Written Exam for the M.Sc. in Economics summer 2011

Financial Markets

Final Exam

April 2, 2011 at 10.00 until April 4, 2011 at 10.00

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 <u>one PDF document</u> (including the standard cover and the appendices). The PDF document must be named with exam number only (e.g. '1234.pdf') and uploaded to Absalon.

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.

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

Problem 1:

(a) Explain the difference in assumptions on market structure which account for the main model difference between Easley and O'Hara (1987) and Glosten (1994), when they both extend the Glosten-Milgrom (1985) model to larger order sizes.

(b) The textbook mentions on page 80 that inventory-holding dealers offer immediacy. Intuitively explain how the bid-ask spread in Stoll's (1978) model generates a profit to dealing which covers the cost of providing immediacy.

(c) Define the permanent and transitory price impacts of a trade, and discuss their relations to measures of illiquidity.

Problem 2:

This problem considers a new model of competition among two exchanges. It is related to chapter 10 of the textbook and the lecture slides of March 25.

Noise traders are randomly located on a unit line from 0 to 1. The two exchanges are located at the extreme points 0 and 1. A noise trader located at point $t \in [0, 1]$ must privately bear the travel cost of t of going to exchange 0 or $1 - t$ of going to exchange 1.

Each noise trader must trade (sell or buy) one unit of an asset in one of the two exchanges. The cost of executing this trade at exhange i, where $i \in \{0, 1\}$, is going to be λ_i, where the endogenous parameters λ_i will be determined below. The total cost of trading at exchange 0 is $t + \lambda_0$, while the total cost of trading at exchange 1 is $(1 - t) + \lambda_1$.

(a) Given any $\lambda_0, \lambda_1 > 0$, argue that there exists a $\hat{t} \in [0, 1]$ such that noise traders at $t < \hat{t}$ prefer trading at exhange 0, while traders $t > \hat{t}$ prefer exhange 1.

(b) Show that $2\hat{t} - 1 = \lambda_1 - \lambda_0$ is the point of indifference, and verify that $\hat{t} \in [0, 1]$ when $\lambda_1 - \lambda_0 \in [-1, 1]$.

For any $\hat{t} \in [0, 1]$, the following explains how much noise trade will arrive in each exchange. Due to the random location of noise traders, the amount of noise trade in exchange 0 is

$z_0 \sim N\left(0, \hat{t}\sigma_z^2\right)$ and the amount of noise trade in exchange 1 is $z_1 \sim N\left(0, \left(1 - \hat{t}\right)\sigma_z^2\right)$. By assumption, z_0, z_1 are jointly normal and independent. Notice that the total amount of noise trade is $z_0 + z_1 \sim N\left(0, \sigma_z^2\right)$, so $\hat{t}$ essentially determines the share of the noise trade going to each exchange.

One insider privately observes that the true current value of the asset is F. From the point of view of market makers, $F \sim N\left(\bar{F}, \sigma_F^2\right)$ and z_0, z_1, F are jointly normal and independent. The risk-neutral insider trades on both exchanges, but there is no transparency of order flow or pricing. Market makers on each exchange are risk-neutral and competitive.

(c) Apply the Kyle (1985) model to argue that the inverse depth parameters are

$$\lambda_0 = \frac{\sigma_F}{2\sigma_z\sqrt{\hat{t}}} \text{ and } \lambda_1 = \frac{\sigma_F}{2\sigma_z\sqrt{1 - \hat{t}}}.$$

Confirm that in the Kyle model, a noise trader's expected cost of buying or selling one unit at exchange i is λ_i.

(d) Combine parts (b) and (c) to prove that the model is in equilibrium for any $\hat{t} \in [0, 1]$ which solves

$$2\hat{t} - 1 = \frac{\sigma_F}{2\sigma_z}\left(\frac{1}{\sqrt{1 - \hat{t}}} - \frac{1}{\sqrt{\hat{t}}}\right).$$

Show that $\hat{t} = 1/2$ solves this equation.

(e) Show, using a graph or analysis, that when σ_F/σ_z is small, there exist also two other solutions to the equation from (d) with $\hat{t} \in (0, 1)$. Discuss also whether it is an equilibrium of this model that all noise traders go to the same exhange. For any equilibrium with $\hat{t} \neq 1/2$, explain in words why one market is more liquid than the other.

Problem 3:

Below is an excerpt of an article from the Economist on November 25, 2010. Please write a short essay discussing to which extent the course readings can relate to the issue of this text. In particular, consider informational problems and liquidity premia. If you wish to elaborate your answer beyond the syllabus, you are welcome to seek more information about the US municipal bond market.

"Habitually seen as safe, America's \$2.8 trillion municipal-bond market was rocked in the crisis of 2008. It regained its poise, however, and has rallied strongly in the past two years. Now a sudden jump in yields has renewed fears that the main source of finance for America's 50 states and thousands of towns and cities is ripe for a crisis all of its own. Investors have long been drawn to "munis" for their supposedly steady, largely tax-exempt returns. This month, though, municipal-bond funds have seen their first weekly net outflows since the spring, estimates the Investment Company Institute. Some leveraged funds fell by more than 10% in a few days. As the market grew more volatile many fund investors fled on the assumption that "there's no smoke without fire", says George Friedlander of Citigroup.

Consequently, borrowers are under pressure. On November 18th California sold \$10 billion of notes but at higher yields than it had expected. (. . .) With tax receipts down and pension and health-care schemes underfunded, many states and local governments are stretched. (. . .). The disappearance of market props has not helped, either. Bond insurers, who used to cover roughly half of the market, have retrenched or gone bust after making bad mortgage bets. Investors depend on credit ratings, given municipal borrowers' lack of transparency. But faith in these scores has dwindled since the subprime crisis. (. . .)

Mr Friedlander thinks the spike in yields is mainly explained by surging supply. Worried that the programme will be allowed to lapse at the end of the year, issuers have rushed to issue Build America Bonds (BABs), taxable but interest-subsidised debt introduced as part of the stimulus package. In all, \$14 billion of munis, twice the weekly average for 2010 and a lot of them BABs, were offered in the week ending November 19th. The market may also have been catching up with federal bonds, which munis usually track, says Matt Fabian of Municipal Market Advisors. Between September and early November 30-year Treasury yields had risen four times more than municipal yields.

Higher rates often signal higher default risk. There is no sign of that yet. In the year to November 1st, munis defaulted at roughly the same, stately, pace as in 2009, points out James Rieger of Standard & Poor's (S&P). The overall default rate is a mere 0.3%. (. . .) Analysts at S&P reckon that the revenues of large states, such as Texas, California and New York, would have to fall by 45% or more for debt service to be jeopardised. As a result, municipal defaults should remain low relative to similarly rated corporate credit, argues Mr Friedlander. But investors will have to work to separate the prudent from the profligate. The mix of borrowers' revenues matters, says Natalie Cohen of Wells Fargo. For instance, an increase in consumption would benefit Florida, which gets the bulk of its revenues from a sales tax, more than Oregon, which relies chiefly on income tax. (. . .) Not everyone believes a bloodbath is avoidable. With the Republicans in the ascendancy, federal aid for states is likely to be cut. The states, in turn, can't support troubled municipalities indefinitely."