Written Exam for M.Sc. in Economics 2010-II

Investment Theory

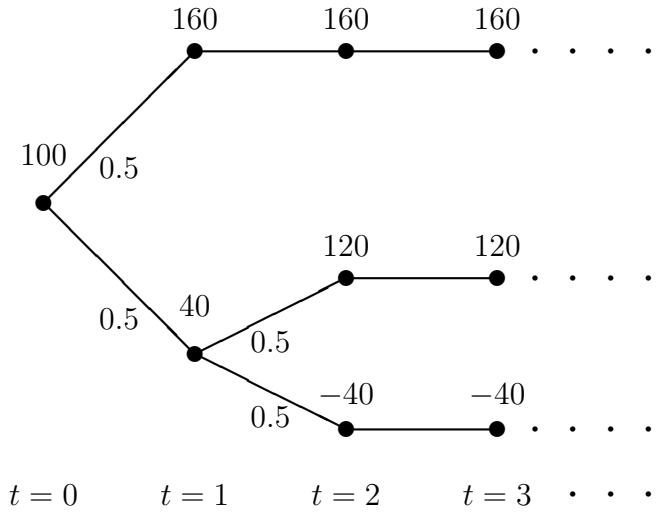
12.. August 2010

Master Course

3 hours written exam. Closed Books. All questions should be clearly and briefly answered. Calculations and figures should be clear and understandable. Calculations and figures should be explained.

Exercise 1.

Consider an investment project. The investment cost is $I > 0$. If the project is started at date t, the investment cost is paid at date t and dividends are received from date t and forward. Dividends of the project are described below. The cost of stopping the project is $E > 0$. If the project is stopped at



date t, then the stopping cost is paid at date t and no dividends are received from date t and forward. The discount rate is 0.05.

(a) Give an example of an investment project which fits with the above project.

(b) Suppose that the project is active. Find the optimal strategy for the exit option as a function of E. Find the value of exit option as a function of E.

(c) Calculate the NPV for a strategy where the project is started at date $t = 0$ as a function of I and E.

(d) Calculate the NPV for a strategy where the project is started at date $t = 1$ if and only if the dividend is 160.

(e) Calculate the NPV for a strategy where the project is started at date $t = 2$ if and only if the dividend is 120.

(f) Suppose that $I = 1000$ and $E = 540$? What are the optimal strategies? What are the values of the entry and the exit options.

Exercise 2.

Consider an investment project with the options to suspend and reactivate. The revenue of an active project follows a Geometric Brownian Motion

$$dP \;=\; \alpha P dt + \sigma P dz.$$

The dividend of an active project is $P - C$ where $C > 0$. The dividend of a suspended project is zero. The investment cost is $I > 0$, the cost of suspending is $S > 0$ and cost of reactivating is $R > 0$.

The interest rate is $r > 0$ and there is an asset without dividend with price Q where the price follows a Geometric Brownian Motion

$$dQ \;=\; (\alpha + \delta) Q dt + \sigma Q dz$$

with $\delta > 0$.

Let $F(P)$ be the value of the option to invest, $V_A(P)$ the value of an active project and $V_S(P)$ the value of a suspended project.

(a) Give an example of an investment project which fits the above project.

(b) State the possible strategies for the three options in the project.

(c) Show how to find differential equations in $V_A(P)$ and $V_S(P)$.

(d) Solve the differential equations in $V_A(P)$ and $V_S(P)$.

(e) Find equations to determine the undetermined constants in your expressions for $V_P(P)$ and $V_S(P)$. Which signs do you expect the constants to have? Explain your answer.

(f) Give a short interpretation of your expressions for $V_A(P)$ and $V_S(P)$.

(g) Find and solve a differential equation in $F(P)$.

(h) Find equations to determine the undetermined constants in your expression for $F(P)$.