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

Financial Markets

Final Exam

August 17, 2009

(3 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) Define asset market depth, and discuss intuitively the market institutions that support depth.

(b) Discuss intuitively the potential over-reaction of asset market prices connected to the arrival of dispersed private information.

(c) Discuss intuitively, how the advent of a credit crisis may have affected the liquidity of asset markets.

Problem 2:

This examines the competitive limit-order market model of Malinova and Park with trades in quantities $1, \ldots, Q$. We will consider only one period of trade. Let p denote the prior probability that the asset value is $V = 1$, otherwise the value is $V = 0$.

We follow their main information example. The risk-neutral informed traders have private beliefs $\pi \in [0, 1]$ distributed with c.d.f. $F_V(\pi)$ where $F_0(\pi) = 2\pi - \pi^2$ and $F_1(\pi) = \pi^2$. The probability that a trader has information is μ. We let $\lambda = (1 - \mu)/(2Q)$ denote the chance that the trader is uninformed and wants to buy a particular number $q \in \{1, \ldots, Q\}$ of assets.

Let ask_q denote the ask price for the q-th limit sell order. A buy order for $\hat{q}$ units walks up the book and costs $\sum_{q=1}^{\hat{q}} \text{ask}_q$. We restrict attention to the case $0 < \text{ask}_1 < \ldots < \text{ask}_Q < 1$.

(a) Write $E\pi = (V = 1|\pi) = p\pi/(p\pi + (1 - p)(1 - \pi))$. Argue that an informed trader's rationality implies that q units are optimally purchased for private beliefs in an interval $[\pi_q, \pi_{q+1}]$ where $E\pi_q = \text{ask}_q$ for $q = 1, \ldots, Q$, and $\pi_{Q+1} = 1$.

(b) Let β_q^V denote the chance that a limit sell order for q units is hit by an incoming trader, conditional on true asset value V. Argue that $\beta_q^V = (Q + 1 - q)\lambda + \mu(1 - F_V(\pi_q))$.

(c) In the limit order book, the ask price for the qth unit is $\text{ask}_q = p\beta_q^1/\left(p\beta_q^1 + (1 - p)\beta_q^0\right)$. Combine the equations to show

$$\frac{\pi_q}{1 - \pi_q} = \frac{\beta_q^1}{\beta_q^0}. \tag{1}$$

(d) Using the expression for β_q^V and the definition of F_V, it is possible to rewrite (1) to show that π_q solves the equation

$$(Q + 1 - q)\lambda(2\pi - 1) = \mu(1 - \pi)^2 \tag{2}$$

for π. Do not prove that now, but instead draw a diagram showing each of the left-hand side and right-hand side of (2) as a function of $\pi_q \in [0, 1]$.

(e) Based on your diagram from (d), verify that $1/2 < \pi_1 < \cdots < \pi_Q < 1$. Argue that all of these Q thresholds are strictly increasing in μ and strictly decreasing in λ. Recalling $E\pi_q = \text{ask}_q$, argue that the same comparative statics result holds for the ask prices.

Problem 3:

Below is an excerpt of an article from the Economist on July 2, 2009. Please write a short essay discussing to which extent the course readings can relate to the issue of this text.

"New trading venues offer a challenge to conventional exchanges. In the world of exchanges, "dark pools" are rising fast.

Dark pools are trading venues that match buyers and sellers anonymously. By concealing their identity, as well as the number of shares bought or sold, dark pools help institutional investors avoid price movements as the wider market reacts to their trades.

Most dark pools are operated by electronic exchanges and broker-dealers. As conventional exchanges increasingly handle small, frequently traded orders, dark pools have become the preferred venue for large "block" transactions. In America more than 40 dark pools are in operation, accounting for an estimated 9% of traded equities. The EU's introduction of the Markets in Financial Instruments Directive (MiFID), a framework for financial services that provides for off-exchange trading, is sparking similar growth in Europe.

The swell of dark pools raises questions for investors, regulators and exchanges. For investors, too many new trading venues may cause liquidity to fragment. Turquoise, a European dark-pool operator owned by a consortium of investment banks, will launch an aggregator on July 20th to scour the dark pools of nine broker-dealers including Citibank, Deutsche Bank and Merrill Lynch in an attempt to offer investors better pricing and a higher rate of matching trades. The market will also do its bit. Although dark pools have captured a significant chunk of equity-trading volumes, many are still struggling to turn a profit. "I have no doubt there will be downward pressure on the total number of dark pools," says Marcus Hooper of Pipeline, another operator, who reckons consolidation will go furthest in Europe.

Regulators voice two contrasting concerns. One is that some dark pools give off signals, or indicators of interest, about positions that others can exploit. Backers say the pools are designed to reduce the ability of investors to front-run large orders. The other is that they hamper price discovery. Mary Schapiro, the chairman of the Securities and Exchange Commission, has expressed concern about their opacity. Immediate disclosure of orders, after they have been executed, is the obvious answer.

Conventional exchanges are already struggling with lower trading volumes and a meagre flow of public share offerings, both side-effects of the recession. They can ill afford to lose more business to dark pools. Some incumbents are taking the fight directly to the upstarts: the London Stock Exchange, one of the world's oldest bourses, announced on June 29th that it had received regulatory approval for the launch of Baikal, its own pan-European dark pool."