

## Written Exam Economics Winter 2017-2018

### Financial Markets

Date: From 3 January 2018 at 10 AM to 5 January 2018 at 10.00 AM

This exam question consists of 11 pages in total

**A take-home exam paper cannot exceed 10 pages – and one page is defined as 2400 keystrokes.**

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by “eksamen på dansk” in brackets, you must write your exam paper in Danish.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students’ self-service system.

***The paper must be uploaded as one PDF document. The PDF document must be named with exam number only (e.g. ‘1234.pdf’) and uploaded to Digital Exam.***

#### Focus on Exam Cheating

In case of presumed exam cheating, which is observed by either the examination registration of the respective study programmes, the invigilation or the course lecturer, the Head of Studies will make a preliminary inquiry into the matter, requesting a statement from the course lecturer and possibly the invigilation, too. Furthermore, the Head of Studies will interview the student. If the Head of Studies finds that there are reasonable grounds to suspect exam cheating, the issue will be reported to the Rector. In the course of the study and during examinations, the student is expected to conform to the rules and regulations governing academic integrity. Academic dishonesty includes falsification, plagiarism, failure to disclose information, and any other kind of misrepresentation of the student’s own performance and results or assisting another student herewith. For example failure to indicate sources in written assignments is regarded as failure to disclose information. Attempts to cheat at examinations are dealt with in the same manner as exam cheating which has been carried through. In case of exam cheating, the following sanctions may be imposed by the Rector:

- 1. A warning
- 2. Expulsion from the examination
- 3. Suspension from the University for at limited period or permanent expulsion.

## Problem 1

- (a). Consider the Glosten-Milgrom model. Often we assume that the liquidity traders are pure noise traders, that is, that they are price insensitive. What is the effect of this on the spread, compared to the situation where liquidity traders are price sensitive? Furthermore, discuss the possibility of market breakdown (in the sense that no zero-profit bid and ask prices exist) when liquidity traders are price sensitive/insensitive. Can a breakdown occur in both cases?
- (b). In the article by Kondor (lecture 12), we saw that second-order beliefs can be important in generating trade. Explain why in the Kyle model, for the market maker, there is no difference between the first-order beliefs (what the market maker believes about  $v$ ) and second-order beliefs (what the market maker believes the traders believe about  $v$ ).
- (c). In the model by Abreu and Brunnermeier, it is possible to have a situation in which everybody knows that there is a bubble, and everybody knows that everybody knows, but still, the bubble persists.
  - (i). Explain why that is impossible in the standard Glosten-Milgrom framework we have considered.
  - (ii). Do you find the Glosten-Milgrom or the Abreu-Brunnermeier model more realistic? Explain your answer.

## Problem 2

In the following we describe a model inspired by Glosten and Milgrom (1985), but add a new feature: speculators' private information now comes from a financial analyst.

**Setup.** There is a single asset with value  $v \in \{0, 1\}$ , where  $\mathbb{P}(v = 1) = \mu$ . The model has two periods  $t = 1, 2$ . All trade takes place in period  $t = 1$ , and in period  $t = 2$  the profits are realized and  $v$  is revealed. The model has three players: a dealer, a trader and an analyst.

**Dealer.** The competitive (zero-profit) dealer sets ask prices  $a$  and  $b$ . Thus  $a = \mathbb{E}[v|\text{buy}]$  and  $b = \mathbb{E}[v|\text{sell}]$ .

**Trader.** There is a single trader who either buys or sells one unit, or abstains. With probability  $\pi \in (0, 1)$  the trader is a **speculator** who trades for profit. The speculator's payoff if he buys is  $u_B(v) = v - a$  and his profit if he sells is  $u_S(v) = b - v$ . If he abstains, his profits are zero. With probability  $1 - \pi$  the trader is a **noise trader**, who buys or sells with equal probability.

**Analyst.** In period  $t = 1$ , the analyst privately observes a signal  $s \in \{0, 1, n\}$ . The signal  $s = n$  can be interpreted as 'no signal'. The probability of not getting a signal is  $\mathbb{P}(s = n) = 1 - \phi$ . However, conditional on getting a signal, the probability that the signal is correct is 1.<sup>1</sup> The analyst prepares a report  $r \in \{0, 1, n\}$ . The report  $r = n$  can be interpreted as 'no report'. The report  $r$  is observed by the trader but *not* the dealer. Thus,  $r$  is private information to the trader.

The analyst gets a payoff of 1 if he issues a correct report, a payoff of -1 if he issues a wrong report, and a payoff of  $f$  if he issues no report. Think of  $f$  as a fee that accrues to the analyst independently of what he does. Suppose  $f \in (0, 1)$ .

The analyst's payoffs can thus be written as

$$U(r, v) = \begin{cases} 1 & \text{if } r \neq n \text{ and } r = v; \\ -1 & \text{if } r \neq n \text{ and } r \neq v; \\ f & \text{if } r = n. \end{cases}$$

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<sup>1</sup>That is to say:  $\mathbb{P}(v = 1|s = 1) = \mathbb{P}(v = 0|s = 0) = 1$ .

His expected payoffs are then

$$U(r|s) = \begin{cases} \mathbb{E}[\mathbb{I}(r = v) - \mathbb{I}(r \neq v)|s] & \text{if } r \neq n; \\ f & \text{if } r = n, \end{cases}$$

where  $\mathbb{I}(\cdot)$  is the indicator function.

**Equilibrium.** We will look for an equilibrium in which: the trader chooses his trade to maximize his payoff given  $a, b, r$ , and the analyst's strategy; the analyst chooses  $r$  to maximize his payoff given  $a, b, s$ , and the trader's strategy.

- (a). Suppose first that the analyst is truthful, in the sense that he chooses the report  $r = s$ . Suppose  $a \in (\mu, 1)$ . Find the trader's optimal strategy, and show that conditional on this strategy:

$$\mathbb{P}(v = 1|a, \text{buy}) = \frac{\mu(1 + \pi(2\phi - 1))}{\mu(1 + \pi(2\phi - 1)) + (1 - \mu)(1 - \pi)} \equiv p_B.$$

**Hint:** It is useful to consider three cases:  $r = 1$ ,  $r = 0$ , and  $r = n$ .

- (b). Find  $a$  using your answer to (a). Check that  $a \in (\mu, 1)$  to show that you have found an equilibrium for the trader (recall that we have fixed the analyst's strategy).
- (c). Now suppose the analyst is strategic, such that he maximizes his expected payoff  $U(r|s)$ . Argue that he will always send the report  $r = s$  if  $s \neq n$ . Suppose then  $s = n$ , and argue that there exist  $\bar{x}$  and  $\underline{x}$ , such that whenever  $\mu > \bar{x}$  the analyst will send the report  $r = 1$ , whenever  $\mu < \underline{x}$  the analyst will send the report  $r = 0$ , and whenever  $\underline{x} \leq \mu \leq \bar{x}$ , the analyst will send the report  $r = n$ . Find  $\underline{x}$  and  $\bar{x}$ . What is the intuition for this result?
- (d). Suppose the analyst follows the optimal strategy you found in the previous question. Given this strategy, find  $\mathbb{P}(v = 1|r = 1)$  as a function of  $\mu$ .
- (e). Suppose again the analyst follows the optimal strategy you found in (c). Find the optimal strategy of the speculator. Use this to find the equilibrium values of  $\mathbb{P}(v = 1|a, \text{buy})$  and  $a$ .

- (f). Draw the ask price you found in the previous question as a function of  $\mu$ . How does it compare to the price you found in (b)? Discuss.
- (g). Now, suppose that the analyst's signal  $s$  is not perfectly revealing, such that  $\mathbb{P}(v = 1|s = 1) = \mathbb{P}(v = 0|s = 0) = \psi \in (1/2, 1)$ . Show that there are  $\mu \in (0, 1)$  such that  $a = \mu$ . Discuss.

**Hint:** Try to look at extreme values of  $\mu$ .

## Problem 3

On the next pages you find two articles. Both articles relate to the role of so-called *sell-side financial analysts* who work for firms that also trade stocks. The first article from *The Economist* is about sell-side analysts' long- and short-term forecasts. The second article from the *Wall Street Journal* reports the finding of a study of the recommendations of top (sell-side) analysts.

(i) Identify the main arguments of the two articles, and evaluate them using your knowledge from the course as well as any outside knowledge you find relevant. (ii) Discuss how the apparently opposing views of the two articles can be reconciled. Think about how it matters whether you take a short-term/long-term view, and whether you consider analysts who are forecasting a variable (such as company earnings) or analysts who are giving buy/sell stock recommendations to investors. (iii) What effect might sell-side analysts have on market outcomes? You may want to consider the effect on liquidity but also issues such as bubbles.

# Discounting the bull; Analyst forecasts

[ProQuest document link](#)

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## FULL TEXT

Stock analysts' forecasts tend to be wrong in reassuringly predictable ways

"SELL-SIDE" analysts, whose firms make money from trading and investment banking, are notoriously bullish. As one joke goes, stock analysts rated Enron as a "can't miss" until it got into trouble, at which point it was lowered to a "sure thing". Only when the company filed for bankruptcy did a few bold analysts dare to downgrade it to a "hot buy".

Economic research shows that there is some truth to the ribbing. The latest figures from FactSet, a financial-data provider, show that 49% of firms in the S&P 500 index of leading companies are currently rated as "buy", 45% are rated as "hold", and just 6% are rated as "sell". In the past year, 30% of S&P 500 companies yielded negative returns.

Profits forecasts made more than a few months ahead have a dismal record of inaccuracy. According to Morgan Stanley, a bank, forecasts for American firms' total annual earnings per share made in the first half of the year had to be revised down in 34 of the past 40 years. Studying their forecasts over time reveals a predictable pattern (see chart 1).

In theory, a diligent share analyst should do his own analysis—that is, by projecting a firm's future revenue and expenses, and discounting them to the present. Such models, however, are extremely sensitive to different assumptions of growth rates. Since no one can know the future, analysts cheat.

Three statistical sins are common. Analysts can look at comparable companies to glean reasonable profits estimates, and then work backwards from their conclusions. Or they can simply echo what their peers are saying, and follow the herd. Or, most important, they can simply ask the companies they are following what their actual earnings numbers are.

Surveys conducted by Lawrence Brown of Temple University found that two-thirds of sell-side analysts found private calls with company managements to be "very useful" in making their estimates. Analysts' need to maintain relationships with the companies they cover must colour their projections. They are judged primarily on the accuracy of their short-term forecasts, so there is little risk in issuing flattering, if unrealistic, long-term projections. In the short run, however, they have an incentive to issue ever-so-slightly pessimistic forecasts, so companies can "beat" expectations. Since the financial crisis, company profits have exceeded short-term analyst forecasts around 70% of the time.

So are forecasts are useless? Simply taking the market's earnings figures from the previous year and multiplying by 1.07 (corresponding with the stockmarket's long-run growth rate) can be expected to yield a more accurate forecast of profits more than a year in the future.

Yet the very predictability of the errors in analysts' forecasts suggests they could be informative, if they are properly interpreted. Taking forecasts of S&P 500 earnings from 1985-2015, The Economist has built a simple statistical model to try to take out the bias that taints Wall Street's prognostications. After controlling for the forecasts' lead time and whether or not they were made during a recession, we find that even our relatively crude model can improve upon the Wall Street consensus for forecasts made more than a quarter in advance (see chart 2).

Adjusting for bias in short-term forecasts is harder. It is tempting simply to accept the errors—after all, they tend to be off by just a little. Data from Bloomberg show that the 320 S&P 500 companies that beat earnings expectations

in 2015 did so only by a median of 1.4%. An alternative is to look at crowdsourcing websites such as Estimize. There punters—some amateur, and some professional—are shown Wall Street consensus estimates and asked to make their own forecasts. Estimize users beat Wall Street estimates two-thirds of time. To some extent, judging Wall Street by its ability to make accurate predictions is silly. Harrison Hong, an economist at Columbia University, reckons that stock analysts should be viewed "more like media". The latest forecasts aggregated by Thomson Reuters suggest that the S&P 500 will yield earnings per share of \$130.83 in 2017 and \$146.33 in 2018. According to our model, that would imply that they believe the actual numbers will be closer to \$127.85 and \$134.30. Share analysts want to tell the truth. They just like making it difficult.

## DETAILS

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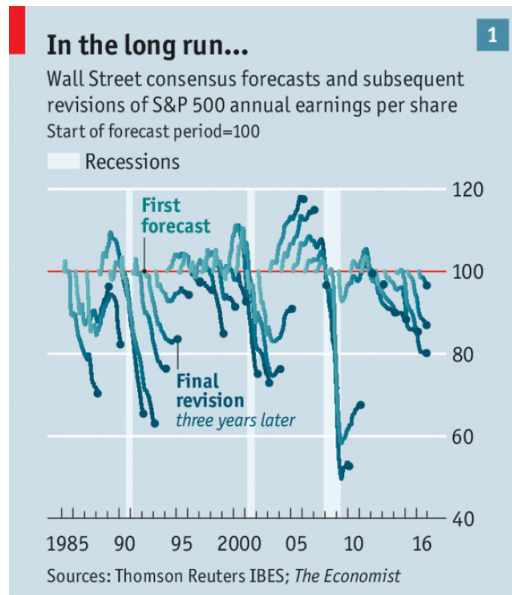


FIGURE 1: CHART 1 FROM THE ARTICLE  
“DISCOUNTING THE BULL; ANALYST FORECASTS”

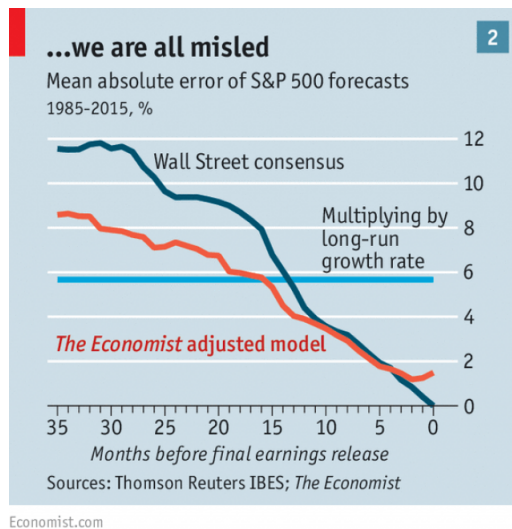


FIGURE 2: CHART 2 FROM THE ARTICLE  
“DISCOUNTING THE BULL; ANALYST FORECASTS”

# Investing in Funds &ETFs: A Quarterly Analysis - -- Stock Tips From Star Analysts Are Worth a Lot... --- ...but only if you act very fast

Schoenberger, Chana R.

[ProQuest document link](#)

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## ABSTRACT

The professors, Ayako Yasuda, an associate professor of management at the University of California, Davis, Graduate School of Management, and Lily Hua Fang, an associate professor of finance at the Insead business school in Singapore, published their findings in the Journal of Financial Services Research last month.

## FULL TEXT

Do annual rankings of star stock analysts predict their stock-picking abilities? Or are they often a popularity contest?

Two business-school professors have addressed this long-standing Wall Street question. Their answer: Top analysts in the annual rankings by Institutional Investor magazine really do offer more-lucrative recommendations than their peers with lower rankings.

The catch: Investors have to act immediately on "buy" recommendations to take full advantage of the difference.

The professors, Ayako Yasuda, an associate professor of management at the University of California, Davis, Graduate School of Management, and Lily Hua Fang, an associate professor of finance at the Insead business school in Singapore, published their findings in the Journal of Financial Services Research last month.

Their research was based on data from 1994 to 2009.

"We wanted to know, if you follow these [top-ranked] analysts' buy and sell recommendations, and bought and sold stocks accordingly in a timely manner, if that portfolio strategy would have a higher risk-adjusted investment return" than a portfolio based on other analysts' recommendations, Dr. Yasuda says.

The professors constructed a portfolio that mimicked the buy and sell calls of Institutional Investor's All-America analysts, who are chosen in a poll of money managers, institutional investors and analysts. Then they measured the results against those of a portfolio based on recommendations from analysts who weren't ranked the highest.

The All-Americans' recommendations, they found, produced returns that were higher by about 0.6 percentage point a month.

That advantage shrank, though, if the top analysts' buy recommendations weren't acted on right away. A portfolio

that followed the star analysts' buy calls one day after they were made produced about half the extra returns of the portfolio that traded on the recommendations the day they were made.

That indicates that clients who receive top analysts' research notes when they are first issued are in a better position than investors who don't pay for rapid access to the notes and have to wait until the calls become public.

Or as Dr. Yasuda says, "Investors who have access to these AA analysts' opinions have a leg up over other investors who get the news when it's yesterday's news."

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Credit: By Chana R. Schoenberger

## DETAILS

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