Investment, Finance and Asset Prices

ECON 5068

Practice Exam 2024

Duration: 2 Hours

Instructions:

- Answer **TWO** questions.
- Marks for each part are shown in brackets, 100 marks total.
- Show all your working.
- Refer to Mathematical Appendix if needed

Q 1: Uncertainty [50 marks]

Drawing upon the investment-uncertainty literature, answer the following questions:

1.1 How does increased uncertainty influence the investment decisions of firms, especially under conditions of partial irreversibility? Illustrate how "real options" theory helps explain firms' cautious approach to investment during periods of heightened uncertainty. Explain in not more than 400 words.

[20%]

1.2 Discuss how policymakers might consider uncertainty in designing economic stimulus policies. Based on the uncertainty-investment literature, why might such policies have limited impact during periods of high uncertainty? Explain in not more than 300 words.

[15%]

1.3 If you have access to a panel dataset with firm level information on investment, financial conditions and uncertainty measures, explain how you would test for the impact of uncertainty on firm level investment outcomes? Explain in not more than 300 words, specify the regressions you would run and discuss expected results.

[15%]

Q 2: Investment and External Finance [50 marks]

Consider the problem of a value maximizing perfectly competitive firm whose profit function at time t is given by $\theta_t K_t^\alpha$ where θ_t denotes the productivity level, K_t denotes capital and α is a parameter representing the elasticity of output with respect to capital. The firm's capital stock evolves according to the standard capital law of motion:

$$K_{t+1} = (1-\delta)K_t + I_t$$

where I_t is investments in capital at time t and δ is the depreciation rate. The price of a unit of capital good is normalized to 1 and investment is subject to convex adjustment costs given by

$$C(I_t, K_t) = \frac{\phi}{2} I_t^2,$$

where $\phi > 0$ is a constant. The firm may need to rely on external financing to cover its investment expenditures. External financing costs are given by

$$FC(I_t, K_t) = \max\{0, \mu(I_t - \theta_t K_t^\alpha)\}$$

where $0 < \mu < 1$ and $\theta_t K_t^\alpha$ is the firm profit function. This formulation implies that any investment expenditure not covered by the firm's revenues requires external financing, incurring a proportional cost μ. Financing costs are increasing in the level of investment.

Time is discrete and runs to infinity, $t = 0, 1 \ldots \infty$. Future values are discounted with the factor β. The productivity level for the firm is stochastic and follows an independent and identically distributed (i.i.d) Normal process:

$$\theta_t \overset{iid}{\sim} N(0, \sigma^2), \quad t = 0, 1, 2, \ldots \infty$$

Productivity θ is thus assumed to be serially uncorrelated. Based on the above information, answer the following questions:

2.1 Write down the Bellman equation. Derive and interpret the optimal investment decision condition. You can assume that $I_t > \theta_t K_t^\alpha$ so that financing costs are just $FC(I_t, K_t) = \mu(I_t - \theta_t K_t^\alpha)$.

[25%]

2.2 Define marginal Q and provide an economic interpretation.

[10%]

2.3 Explain how the presence of external financing costs affects both the investment decision and the value of the firm, respectively? Explain how investment will respond to a tightening of financial conditions?

[15%]

Q 3: Cash Flow Sensitivity of Investment [50 marks]

Based on the firm investment and external finance literature, answer the following questions:

3.1. Do you agree with the statement: "Investment–cash flow sensitivity is a reliable indicator of financing constraints at the firm level." Discuss, citing supporting arguments and key critiques. (guidelines 1-2 pages) [20%]

3.2. You have an unbalanced firm-level panel with investment, cash flow, Tobin's q (or proxies), leverage, age, size, payouts, credit ratings, and stock returns over 10–15 years. In less than 500 words, design an empirical strategy to identify the causal effect of financial constraints on investment. Your answer should: (a) justify how you classify constraints and discuss drawbacks; (b) specify the baseline regression and key controls/fixed effects; (c) address endogeneity concerns and (d) propose robustness checks.

[30%]

END OF EXAMINATION

Mathematical Appendix:

- Power rule:
$$\frac{d}{dx}x^n = nx^{n-1}$$
- Logarithmic rule:
$$\frac{d}{dx}\ln(x) = \frac{1}{x}$$
- Logarithmic function rule:
$$\frac{d}{dx}\ln(f(x)) = \frac{f'(x)}{f(x)}$$
- Chain rule:
$$\frac{d}{dx}f(g(x)) = f_x(g(x)) \cdot g_x(x)$$
- Product rule:
$$\frac{d}{dx}[u(x)v(x)] = u_x(x)v(x) + u(x)v_x(x)$$
- Geometric Series:
$$S = a + ar + ar^2 + ... = a(1 + r + r^2 + ...) = \frac{a}{1-r}$$