & \frac{-Kb_d\rho^K\phi^{K-1}(1-\rho\phi)+\rho b_d(1-\rho^K\phi^K)}{(1-\rho\phi)^2} \\ 0 & 0 & K\rho^K\phi^{K-1} \end{bmatrix}. \tag{A-2}$$

2 Appendix to Section V: Derivation of the variance decomposition for dp with excess returns

Following Cochrane (2008), by multiplying both sides of the augmented Campbell and Shiller (1988) decomposition based on excess returns by $dp_t - \text{E}(dp_t)$, and taking unconditional expectations we obtain the following variance decomposition for dp_t:

$$\text{Var}(dp_t) = \text{Cov}\left(\sum_{j=1}^K \rho^{j-1} r_{t+j}^e, dp_t\right) - \text{Cov}\left(\sum_{j=1}^K \rho^{j-1}\Delta d_{t+j}, dp_t\right)$$

$$+ \text{Cov}\left(\sum_{j=1}^K \rho^{j-1} r_{f,t+j}, dp_t\right) + \text{Cov}\left[\rho^K dp_{t+k}, dp_t\right], \tag{A-3}$$

and by dividing both sides by $\text{Var}(dp_t)$, we have:

$$1 = \beta \left(\sum_{j=1}^{K} \rho^{j-1} r_{t+j}^e, dp_t \right) - \beta \left(\sum_{j=1}^{K} \rho^{j-1} \Delta d_{t+j}, dp_t \right)$$

$$+ \beta \left(\sum_{j=1}^{K} \rho^{j-1} r_{f,t+j}, dp_t \right) + \beta \left[\rho^K dp_{t+k}, dp_t \right] \Leftrightarrow$$

$$1 = b_r^K - b_d^K + b_f^K + b_{dp}^K, \tag{A-4}$$

where $\beta(y, x)$ denotes the slope from a regression of y on x. This expression represents the variance decomposition for dp when the predictive slopes are obtained directly from long-horizon regressions.

3 Appendix to Sections V and VI: results

Below is the list of figures, presented further below, which are associated with Sections V and VI in the paper.

Subsection	Figure
V.A	1
V.C	2 & 3
V.D	4 & 5
VI	6 & 7

References

Campbell, J., and R. Shiller, 1988, The dividend price ratio and expectations of future dividends and discount factors, Review of Financial Studies 1, 195–228.

Cochrane, J., 2008, The dog that did not bark: A defense of return predictability, Review of Financial Studies 21, 1533–1575.
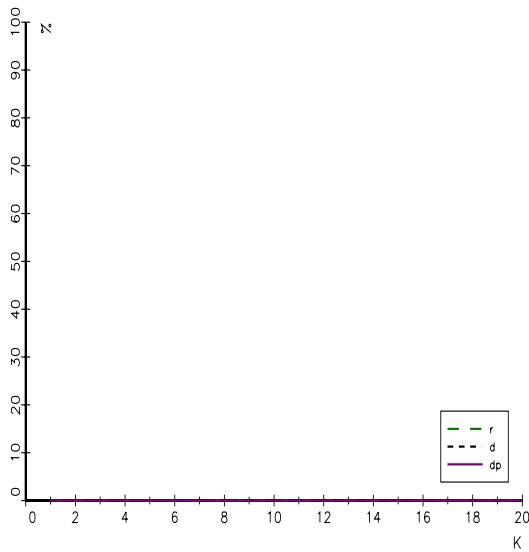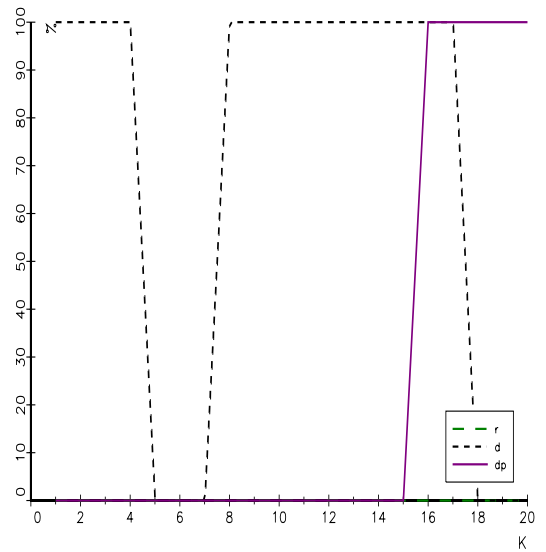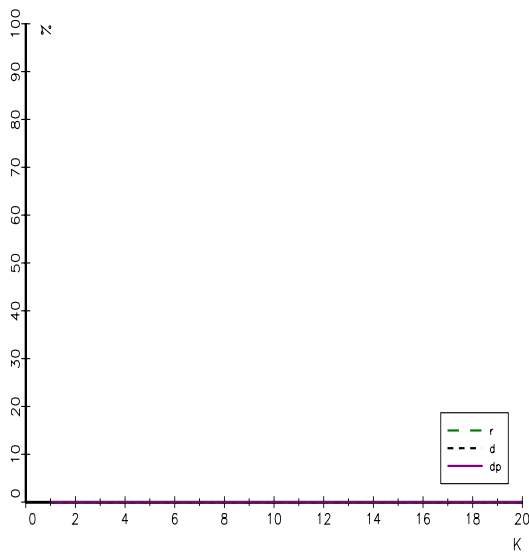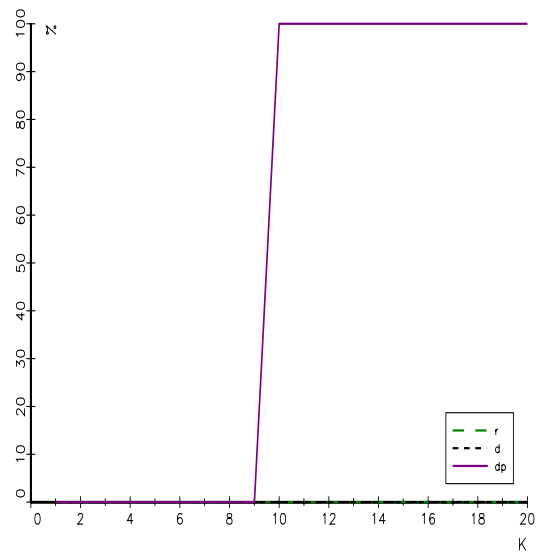
Figure 1: Term-structure of bootstrap-based *p*-values

This figure plots the simulated *p*-values for the future return (*r*), dividend growth (*d*), and dividend yield (*dp*) slopes from a Bootstrap simulation with 10,000 replications under the null of no predictability. The predictive variable is the dividend yield. The numbers indicate the fraction of pseudo samples under which the return and dividend yield (dividend growth) coefficient is higher (lower) than the corresponding estimates from the original sample. *K* represents the number of years ahead. The sample is 1928–2010.
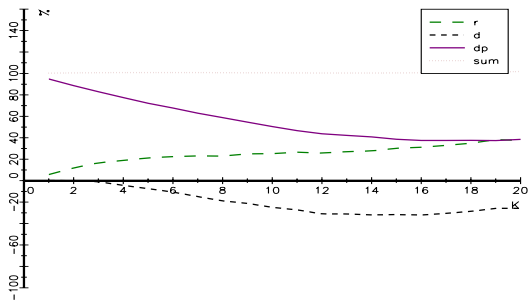
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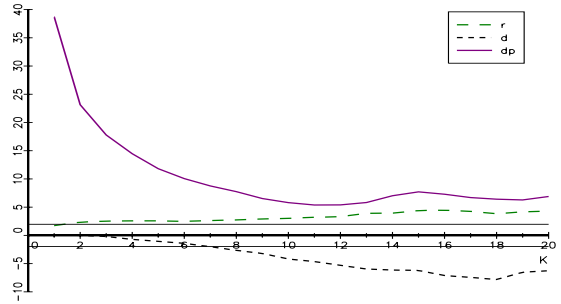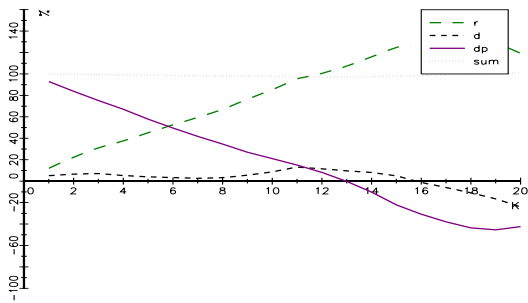
Panel B (Small, t-stats)

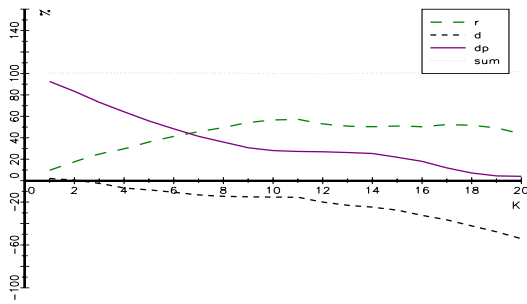Panel C (Large, slopes)
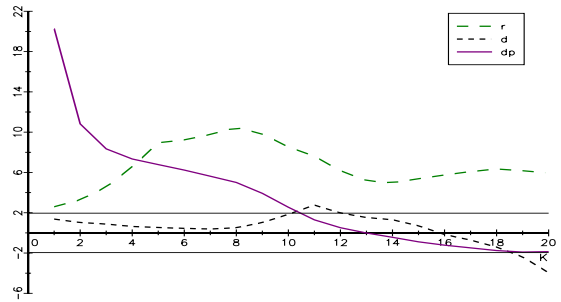
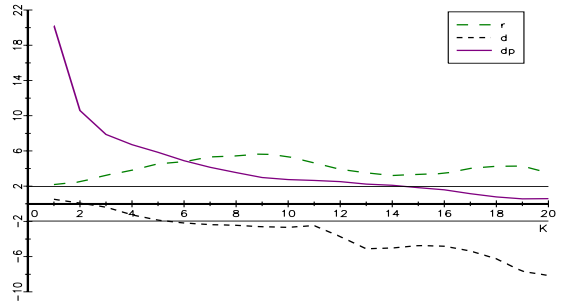Panel D (Large, t-stats)
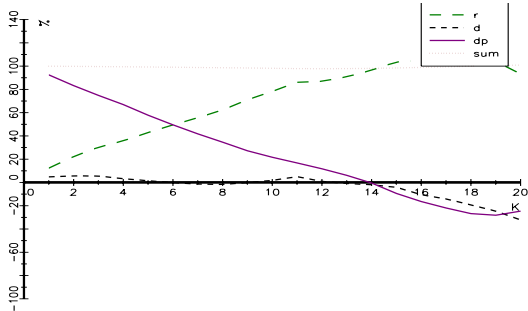
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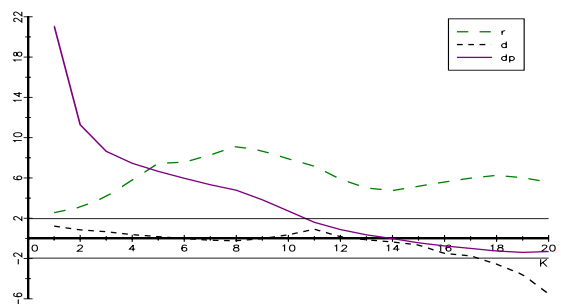
Panel F (Market, t-stats)

Figure 2: Term structure of long-run coefficients: Size portfolios (1946–2010)
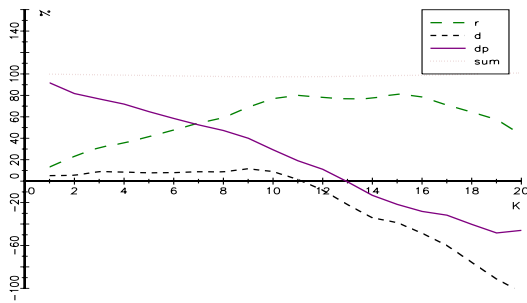
This figure plots the term structure of the long-run predictive coefficients, and respective t-statistics, for the case of size portfolios. The predictive slopes are associated with the log return (r), log dividend growth (d), and log dividend-to-price ratio (dp). The forecasting variable is the log dividend-to-price ratio in all three cases. "Sum" denotes the value of the variance decomposition, in %. Panels A and B present the results for small stocks, while Panels C and D show the results for big stocks. Panels E and F are related to the value-weighted stock market index (VW). The long-run coefficients are measured in %, and K represents the number of years ahead. The horizontal lines represent the 5% critical values (-1.96, 1.96). The sample is 1946–2010.
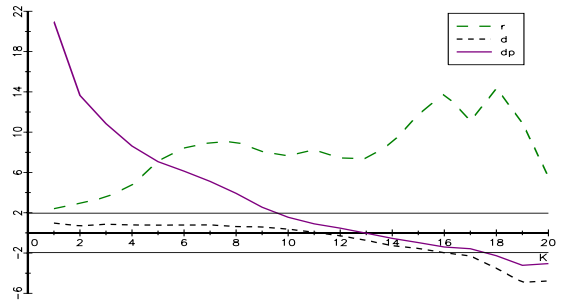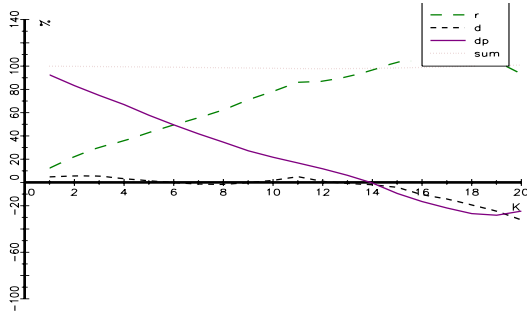
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Panel A (Growth, slopes)
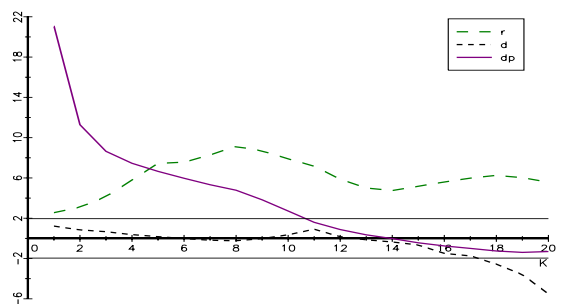
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Panel C (Value, slopes)
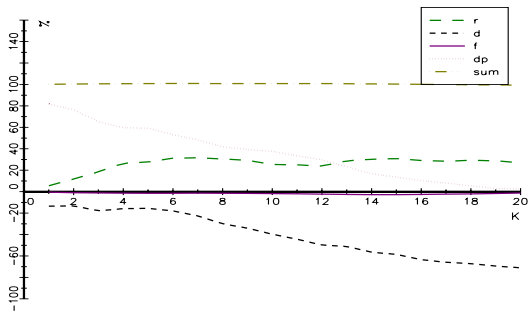
Panel D (Value, t-stats)
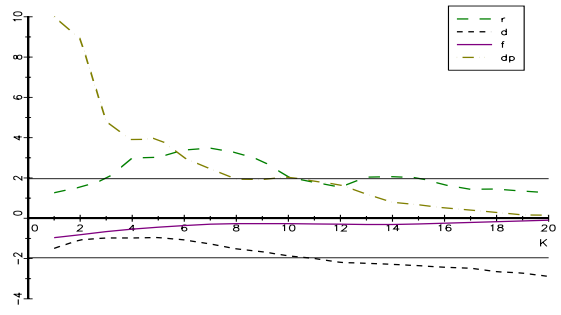
Panel E (Market, slopes)

Panel F (Market, t-stats)

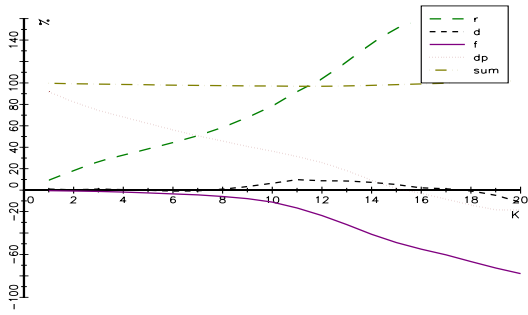Figure 3: Term structure of long-run coefficients: BM portfolios (1946–2010)

This figure plots the term structure of the long-run predictive coefficients, and respective t-statistics, for the case of BM portfolios. The predictive slopes are associated with the log return (r), log dividend growth (d), and log dividend-to-price ratio (dp). The forecasting variable is the log dividend-to-price ratio in all three cases. "Sum" denotes the value of the variance decomposition, in %. Panels A and B present the results for growth stocks, while Panels C and D show the results for value stocks. Panels E and F are related to the value-weighted stock market index (VW). The long-run coefficients are measured in %, and K represents the number of years ahead. The horizontal lines represent the 5% critical values (-1.96, 1.96). The sample is 1946–2010.
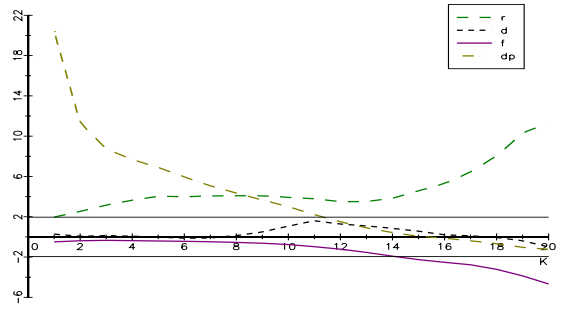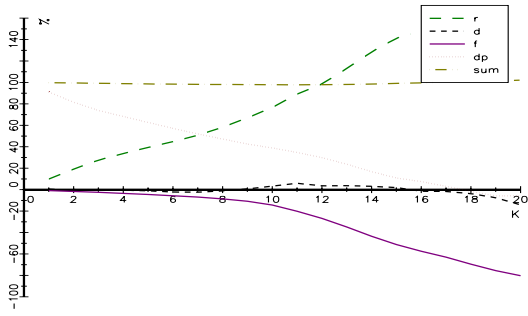
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Panel A (Small, slopes)
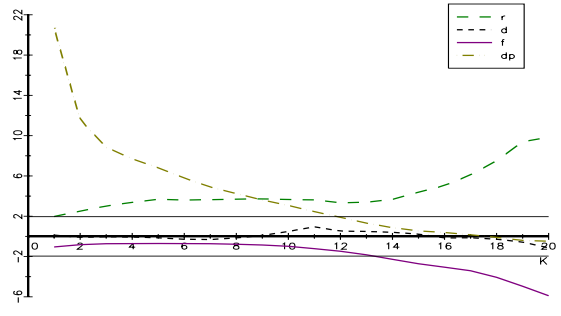
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Panel C (Large, slopes)
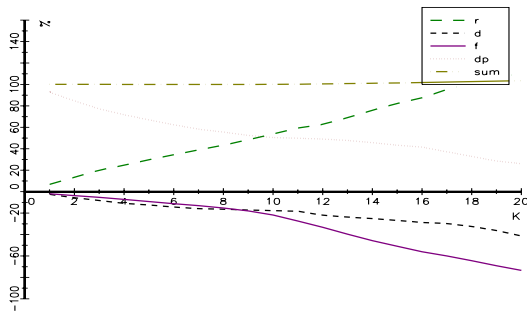
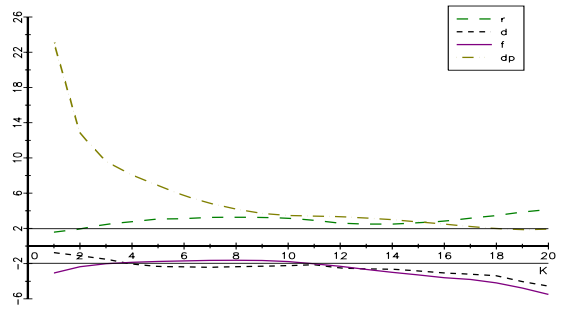Panel D (Large, t-stats)

Panel E (Market, slopes)

Panel F (Market, t-stats)

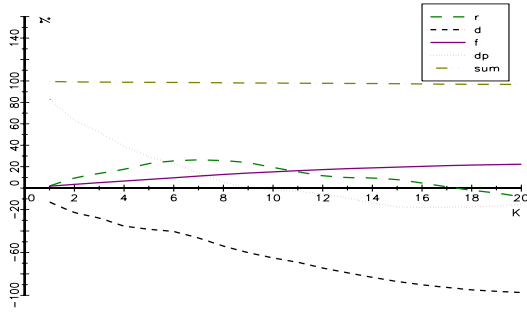Figure 4: Term structure of long-run coefficients: Size portfolios (excess returns)

This figure plots the term structure of the long-run predictive coefficients, and respective t-statistics, for the case of size portfolios. The predictive slopes are associated with the excess log return (r), log dividend growth (d), log interest rate (f), and log dividend-to-price ratio (dp). The forecasting variable is the log dividend-to-price ratio in all four cases. "Sum" denotes the value of the variance decomposition, in %. Panels A and B present the results for small stocks, while Panels C and D show the results for big stocks. The long-run coefficients are measured in %, and K represents the number of years ahead. The horizontal lines represent the 5% critical values (-1.96, 1.96). The sample is 1928–2010.
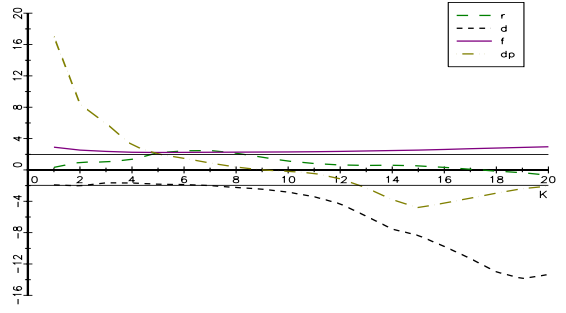
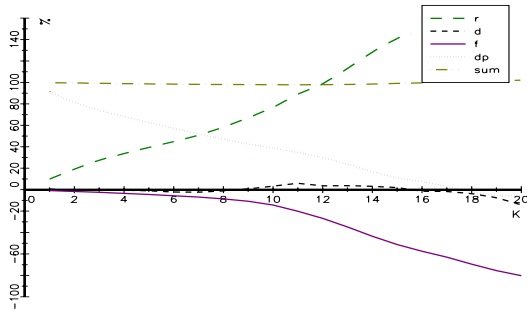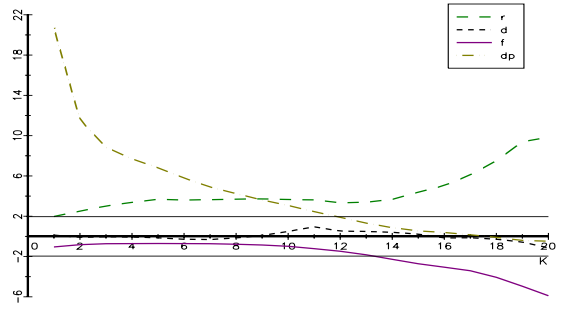Figure 5: Term structure of long-run coefficients: BM portfolios (excess returns)
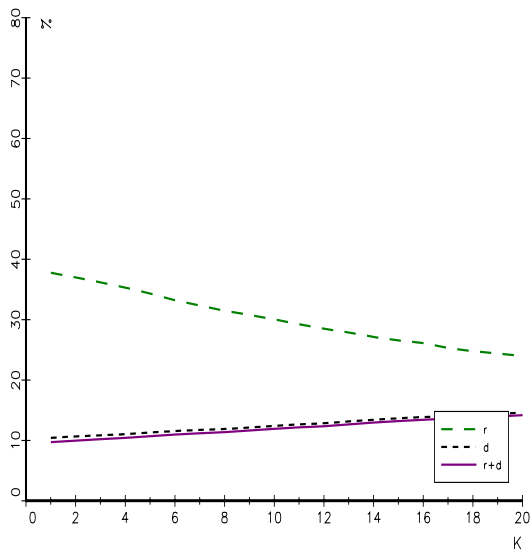
This figure plots the term structure of the long-run predictive coefficients, and respective t-statistics, for the case of BM portfolios. The predictive slopes are associated with the excess log return (r), log dividend growth (d), log interest rate (f), and log dividend-to-price ratio (dp). The forecasting variable is the log dividend-to-price ratio in all four cases. "Sum" denotes the value of the variance decomposition, in %. Panels A and B present the results for growth stocks, while Panels C and D show the results for value stocks. The long-run coefficients are measured in %, and K represents the number of years ahead. The horizontal lines represent the 5% critical values (-1.96, 1.96). The sample is 1928–2010.
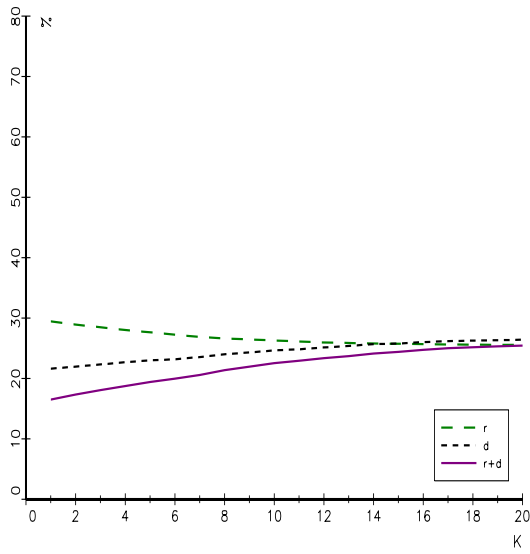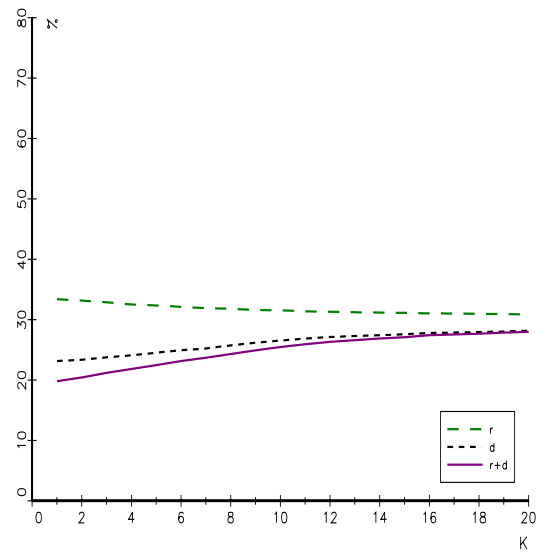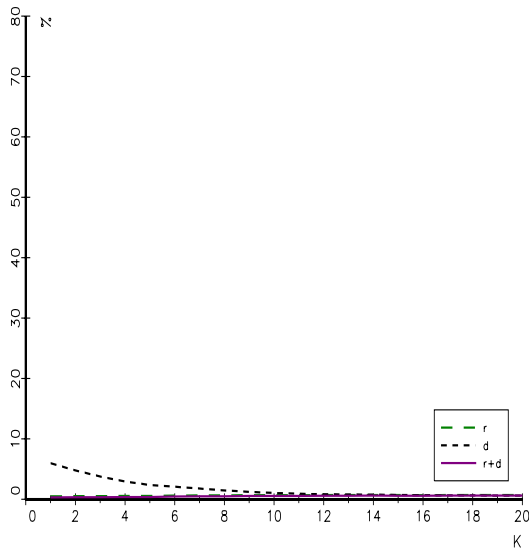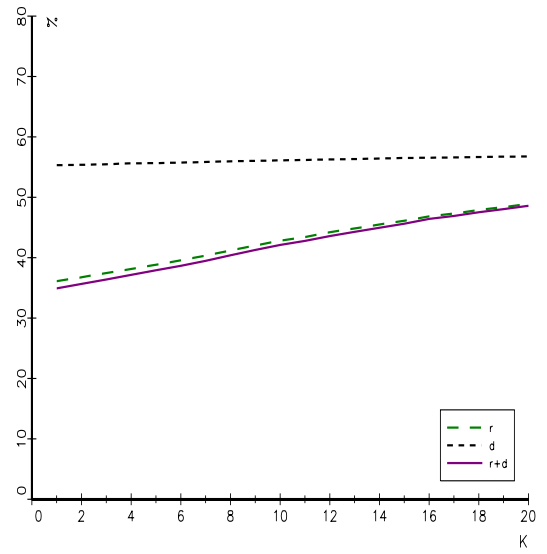
Panel A (Small) Panel B (Large)
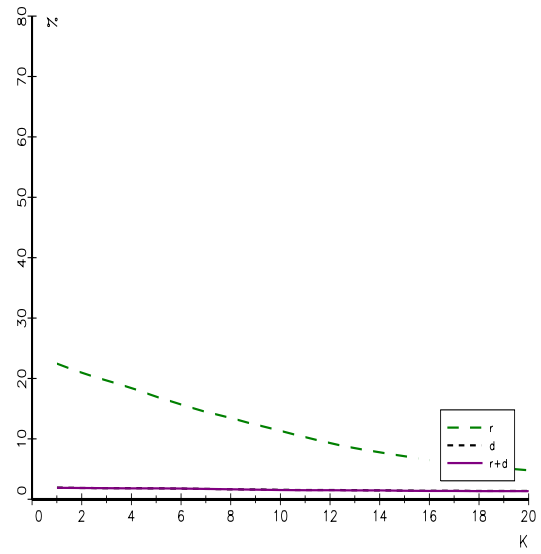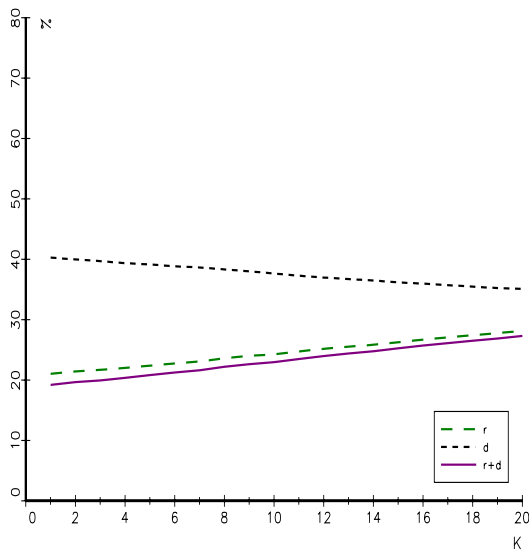
Panel C (Growth) Panel D (Value)

Figure 6: Term-structure of simulated p-values: no return predictability
This figure plots the simulated p-values for the return (r) and dividend growth (d) slopes from a Monte-Carlo simulation with 10,000 replications under the null of no return predictability. The predictive variable is the dividend yield. The numbers indicate the fraction of pseudo samples under which the return or dividend growth coefficient is higher than the corresponding estimates from the original sample. The line labeled $r + d$ shows the faction of samples in which both coefficients are jointly greater than the corresponding sample estimates. K represents the number of years ahead. The sample is 1928–2010.
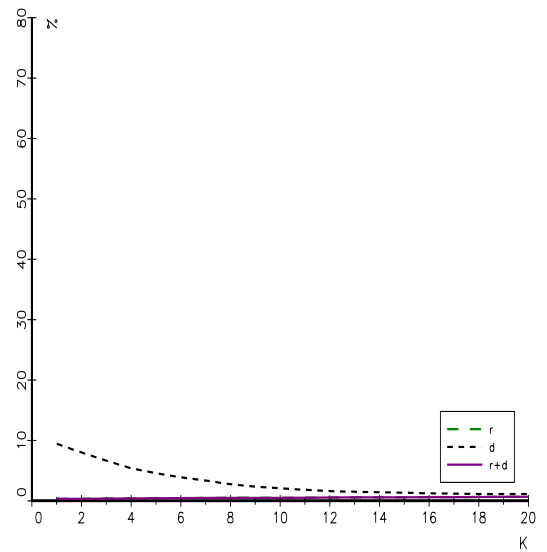
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Panel A (Small)   Panel B (Large)

Panel C (Growth)   Panel D (Value)

Figure 7: Term-structure of simulated p-values: no dividend predictability

This figure plots the simulated p-values for the return (r) and dividend growth (d) slopes from a Monte-Carlo simulation with 10,000 replications under the null of no dividend growth predictability. The predictive variable is the dividend yield. The numbers indicate the fraction of pseudo samples under which the return or dividend growth coefficient is lower than the corresponding estimates from the original sample. The line labeled $r + d$ shows the faction of samples in which both coefficients are jointly lower than the corresponding sample estimates. K represents the number of years ahead. The sample is 1928–2010.