**Universität Leipzig**

**Wirtschaftswissenschaftliche Fakultät**

**MASTER VWL – PRÜFUNG (FINAL EXAM)**

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<th>DATUM:</th>
<th>06.08.2013</th>
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<td>MODUL:</td>
<td>ADVANCED MACROECONOMICS</td>
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<tr>
<td>PRÜFER:</td>
<td>PROF. DR. THOMAS STEGER</td>
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**ERLÄUTERUNGEN (Explanation)**

1. Die Klausur besteht aus drei Aufgaben. Hiervon sind zwei Aufgaben zu bearbeiten! Sollten Sie alle drei Aufgaben bearbeiten, werden die ersten zwei Aufgaben gewertet. (The exam consists of three exercises. Of these three exercises two exercises have to be edited. If you have edited all three exercises, the first two exercises will be scored.)

2. Zur Bearbeitung stehen insgesamt 60 Minuten zur Verfügung. (To process the exam you have 60 minutes available.)

3. Sie können die Klausur entweder in deutscher oder englischer Sprache beantworten. (You can answer the exam either in German or English.)

4. Gewertet werden kann nur jener Teil der Antworten, der in angemessener Zeit entzifferbar ist. Achten Sie daher in eigenem Interesse auf eine klare Schrift. (Only the part of the answers, which is legible in a reasonable time, can be considered. Therefore take care of a neat writing in your own interest.)

**ZUGELASSENE HILFSMITTEL: keine**

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| DATUM, UNTERSCHRIFT DES PRÜFERS: |
Exercise 1: Investment Demand of Firms (20 points)

Consider a firm that produces a homogenous final output good $Y_t$ under perfect competition. The output technology reads

$$ Y_t = A(K_t)^{\alpha}(L_t)^{1-\alpha} $$

The firm's planning horizon is infinity. There are investment costs (capital adjustment costs), denoted as $IC_t$. Installing the amount of $I_t$ capital goods (gross investment) requires the following amount of final output

$$ IC_t = I_t \left[ 1 + \theta \left( \frac{I_t}{K_t} \right)^\eta \right] $$

It is assumed that the firm maximizes the present value of its cash flow (or entrepreneurial residual income) subject to a capital accumulation equation, $K_{t+1} = I_t + (1-\delta)K_t$, i.e. the firm solves the following dynamic problem

$$ \max_{\{I_t, K_t\}} \sum_{t=0}^{\infty} \left( \frac{1}{1+r} \right)^t \left( Y_t - w_t L_t - IC_t \right) $$

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

$$ IC_t = I_t \left[ 1 + \theta \left( \frac{I_t}{K_t} \right)^\eta \right] $$

(a) Consider the production technology $Y_t = A(K_t)^{\alpha}(L_t)^{1-\alpha}$. Assume that $K_t$ increases by 1 percent. By how much does, ceteris paribus, $Y_t$ change in proportional terms?

(b) Determine the firm's investment demand (i.e. the demand for final output devoted to capital investment).

Remark: Investment demand will be a function $I_t = I_t(q_t)$, where $q_t$ denotes the shadow price of installed capital goods. (You are not requested to determine the difference equation which describes the dynamics of $q_t$.)

(c) Provide a sound economic interpretation of your result.

Notation: $Y_t$: final output good at time $t \in \mathbb{R}$; $A > 0$: constant technology parameter; $K_t$: stock of physical capital at $t$; $L_t$: labor employed at time $t$; $0 < \alpha < 1$, $\theta \geq 0$, $\eta \geq 1$: constant technology parameter; $w_t$: denotes the wage rate, $r$: fixed interest rate, and $\delta \geq 0$: capital depreciation rate
Exercise 2: New Keynesian Macroeconomics - Sticky Prices (20 points)

Consider a firm that exists for two periods only (period $t=0$ and period $t=1$) and acts under monopolistic competition. It produces a (differentiated) consumption good $c_{jt}$. The demand schedule is given by

$$c_{jt} = \left( p_{jt} \right)^{\theta} B_t$$

where $c_{jt}$ is the amount of consumption good $j$ at time $t \in \{0, 1\}$ (i.e. time is discrete), $p_{jt}$ denotes the price of $c_{jt}$, $\theta > 1$ a constant parameter, and $B_t$ represents an exogenous component which may capture variations in real aggregate income as well as changes in the price level.

Nominal average costs (equal to marginal costs) are given by $a_t$ ($a_{jt}=a_t$ for all $j$). Nominal average costs do not depend on the level of output but may vary over time due to, say, changes in the nominal wage rate.

We assume that there are nominal price rigidities according to Calvo (1983). That is, each period there is a constant probability $0 \leq \omega \leq 1$ that the firm is not allowed to adjust its goods price.

Assuming that firm $j$ can set its goods price at $t=0$, the firm’s objective function may be written as

$$\text{obj} := E_0 \left[ p_{j,0} c_{j,0} - a_0 c_{j,0} + \beta \omega \left( p_{j,0} c_{j,1} - a_0 c_{j,1} \right) \right]$$

where $0 < \beta < 1$ denotes the discount factor and $E_0$ expectations conditional on information available at time $t=0$.

(a) Determine the optimal goods price $p_{j,0}$. Provide a concise economic interpretation of your results.

(b) Discuss briefly the similarities and the differences between the Calvo (1983) approach and the "convex price adjustment cost setup".
Exercise 3: Miscellaneous (20 points)

(1) The No-Ponzi-Game Condition (10 points)
Consider an infinitely lived dynasty, named the Ponzi-Clan. This clan wishes to increase consumption today by $x$ (denominated in €). Consumption expenditures are being financed by borrowing money. Debt repayment as well as interest payments are being financed by increasing indebtedness further. Debt at time $t$ is denoted as $d(t)$.

(a) Characterize the asymptotic present value of debt $e^{-rt}d(t)$.

(b) Is this strategy compatible with the No-Ponzi-Game-Condition? Provide a concise reasoning and interpretation of your answer.

(2) The Fisher Equation (10 points)
Consider a model economy with two assets. First, there is an equity share, its value is denoted as $v(t)$, which pays a dividend of $\pi(t)$ each period. Second, there is a bond which pays a (constant) rate of return of $r$.

(a) Set up the capital market equilibrium condition or, equivalently, the condition which describes the absence of arbitrage opportunities. Provide a concise economic interpretation of this capital market equilibrium condition.

(b) Explain the relationship between the capital market equilibrium condition and the forward-looking solution: $v(0) = \int_0^\infty e^{-rt} \pi(t) dt$. (You are not expected to solve the differential equation which describes capital market equilibrium.)