

# Written Exam for the M. Sc. in Economics 2009–II

## Financial Markets

Final Exam

June 16, 2009

(4 hour closed book exam)

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.

Please answer all 3 problems and all sub-questions below.

### Problem 1:

Please answer the following 3 sub-questions.

- (a) Discuss intuitively, how speculators may stabilize and destabilize financial markets.
- (b) Discuss intuitively the balance between informed trading and market liquidity.
- (c) Define order-based and quote-based markets, and intuitively discuss their relative advantages.

## Problem 2:

This question relates to the competitive model of Vives Section 4.2.1. We consider the model with  $\mu = 1$ , i.e., all rational traders are informed. To simplify, we also let Vives'  $\bar{\theta} = 0$ . The goal below is to consider the bias of the market price as an estimate of the asset value.

A risky asset has unknown value  $\theta \sim N(0, 1/\tau_\theta)$ . A continuum of risk-averse informed traders obtain private signals  $s_i = \theta + \varepsilon_i$ , where  $\varepsilon_i \sim N(0, 1/\tau_\epsilon)$ . These traders have constant absolute risk aversion (CARA) equal to  $\rho > 0$ . Exogenous noise demand for the asset is given by  $u \sim N(0, 1/\tau_u)$ . Assume that  $\theta, u, \epsilon$  are independent, jointly Normally distributed variables. Trading takes place in a call auction, where rational traders submit demand schedules.

(a) Vives establishes in Proposition 4.1 that there exists a Bayesian linear equilibrium of this model, where the informed trader demand is  $X_i(s_i, p) = a(s_i - p) - bp$  with constants  $a, b > 0$ , and where the price is  $p = \lambda a \theta + \lambda u$ . Comment on the nature of such a Bayesian linear equilibrium; which information can the traders base their demand on?

(b) The price  $p$  is informative about  $\theta$ , and the posterior distribution of  $\theta|p$  is Normal with mean  $E[\theta|p]$  and precision  $\tau = \tau_\theta + a^2\tau_u = 1/V[\theta|p]$ . First, please explain that an informed trader's posterior distribution of  $\theta|p, s_i$  is Normal with mean  $E[\theta|p, s_i] = (\tau E[\theta|p] + \tau_\epsilon s_i) / (\tau + \tau_\epsilon)$  and precision  $\tau + \tau_\epsilon = 1/V[\theta|p, s_i]$ . Second, verify that  $E[\theta|p, s_i] - p = (\tau(E[\theta|p] - p) + \tau_\epsilon(s_i - p)) / (\tau + \tau_\epsilon)$ .

(c) With the rational trader's particular CARA utility function, the demand must satisfy  $X_i(s_i, p) = (E[\theta|p, s_i] - p) / (\rho V[\theta|p, s_i])$ . Recall that in our equilibrium,  $X_i(s_i, p) = a(s_i - p) - bp$ . Using (b), conclude that  $a = \tau_\epsilon / \rho$  and that  $\tau(E[\theta|p] - p) / \rho = -bp$ .

(d) Interpret this last result in (c) as a systematic bias:  $E[\theta|p] - p$  is proportional to  $-p$  so the price is below (above)  $E[\theta|p]$  as the price is below (above) the prior mean  $E[\theta] = 0$ .

(e) Note that the bias extent can be measured by  $bp/\tau$ . Vives finds  $b = \tau_\theta / (\rho + \tau_\epsilon \tau_u / \rho)$ . Please discuss how the extent of the bias depends on the model's exogenous parameters.

### Problem 3:

Below is an excerpt of a discussion of the Yale University endowment management strategy, from the Yale Daily News on January 26, 2009. Please write a short essay discussing to which extent theories from the course readings can relate to the issue of this text.

“David Swensen grew his fame, and Yale’s fortune, by redefining how university endowments are managed. The investment guru pioneered a revolutionary approach upon which investors bestowed a simple name: The Yale Model. But the financial crisis has called into question the wisdom of that model. Unlike the early 2000s, when Yale’s diversified holdings helped sidestep the burst of the dot-com bubble, today every kind of asset has plunged, dragging Yale’s portfolio down an estimated 25 percent, to roughly \$17 billion. (...)”

Swensen’s approach uses statistical analysis, calculating risk and expected return, to divvy up the portfolio into a fixed distribution of different kinds of assets. As one kind of asset declines in value, Swensen advocates buying more to meet the preassigned target. When an asset class appreciates, the Yale model says to sell in order to keep allocation down. In other words, the model forces investors to buy low and sell high. “The notion is that when markets move they pull you away from your long-term policy targets,” he said. “If an asset class posts poor relative performance you need to rebalance by purchasing, and if an asset class posts strong relative performance than you need to sell.” Today, all asset classes are performing poorly. The worst, Swensen said, have been emerging market equities.

There has been a slight shift away from securities, Swensen said, in favor of illiquid assets, such as real estate, oil, gas and timber. These so-called “real” assets were the class that Swensen’s strategy popularized — the class that helped him steer Yale’s endowment to four consecutive years of double-digit growth between 2004 and 2007. “Over long periods of time the illiquid assets are less efficiently priced and they generally promise higher prospective rates of return,” Swensen said. “Some people lose sight of that in the midst of a market trauma.” (...)”

Illiquid assets, though riskier, promise hefty returns in the long run. And the long run is Swensen’s chief concern. “David really understands that Yale is more than 300 years old, and when buildings are built at Yale they are expected to last 100 years,” said Charles Ellis ’59, an investments consultant and a former member of the Yale Corporation’s Investment Committee. “He is a very long-term thinker in the most disciplined way.” (...)”

With credit markets frozen, Swensen said, assets are mispriced, which spells opportunity for investors with the capital to take advantage of firesale prices. Years from now, those bargains will pay off, he said. But for now, all those declines mean there is no way to avoid this year’s 25 percent drop this year, which effectively erases the 28 percent gain of 2007 and brings the endowment back to what it was in 2006.”