

平成20年度実施

東北大学大学院情報科学研究科

博士課程後期入学試験問題（8月26日）

## 専門科目

専門試験科目 第7・社会科学群

## 経済学系

### 注意

設問5題中3題を選んで答案用紙に解答しなさい。

その際、一つの問題につき一枚の答案用紙を使用すること。

また、各答案用紙の左上にある

問題番号	
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の中に解答した問題の番号を記入すること。

問題冊子と答案用紙のすべてを提出すること。

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問題 1 工業財 1,2 の価格を  $p_1, p_2$ 、農業財の価格を 1 とする。そして、 $x_1, x_2$  を工業財 1,2 の消費量、 $A$  を農業財の消費量とし、消費者の効用関数が

$$U(x_1, x_2, A) = \alpha \log x_1 + (1 - \alpha) \log x_2 + A$$

で与えられるとする。ただし、 $\alpha \in (0, 1)$ 。

- (1) 収入が  $I (> 1)$  のときに、2 工業財と農業財のマーシャルの需要関数を求めよ。
- (2) 間接効用関数を求めよ。

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**問題 2** 固定為替レートを持つ小国が、経済を刺激するために金融政策を用いることは推奨できるか？君の判断とその理由を述べよ。為替制度の選択に際して、考慮すべき重要な前提について論じよ。

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**問題 3**  $s$  は土地の消費もしくは住宅の広さを表し、 $z$  は土地以外のすべての消費財を含む合成財の量を表す。CBD から  $x$  離れたところの通勤費用は  $T(x) = 2x$  である。そして、家計の収入を  $Y$  とし、 $z$  の価格を 1 とする。効用関数  $U(z, s) = \log z + \log s$  のとき、付け値関数 (bid-rent function)  $\Psi(u, r)$  と付け値最大化敷地規模 (bid-max lot size)  $S(u, r)$  を求めよ。ただし、 $u$  は効用水準で、 $r$  は土地の価格である。

問題 4 以下の時系列に関する単回帰モデルを考える：

$$y_t = \alpha + \beta x_t + u_t, \quad E(\mathbf{u}) = 0, \quad E(\mathbf{u}\mathbf{u}') = \sigma^2 I \quad (1)$$

ここに、 $\mathbf{u}$  は  $u_t$  からなる列ベクトル ( $t = 1, \dots, n$ ) である。また  $n$  変量正規分布の確率密度関数は、 $f(\mathbf{u}) = \frac{1}{(2\pi\sigma^2)^{n/2}} \exp\left(-\frac{\mathbf{u}'\mathbf{u}}{2\sigma^2}\right)$  で与えられる。

- (1) パラメータ  $(\alpha, \beta, \sigma^2)$  を最尤推定する時、必要とされる仮定と、得られる誤差分散の推定量  $\hat{\sigma}_{ML}^2$  を、OLS(最小二乗) 推定の場合と比較せよ。ただし必要に応じて、説明変数行列  $X = (\mathbf{1} \ \mathbf{x})$ 、パラメータ列ベクトル  $\mathbf{b} = (\alpha \ \beta)'$  を用いて記述してもよい。(1 はすべての成分が 1 の、 $\mathbf{x}$  は  $x_t$  からなる  $n$  次列ベクトルである。)
- (2) (1) 式の攪乱項  $u_t$  ( $E(u_t) = 0, E(u_t^2) = \sigma^2$ ) が AR(1) である時：

$$u_t = \rho u_{t-1} + \epsilon_t, \quad E(\epsilon) = 0, \quad E(\epsilon\epsilon') = \sigma_\epsilon^2 I, \quad (2)$$

$u_t$  は、 $t$  以前の  $\epsilon_{t-s}$  ( $s > 0$ ) にしか依存しないことを示せ。(これを「系統的独立性」と呼ぶ。) また時系列データの代わりに空間データを用いる (たとえば  $t$  が年ではなく、県を表す) 場合には、「系統的独立性」は期待できるか？

- (3) (1) 式の攪乱項の共分散行列を  $E(\mathbf{u}\mathbf{u}') = \sigma^2 \Omega$  と書く時、 $\Omega$  を  $\rho$  を用いて表せ。この  $\Omega$  を用いて、パラメータ  $\mathbf{b} = (\alpha \ \beta)'$  の GLS(一般化最小二乗) 推定量を求め、それが不偏性を持つことを示せ。

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#### 小論文課題

外部不経済による「市場の失敗」を解決するために、Pigou 税が用いられる。公害企業への課税を例に、その概略を税収の分配の問題を含めて論じよ。さらに温室効果ガス (GHG) 排出に対する排出権割当と、先の分配問題の関連についても考察せよ。

[参考] Coase の定理：(環境財の) 所有権の与え方は、Pareto 効率的な資源配分の達成には無関係である。

平成20年度実施

東北大学大学院情報科学研究科

博士課程後期入学試験問題（9月26日）

## 外国語

専門試験科目 第7・社会科学群

### 注意

この冊子には、問題用紙3枚と答案用紙2枚、それに下書き用紙1枚が綴じられている。

解答はじめの合図があったら、必要に応じて各用紙を切り離してもよい。

問題表紙、問題用紙、答案用紙、下書き用紙のすべてを提出すること。

次の文章は「ウォール・ストリート・ジャーナル」7月12日号掲載された、米国の温暖化対策に関する報道である。要旨をまとめなさい。

WASHINGTON — The Bush administration published a government blueprint to reduce the U.S. output of global-warming gases, but at the same time rejected the document out of hand — saying it relied on “untested legal theories” and would impose “crippling costs” on the U.S. economy.

Essentially, the White House presented critics of the report with a prepackaged rebuttal brief, in what is expected to be the Bush administration’s last major effort to frame the national discussion on responding to global warming before a new president inherits the issue. The White House argues the Environmental Protection Agency must not be allowed to regulate greenhouse gas emissions, for fear it would be able to block development across the country.

The EPA document was written to respond to a Supreme Court order. The court instructed the agency to decide whether greenhouse gases are a danger to public health or welfare. Instead, the final document took no position on the court’s question — yet escalated the extraordinary battle between the agency and the White House.

The White House rejected an earlier draft that did find a danger to welfare, which would trigger application of the strict rules of the Clean Air Act to regulating greenhouse gases. This time, the agency stopped short of the endangerment finding, but still drew up a road map for using the Clean Air Act. That led the White House to warn of a government “command-and-control” regime that would regulate virtually every aspect of American life from cars to factories, hotels and lawnmowers.

The EPA’s document represents the denouement of a long-simmering conflict between the EPA’s career staff and the White House, which has caught EPA administrator Stephen Johnson in an awkward middle ground. On Friday, he praised his staff’s “great work” in trying to put “a square peg into a round hole,” but rejected its findings, siding with other cabinet members in dismissing use of the Clean Air Act.

The EPA’s report attempts to summarize the benefits and costs of regulating greenhouse-gas emissions, and makes no recommendations. But its details may be less significant than its potential political impact.

By highlighting the costs of greenhouse-gas regulation at a time when many American consumers and businesses are reeling from high energy prices, the Bush Administration is trying to push back against calls by congressional Democrats for it to use its existing authority to place limits on such emissions.

Both of Mr. Bush’s would-be successors — Arizona Republican John McCain and Illinois Democrat Barack Obama — have expressed support for capping greenhouse-gas emissions. The Bush administration’s actions Friday highlight the concerns about the costs of such regulation. Those concerns — pushed intensely by Republicans and some business lobbyists — helped to derail legislation in the Senate last month that was aimed at responding to climate change.

In a letter accompanying the EPA document, Susan Dudley, administrator of the White House Office of Information and Regulatory Affairs, bluntly disavowed the EPA's analysis, saying it relied on "untested legal theories" and "cannot be considered Administration policy or representative of the views of the Administration." In the letter, dated Thursday and addressed to Mr. Johnson, she added, "There is strong disagreement with many of the legal, analytical, economic, science and policy interpretations in the draft."

The administration also attached a letter from the secretaries of transportation, agriculture, commerce and energy, asserting that the EPA's work "does not recognize the enormous — and, we believe, insurmountable — burdens, difficulties and costs, and likely limited benefits" of using the Clean Air Act to regulate greenhouse gases.

A spokesman for Sen. Obama said he was "disappointed in the White House's decision to again refuse to tackle greenhouse gas emissions." A spokesman for Sen. McCain said the approach outlined by the EPA "would give a small, unelected group of bureaucrats unprecedented power to regulate broad swaths of our economy — effectively placing production, employment and investment decisions under government control."

The Bush administration has long opposed economy-wide regulation of greenhouse-gas emissions, and argued that allowing the EPA to regulate greenhouse gas emissions would turn it into a massive planning and zoning board, with the power to block construction of schools, hospitals, apartment buildings and a range of other facilities whose emissions have previously not been subject to regulation.

The final document affirms the agency's authority to tackle climate change, and suggests a variety of regulatory avenues. It concludes automobiles could be more fuel-efficient than currently required by law. Based on advanced technologies such as plug-in hybrid vehicles, fuel efficiency could be improved to more than 35 miles per gallon between 2020 and 2025, the document said. A 2007 energy law supported by the Bush administration mandates an average vehicle fuel-efficiency of 35 miles per gallon by 2020.

For other sectors, the document describes how emissions such as carbon dioxide could be regulated through government permits and an emissions trading system similar to one the EPA administers for acid rain pollution. The analysis has been sharply disputed by President Bush's aides and lobbyists for utilities and major manufacturers, who say that the Clean Air Act was never intended as a tool for fighting global warming.

"This is a classic example of EPA staff saying we can manage the economy of the United States better than the president," said William Kovacs, vice president of the U.S. Chamber of Commerce in Washington.

The administration's critique will provide ample ammunition for opponents of strong greenhouse-gas curbs. Democrats in Congress have already struggled this year to find unity on how much to raise the cost of using fossil fuels, in the face of concerns from coal-state Democrats, representatives of auto making states, and allies of the oil industry.

Earlier this month, during the debate on a climate-change bill in the Senate, opponents of the bill scored points by saying the legislation would raise gas prices, and cause huge job losses.

The administration has argued that capping U.S. carbon-dioxide emissions could put the country at a steep competitive disadvantage relative to developing countries such as China and India, which don't operate under such caps.

The administration has instead backed investments in clean-energy technologies, including renewable fuels, hydrogen fuel cells and advanced car batteries. Mr. Bush also signed a sweeping energy law last year that called for the biggest increase in automobile fuel-economy standards in a generation.

Until last April's Supreme Court decision, the administration had argued that the agency lacked the authority to set limits on carbon dioxide. Following the court's ruling, the EPA spent months drafting a document that tentatively concludes that greenhouse gases endanger public welfare.

The agency forwarded its endangerment finding in December to Ms. Dudley's office. But the document was never published, and a White House official asked the EPA to retract it, according to Jason Burnett, a senior EPA climate-change adviser at the time who has since left the agency. The same month, Mr. Johnson — the EPA's administrator — denied California permission to regulate greenhouse-gas emissions, despite a recommendation in favor of California's request by many of his top aides. That decision has prompted a lawsuit by California and more than a dozen other states that want to control such emissions.

The administration's critics pointed to several portions of the final document that they said reflected an attempt by the administration to play down the benefits of combating global warming.

For example, a draft version of the document that was obtained by The Wall Street Journal and other news outlets last month stated that "the net benefit to society" of controlling automobile carbon-dioxide emissions "could be in excess of \$2 trillion."

The document released on Friday, however, states that the "net present value to society could be on the order of \$340 to \$830 billion without considering benefits of GHG reductions," and estimates that gasoline prices will be just over \$2 per gallon for the period 2010–2020, a projection that critics called inappropriately low. Asked about the gasoline projection, an EPA spokesman said, "A draft is a draft and what we published today is the final" version.

"This administration has turned its back on a golden economic opportunity, choosing instead to keep walking the path of costly delay," said Nathaniel Keohane, director of economic policy and analysis with the Environmental Defense Fund.