B35150 Winter 2014 Quiz Solutions

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Quiz 1

1. You run a regression, and find that the percent dividend yield DP_t, expressed in percent units (2 = 2%) follows

$$DP_{t+1} = 0.9 \times DP_t + \varepsilon_{t+1}.$$

This year's DP ratio is 2%. What is the forecast (conditional mean) of dividend yields for each of the next 2 years? $(E_t(DP_{t+1}); E_t(DP_{t+2}))$

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0.9 x 2 = 1.8

0.9 x 1.8 = 1.62

Quiz 1

2. In November of 2008, stock volatility $\sigma(r)$ reached 64% on an annualized basis. What size of daily fluctuation does this correspond to – what is the actual volatility (standard deviation) of daily returns? (Use $256 = 16^2$ trading days per year).

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$64/\sqrt{256} = 64/16 = 4\%$. Volatility scales with square root of horizon.

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Decline. This is the fallacy that higher expected returns draws more money.

Quiz 2

Q1: What are the rough numerical values in the following regressions. Smal letters are logs; ignore constants

$$\begin{aligned} r_{t+1} &= ?_r dp_t + \varepsilon^r_{t+1} \\ \Delta d_{t+1} &= ?_d dp_t + \varepsilon^d_{t+1} \\ dp_{t+1} &= ?_{dp} dp_t + \varepsilon^{dp}_{t+1} \end{aligned}$$

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$$
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\end{aligned}
$$

$$
\begin{aligned}
?_r &\sim 0.1 \\
?_d &\sim 0 \\
?_{dp} &\sim 0.94
\end{aligned}
$$

Quiz 2

Q2: Sketch the response of returns and dividend yields to a shock to dividend yields, $\varepsilon^{dp}_{t+1} = 1$, $\varepsilon^{d}_{t+1} = 0$

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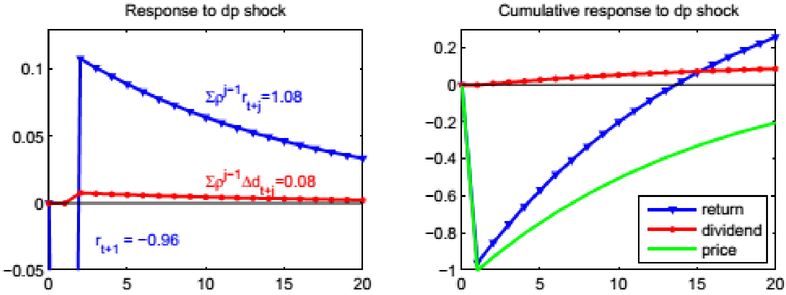

Quiz 3

Q1: Which gets better returns going forward, stocks that have had 5 years of really good growth in sales, or stocks that have had 5 years of bad (negative) growth in sales?

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Bad growth in sales.
Fama-French (1996): "...we find that past sales growth is negatively related to future return."

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Q2: FF "Dissecting anomalies" looks for new variables beyond size and value that can forecast returns. In one sentence, how did FF adjust portfolio returns to account for size and BM effects?

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Fama-French (2008): “The monthly return on a stock is measured net of the return on a *matching* portfolio formed on size and book-to-market (B/M).”

“The matching portfolios are the updated 25 size-B/M portfolios of Fama-French (1993).”

“...[the adjusted average returns] are similar to the intercepts from the 3-factor regression model....”

Quiz 4

1. Many "Dissecting anomaly" average returns are not even across portfolios, but are concentrated in the extreme portfolios. Why does this happen (there are two good answers), and does it mean something's wrong?

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Many of the anomalies come from micro caps because:

1. Micro caps are more volatile
2. Portfolios are equally weighted and thus magnify these effects.

It highlights the limitation of using equally weighted portfolios for dissecting anomalies.

Quiz 4

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Profitability, which uses gross profits as a proxy:

(Revenue-COGS) / Assets

Quiz 5

An investor is risk neutral with $u(c_t) = c_t$ and $\beta = 0.9$, i.e. his overall utility function is simply $c_t + 0.9c_{t+1}$. He eats $c_t = \$100$ and $c_{t+1} = \$110$.

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1. Use the basic asset pricing equation $p_t = E_t\left[\beta \frac{u'(c_{t+1})}{u'(c_t)} x_{t+1}\right]$ to find the price p_t of a one-period bond that pays \$1 at time $t+1$.

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$$\frac{u'\left(C_{t+1}\right)}{u'\left(C_t\right)} = 1$$

$$\begin{aligned} P_t &= E_t\left[0.9 \times 1\right] \\ &= 0.9 \end{aligned}$$

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Typo:

$$\frac{1}{1-x} \approx 1 + x.$$

Pricing Equation:

$$\begin{aligned} 1 &= E_t\left[\beta \frac{u'\left(C_{t+1}\right)}{u'\left(C_t\right)} R^f\right] \\ \Rightarrow \quad R^f &= \frac{1}{E_t\left[\beta \frac{u'(C_{t+1})}{u'(C_t)}\right]} \end{aligned}$$

Quiz 5

$$\begin{aligned} \Rightarrow \quad R^f &= \frac{1}{0.9} = \frac{1}{1 - 0.10} \\ \Rightarrow \quad R^f &\approx 1.10 \end{aligned}$$

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R^f independent of c_{t+1}, so if $c_{t+1} = \$120$, no change to R^f.
What would you expect instead? R^f increases. How? Add risk aversion:

$$\begin{aligned} m_{t+1} &= \beta \frac{u'(C_{t+1})}{u'(C_t)} = \beta \left(\frac{C_{t+1}}{C_t} \right)^{-\gamma} \\ &\approx 1 - \delta - \gamma \Delta c_{t+1}, \end{aligned}$$

where $c_{t+1} = \log(C_{t+1})$.

Quiz 5

Recall:

$$R^f = \frac{1}{E_t\left[m_{t+1}\right]}.$$

This implies:

$$R^f \quad \approx \quad \frac{1}{1-\delta-\gamma E_t\left[\Delta c_{t+1}\right]}.$$

Quiz 5

Use the approximation $\frac{1}{1-x} \approx 1 + x$:

$$R^f \approx 1 + \delta + \gamma E_t \left[\Delta c_{t+1} \right].$$

Thus, if expected consumption growth rises, would expect risk-free rate to increase.

Quiz 5

Intuition:
Risk aversion compels the investor to smooth consumption over time by borrowing from the future if $E_t [\Delta c_{t+1}]$ rises.
But his expected consumption remains the same at $120.
Therefore, the borrowing rate must rise to make him indifferent between borrowing from the future and staying put.

Quiz 6

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One year performance persists, but is mostly eliminated after one year.

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Q2: Suppose half of the funds have true alpha $\alpha = 5\%$ but the other half have true alpha $\alpha = -5\%$. Though the average fund has zero alpha, not all alphas are zero and there still are good funds. Cite one fact from this week's readings that supports or contradicts this view.

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Supports view: Gross alphas (from 3-factor and 4-factor model) of EW and VW portfolios of the universe of actively managed mutual funds are zero. However, some mutual funds with the largest alpha do better than chance would suggest in a world where true alpha was zero for all funds (Fama-French 2010).

Quiz 7

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Evaluate strategy against selling uncovered put options. You then capture the nonlinear payoff of risk arbitrage.

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Q2: How do Asness et al suggest we measure the market beta of a hedge fund, in place of a regression $R_t^{ei} = \alpha_i + \beta_i R_t^{em} + \varepsilon_t^i$ (This is not about up vs. down, just beta.)

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Simple linear regressions are biased down (from stale or managed prices). Instead, run regression on contemporaneous and lagged market betas:

$R_t^{ei} = \alpha_i + \beta_{0i} R_t^{em} + \beta_{1i} R_{t-1}^{em} + \beta_{2i} R_{t-2}^{em} + ... + \varepsilon_t^i$.

"True" market beta is the sum of these betas.

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No. Trading costs (bid-ask spread, margin calls, fees for shorting, etc.) make the arbitrage very expensive or impossible to exploit.

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High volume/turnover. Also acceptable: high volatility, low supply of shares, wide dispersion of opinion, restrictions on long-term short selling.

Quiz 8

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1. 2-5 year flow explains each bond more than its own.
2. On-the-run explains off-the-run.
3. There is no lagged effect of order flow on prices.

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No, they bought for a bit then joined in the selling.

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No. Each trade is still as profitable. The time that the arbitrage spread stays open has declined.

Quiz 8

Q4: You have left your securities with your broker/dealer, but you hear the dealer might be in trouble. Why should you run to get your securities out? They're yours after all, not a debt from the bank to you that you have to stand in line in bankruptcy court.

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Re-hypothecation. The dealer has used them as collateral for his own lending. You may face problems in claiming ownership of your securities that haven't been segregated from the dealer's operations.

Quiz 9

Q1: The one-year log yield $y_t^{(1)}$ is 5%, and the two year log yield $y_t^{(2)}$ is 10%. According to the pure expectations hypothesis, what is the expected one-year log yield one year from now, $E_t\left(y_{t+1}^{(1)}\right)$?

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15%.

Pure expectations hypothesis: $E_t\left(y_{t+1}^{(1)}\right) = f_t^{(2)}$.

But $f_t^{(2)} = p_t^{(1)} - p_t^{(2)}$.

And $p_t^{(1)} = -y_t^{(1)}$, $p_t^{(2)} = -2y_t^{(2)}$.

Therefore, $f_t^{(2)} = -y_t^{(1)} + 2y_t^{(2)} = -5\% + 2(10\%) = 15\%$.

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Alternative solution...

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Alternative solution...

We know that $y_t^{(n)} = \frac{1}{n}\left(y_t^{(1)} + f_t^{(2)} + \ldots + f_t^{(n)}\right)$.

In our case, $y_t^{(2)} = \frac{1}{2}\left(y_t^{(1)} + f_t^{(2)}\right)$.

This yields: $10\% = \frac{1}{2}\left(5\% + f_t^{(2)}\right)$ .Want to solve for $f_t^{(2)}$.

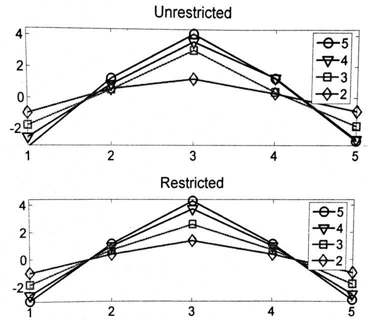
This gives $f_t^{(2)} = 15\%$. By pure expectations hypothesis: $E_t\left(y_{t+1}^{(1)}\right) = f_t^{(2)}$.

Quiz 9

Q2: Cochrane and Piazzesi forecast bond returns with 5 forward rates,

$$rx_{t+1}^{(n)} = a + \beta_1^{(n)} y_t^{(1)} + \beta_2^{(n)} f_t^{(2)} + \beta_3^{(n)} f_t^{(3)} + \beta_4^{(n)} f_t^{(4)} + \beta_5^{(n)} f_t^{(5)} + \varepsilon_{t+1}^{(n)}$$

and present this graph



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What does the top graph represent?

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The estimates of β from the unrestricted regression of bond excess returns on forward rates. The legend gives the maturity of the bond. The x-axis gives the maturity of the forward rate. Suggests single factor in excess bond returns.

Quiz 10

Q1: "The right stock portfolio for you needs to be tailored carefully to your risk aversion. People who are able to take risks should hold stocks with more mean and more standard deviation, while people who are less able to take risks should hold more stable stocks like blue chips and utilities." Comment, with reference to specific models or theorems.

Quiz 10

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Mean-variance investors with no income, or power utility investors with no income and i.i.d normal returns: hold market portfolio plus investment in risk-free asset. Only "tailoring" is investing more/less in market portfolio depending on risk aversion. If facing additional risks in the economy, hold "hedging" portfolios to hedge relevant state variables. Ex: short an industry to hedge income risk.

Quiz 10

Q2: If returns are i.i.d, the mean rises with horizon: $E(r_1 + r_2) = 2E(r)$, but the standard deviation rises with the square root of horizon: $\sigma(r_1 + r_2) = \sqrt{2}\sigma(r)$. Thus, the Sharpe ratio $E(r_1 + r_2)/\sigma(r_1 + r_2)$ grows with the square root of horizon. In this case, stocks are a better deal for long-run investors. Yes, no, maybe?

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No. Optimal portfolio weight $\frac{E(r)-r_f}{\gamma\sigma^2}$ is a function of variance, not standard deviation. Weight does not scale with horizon in an i.i.d world. Stocks are no more or less risky in the long-run *in an i.i.d world.*