考試科目	經濟學	所別	科技管理與智慧財產研究所學士後甲組	考試時間	2月23日(六)第1節

經濟學

請遵守考試規則，並儘量輔以圖形及符號來說明

一、(40分)

假設產業中的每一個廠商有相同的邊際成本 C，產業的需求曲線是 $P=A-BQ$, $Q=q1+q2$。請問在以下各種市場結構下，均衡的價格 P、產業產量 Q、兩個廠商的產量 q1,q2 及利潤以及「消費者剩餘」「社會福利淨損失」分別是多少？

（1） Cournot 雙占（2）Bertrand 雙占 （3）合作雙占 （勾結）

(4) 請由以上答案，說明為何政府要限制廠商彼此勾結。

二、(20分)

日本政府在安倍首相的主導下，企圖讓日圓大幅地貶值，以振興日本經濟。請問(1)為什麼日圓貶值能振興日本經濟？有何利弊？

(2)日圓貶值對台灣及美國的產業經濟分別有何影響？

三、(10分)

何謂「市場失靈」？如果市場不失靈那會怎樣？哪些因素會使得市場失靈？為什麼？請分別說明之。

四、(10分)

台灣的廠商流行外包代工，韓國企業卻傾向垂直整合，請以經濟學的觀念，分析各自的利弊得失！

五、(20分)

請用圖形及符號說明

（1）何謂規模經濟？（2）何謂學習曲線？

（3）何謂網路外部性？（4）何謂轉換成本？

備註	試題隨卷繳交

國立政治大學 102 學年度碩士班招生考試試題

考試科目	企業管理個案	系別	科技管理與智慧財產研究所科技管理組學士後乙	考試時間	2月23日(六) 第一節

注意事項

1. 稿卷共含兩個考題 (每題 50 分)。
2. 每題都必須做答。
3. 答題時，請提供充分的解讀，對問題的正反分析皆需詳盡，最後亦需提出自己的看法，提出解決方案。分析與見解之原創性為給分之重要依據。
4. 本考試為閉卷測試，因此考試進行中，考生不可攜帶任何參考書籍進入考場。

考題一：網路大學是中國學子的新出路？

【本案例取材自大紀元】

端坐家中，輕點滑鼠，就能圓了大學夢。網路大學的推出，讓廣大校外人士又多了一條上大學的途徑——網路大學「沒有圍牆的課堂」。

據北京晚報報導，隨著 9 月 1 日的到來，公辦大學新生錄取工作漸近尾聲，與之相映成趣的是，中國人民大學、復旦大學、清華大學等大學網路學院的招生宣傳正如火如荼地展開。據中國人民大學網路教育學院介紹：截至 8 月底，在全國 200 多個考點中，就有 1.57 萬人報名，生源十分充足。報名學生涉及近 23 個省市，學生年齡在 18 歲到 45 歲之間，這些數字創下了多項中國網路教育之最。

網路大學被稱之為「無圍牆教育」的大學。它借用衛星傳輸、網路、電腦、視訊會議系統等資訊科技，使學生在家裡或就近，就可聆聽大學教授的「現場」授課。這種突破時空限制的線上教育，不僅使高中生不必擁擠在高考的獨木橋上，也可使業界經理隨時到網路大學充電，為未來謀職增加分。因此，網路大學一經推出，便備受社會各界的青睞。

網路大學文憑有用嗎？

整個暑假，網路學院諮詢熱線都被打爆了。為網上人大（人民大學）提供教育服務平臺的中華學習網董事長周雙說，打電話來的學生，問得最多的一個問題是：「是不是真的發文憑？拿到的文憑硬不硬？」中國人民大學網路學院院長楊幹忠肯定地說，在「網上人大」學習的學生，同樣可以拿到人大的文憑。當然，最關鍵的是，證書不加注「成教、遠端教育字樣」，這些文憑的含金量與在校生的無異。據人民大學網路教育研究中心統計，有 76%的學生選擇網上人大的原因是其所授予的人民大學文憑，63%的人認為網上人大的學習方式較好。很顯然，網路大學將成為莘莘學子走進名校的另一張「綠卡」。

如何報考網路大學？

一般說來，網路大學入口比較寬。目前網路教育學院開設的專業有 40 餘個，以電腦技術應用、管理等應用學科為主。網路大學的學費支出較低。人民大學遠端教育的學費總額是 16000 人民幣(160 學分通過考試，按 100 元／學分計總共 16000 元)。這裡面還沒有包括住宿費用以及其他的學習開支。傳統高中起點本科四

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年下來至少需要2至3萬元，於是許多家長應該都會為孩子選擇「物美價廉」的網路大學。那如何報考網路大學呢？

以北大線上為例，報名者如果符合北大線上網頁上的報名條件，就可以在網上註冊，填一份報名表，同時還要將個人報名資料書面郵寄一份，學校會將其掃描生成一份准考證，同時舉辦傳統形式的集中考試。考試通過者將被錄取為網路大學學生，寄發錄取通知書。報名者如果有本科以上學歷，可以免試直接入學。

網路大學的招生應該說是網路與傳統手段相結合。在課程設置上，網路大學大多設置的是一些實用性的學科。如網上人大目前開設了會計、金融、國際貿易、工商企業管理、市場行銷、財政稅收共六個專業，北京郵電大學開設了電腦科學與技術、資訊管理與資訊系統兩個專業，這正好適應了社會和個人的共同需求。這樣的規劃無疑具有很大的就業優勢。

網路大學怎麼上？

讓人們對網路大學感到困惑的是，它將如何開展學業。我們已經習慣了考試入學，坐在教室裡聽老師講課、交作業、考試，這樣一系列的教育過程，網上教育是如何實施的呢？網路大學最典型的授課形式是 VOD（Video On Demand）視頻點播。武軍是網上人大的工商企業管理專業線上大學生，他告訴記者，「網上人大」的學生不僅可以學習由人大教授親自授課，並通過中華學習網製作的光碟觀看課程，答疑、交作業、學校社區都在網上進行。學生還可以隨時上線調閱別的地方的上課內容。學習時間、選哪門課、用什麼進度等，也都可以自主安排。網路大學還安排了專門的老師負責答疑解惑。遇到疑難，我就發 E-MAIL 詢問老師；或者把疑難問題公佈在 BBS 上，同學們很快就給我回了帖，而且同學們的解答方法都很新穎獨到。（全文完）

問題一 (占總分 50 分)

1. 網上學習會衝擊傳統教育嗎？你覺得網上學習會對中國大陸帶來什麼樣的影響？(10 分)
2. 在網上學習的過程中，老師與學生各別會遇到哪些問題？ (20 分)
3. 教育專家擔心，網路大學將會使整體教育「向下沉淪」，他們是否有點杞人憂天。你認為呢? 請分析網路大學全面引進台灣後的潛在問題。(20 分)

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考題二：資訊科技手術卻令績優公司倒閉

【本案例取材自文萃報】

FoxMeyer 公司曾是全美第四大藥品分銷商，提供各種藥物給藥劑師和醫院，年營業額在 50 億美元左右。為提高競爭力，該公司決定引入「企業資源規劃」（ERP：Enterprise Resource Planning）系統，並選擇了 SAP 的產品。目標是在大規模使用電腦系統後促進企業的快速增長，期望每年為公司省下四千萬美元的費用。20 世紀 90 年代初，FoxMeyer 孤注一擲，把公司的未來押在資訊系統和倉儲自動化建設上，但最後卻失敗了。1996 年 8 月，依據美國聯邦破產法第 11 章，該公司 申請了破產保護。為何這套資訊系統不但未能替 FoxMeyer 省錢，反而使其蒙受巨大損失，並最終面臨倒閉呢？

企業新殺手—軟體

20 世紀 90 年代企業最流行的事大概就是引入 ERP 了，所謂的 ERP 就是一套整合的資訊管理系統，將企業中的生產、行銷、庫存、財務、人事等各種作業設立於這套軟體中。在目前的競爭環境中，企業越來越需要緊密地結合上下游作業，所以，引入一套 ERP 軟體雖然要花上千萬美元，許多企業仍趨之若鶩，惟恐落於人後。

參與 FoxMeyer 專案的有 3 家公司：首先是位於德國的 SAP，它是一家 ERP 軟體製造公司，原本是由 3 位從 IBM 跳槽的德國工程師所創立。自成立以來，SAP 在市場上與甲骨文鼎立，逐漸成為第一大 ERP 軟體銷售商。因此，SAP 在業界幾乎與 ERP 劃上等號。第二個是安達信，一家國際性管理顧問公司，為了 FoxMeyer 的案子，安達信派遣一個 50 人的專案小組赴現場說明引入 ERP 軟體。第三家是頂尖自動化公司，它提供倉儲管理系統給 FoxMeyer 的配貨中心。

1998 年 8 月，FoxMeyer 控告 SAP 與安達信引入的 ERP 軟體不當，導致它被迫宣告倒閉。最後由麥肯森（McKesson，也是一家大型藥品經銷商）在 1996 年 10 月收購了 FoxMeyer 的資產。FoxMeyer 要求 SAP 和安達信必須賠償五億美元的損失。公司倒閉了卻要控告軟體公司，這在以前是絕無僅有的。但在未來，會有更多公司一窩蜂投入電子商務，那麼這種訴訟會越來越多。因為電腦聯網後，公司的存亡就維繫在資訊系統 的運作品質上，換言之，軟體成為企業的新殺手。

一宗奇怪的官司

1996 年，FoxMeyer 的隕落成了全美最大的倒閉案。破產信託公司在審理 FoxMeyer 藥品案後指出：「我不知道這次的軟體災難是因為系統運轉不靈，還是因實施不力造成的。」當時，SAP 認為此次訴訟不過是貪得無厭的律師與瀕臨絕望的企業在束手無策時的最後掙扎，得了絕症卻要怪醫生不好！安達信也表達了同樣的無奈。令人不解的是 FoxMeyer 擁有 15000 多個忠心的客戶，也曾是績優企業，為何一套軟體就會要了它的命？

據 Forrester 研究中心分析，ERP 的引入失敗並不是這套軟體設計不當，主要原因是資料庫管理系統的處理

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速度先天不足，而且軟體本身缺乏延展性，因此使系統能處理的交易量大受限制。例如：FoxMeyer 的舊系統一天可以處理約 40 萬筆交易。但 ERP 導入後每天只能處理 10 萬筆交易，而且由於 ERP 採取集中式設計的資料庫，因此每進行一筆交易，系統就要更新子系統的資料，所以速度大打折扣。也因為這樣，ERP 通常不是以整套系統安裝，而是以個別系統安於各部門，最後還是和原來一樣成為分散的資訊系統。

FoxMeyer 上法院控告的主要原因是，SAP 的經理曾擔保上線後原有的交易量不會受影響。此外，SAP 不提供任何保證期，也不提供這套 ERP 軟體的系統績效評估報告，如此根本無從知道這套軟體的功能與適用範圍。控告安達信則是因為這家顧問公司未能負責地引入系統。FoxMeyer 抱怨安達信索取了 3000 萬美元的引入費，但卻把沒經驗的顧問放進 FoxMeyer 專案。安達信則稱這與事實不符，因為每項工作都是 FoxMeyer「簽名驗收」的，但 FoxMeyer 的經理指出，他們簽名是受威脅的，因為安達信曾經威脅要先付清餘款，否則在系統未完全引入前把人員撤走。

ERP 該怎麼用？

業界人士認為 FoxMeyer 失敗的原因是期望過高。FoxMeyer 希望將倉儲自動化與 ERP 結合以降低成本、改善客戶服務。此構想雖佳，但是卻沒有考慮到 ERP 軟體原來是設計給製造業所用，並未考慮到批發業的重點是處理大量的訂單，而不是計算物料與庫存。

ERP 在 FoxMeyer 是處理複雜的交易而不是大量的交易。況且，要結合倉儲、物流與軟體資訊流更是困難重重。ERP 原來是要引入 FoxMeyer 的 23 個倉庫，但只引入 3 個就喊停了。因為引入 ERP 立即面對的就是客戶資料規格不相容的問題，軟體工程師須先將原來的舊系統資料轉換。

此外，就硬體而言，因為 FoxMeyer 每天要處理近 40 萬筆客戶訂貨記錄，公司擔心業務增長得太快，以致於超出當時所使用的 UNISYS 主機的處理能力。所以，FoxMeyer 著手研究以主從式架構（Client/Server）為基礎的系統以緩解資訊交易量，並跟上業務量增長的需求。但是，主從式架構根本無法消化批發商所需處理的龐大資料量，因此引入 ERP 後問題叢生，使許多客戶抱怨而去。

究竟安達信與 SAP 有沒有錯？答案是肯定的，但是，是否讓它們賠償則有待商榷。不過，SAP 已經有產品保險，不會受很大影響。但是前仆後繼的追隨者在引入 ERP 之前，確有必要考慮它是否合適。

手術成功，病人卻死了

對 FoxMeyer 倒閉的原因，始終存有爭議。一位 FoxMeyer 的發言人在 1996 年後期對《華爾街》雜誌說：「由於電腦整合的問 題不斷，顧問公司一直向我們追加專案預算到一億美元，這是導致破產的重要原因。」

曾經協助輔導 FoxMeyer 資訊化引入的一位產業分析員指出，造成 FoxMeyer 困境的原因不是自動化的失敗，也不是軟體的失敗，而是管理上的失敗。他說：「此專案一開始就有問題，安達信在一次會議上誇口表示整個實施過程將在 18 個月內完成，每個軟體模組的引入只需要兩三個月。但是在一個龐大而複雜的組

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織裡，這樣的進度實在太理想化而且是根本行不通的。光是引入一套會計總帳系統（General-Ledger），有時就要花一年時間。」

此外，FoxMeyer 也缺少資深的員工去協助安達信。雖然藥品批發業競爭激烈，但是也不能低估改善業務流和組織變革所需要的時間，安達信為了爭取這個報酬優厚的案子草率地拼湊了一張時間表。

安達信的主管回應：「我們很專業地完成 FoxMeyer 的 ERP 導入，而且結果很好，不幸的是，手術成功了，但病人卻死了。FoxMeyer 每天都從上千家藥店和醫院接到訂單，每家藥店都會訂上百種藥，每天處理成百上千宗交易是很平常的事，為了確保新的系統能夠消化如此大的交易量，我們已將 SAP 的軟體先在幾家大公司的硬體上進行測試，最後才決定用惠普的設備。選擇 SAP 也是經過嚴密考慮後決定的。SAP 被認為是會計和生產管理軟體而非倉儲管理的軟體，所以 FoxMeyer 決定搭配使用麥克休斯軟體公司的倉儲管理軟體。」

科技優勢的代價

另一方面，SAP 聲明：「我們銷售和配貨的軟體系統性是優異的。FoxMeyer 的問題是要處理龐大的資料量和對付複雜的定價環境，但 SAP 已解決了這個問題，而且我們絕對沒有耽擱進度。」不管怎樣，把兩家不同公司開發的軟體拼在一起，使用本來已經很困難了，更何況將兩套不同的業務系統（行銷與倉儲）搭配在一起使用。實際上，FoxMeyer 是無法在短期內取得這兩家公司產品的核心知識再去規劃整合措施的。

FoxMeyer 在業務上的增長也加劇了問題的惡化。1994 年 7 月，該公司爭取到一個合同為美國大學健保聯盟供貨。這是一個由全國性的教學醫院組成的網路，為這個聯盟供貨可望在五年間每年為公司獲取高達 10 億美元的營業收入。

SAP 說：「當這個協定簽下來，我們焦點就變了，從更新原有的資訊系統以備未來之需變成去滿足大學健保聯盟的需要。FoxMeyer 特別為此設置了一個 40000 平方英尺的倉庫。FoxMeyer 準備在引入 ERP 後，仍在硬體系統保存此資料處理能力。但資料量增長後，主機所有的處理能力都被耗盡了，我們必須經常修改軟體。例如，它要我們設計一個在幾小時內發貨的系統，當我們按要求做好時，它卻接著要改成在 1/2 或 1/3 時間內發貨。」

頂尖自動化公司分析：「FoxMeyer 新的倉庫有嚴重的流量問題，它原本希望倉儲自動化引入後，貨物在流動路徑上只有 3 到 4 個站，最後變成了 8 到 9 個，氫系統時常會發生堵塞。」

對此 FoxMeyer 反駁：「問題並不是出在倉儲自動化的運輸裝置，而是倉庫軟體處理訂單的方式造成了整個系統的堵塞。」

雪上加霜的是，原來興建的倉儲設施沒有按預定進度完成，原訂於 1995 年 5 月啟用的倉庫又遇到麻煩。更糟的是，原來要由俄亥俄州配貨中心調來的工人因勞資糾紛而離職。FoxMeyer 許多貨只發了一半，當客戶

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抱怨缺貨時，只好再發貨，並因此造成重複。遺憾的是 FoxMeyer 沒能認清自己的業務能力，及時地放棄一些交易以便為將來鋪路。結果肯定會賺錢的大學健保聯盟的生意倒賠了錢。(全文完)

問題二 (占總分 50 分)

1. 為何 FoxMeyer 導入資訊科技卻變成一場災難？這家公司犯了哪些管理上的錯誤？ (15 分)
2. 你認為 SAP 有錯嗎？請分析科技導入過程發生了哪些問題？ (10 分)
3. 你認為安達信有錯嗎？這家顧問公司犯了哪些錯誤？(10 分)
4. 你認為要如何才能不讓此科技悲劇再次重演？(15 分)

備註	試題隨卷繳交

考 試 科 目	專業英文	系 別	科技管理研究所／科技管理碩士後組	考 試 時 間	2 月 23 日(六) 第 三 節

Please Answer All Questions in ENGLISH

[ARTICLE 1] As the Kindle Turns Five, Amazon Girds for a New Fight

On Nov. 19, 2007, Amazon.com Chief Executive Officer Jeff Bezos appeared before a group of journalists and publishing executives at the W Hotel in Lower Manhattan to introduce something completely unexpected from a company known at the time as an online retailer: an electronic reading device. Oddly shaped, with a sluggish black-and-white screen and a jumble of angular buttons, the original Kindle resembled the unholy spawn of a calculator and a BlackBerry. Despite its peculiar design, the Kindle was easy to use and allowed owners to download a book quickly from Amazon's vast catalog without connecting to a PC. That, it turned out, was the magic trick that transformed not only an industry but Amazon's image in the eyes of the world.

There are certain moments in the history of technology that demand special acknowledgment: the introduction of the IBM PC in 1981, Microsoft's rollout of Windows 95, Apple's introduction of the iPod in 2001, the iPhone in 2007, and even the iPad in 2010. The Kindle belongs in that High-Tech Hall of Fame. Code-named Fiona, the original model was out of stock for much of its 15-month life due to manufacturing problems and unexpected demand, but it showed enough promise that the publishing world finally began to embrace the promise of digital books. "I spent literally decades trying to get publishers to pay attention to e-books, and I know how resistant they were to the idea," says Tim O'Reilly, the founder of computer book imprint and conference organizer O'Reilly Media. "Most publishers just weren't willing to move. Jeff made them all move, and he took a bold bet on hardware and got into a different business that didn't necessarily play to Amazon's strengths."

STORY: Worldreader: Taking the E-Book Revolution to Africa

Investors underestimated the Kindle's impact, at least at first. A litany of similar e-readers had already flopped, including the Sony Reader, which went on sale first in Japan and then received a tepid reception in the U.S. The Sony Reader had to be connected to a PC and had a limited selection of e-books. The Kindle was a stand-alone device that gave users instant access to Amazon's catalog of 90,000 titles. Still, most analysts weren't impressed. "The Kindle is the thing that I got most wrong in the whole history of digital change in publishing," says Mike Shatzkin, CEO of publishing industry consulting firm the Idea Logical. "I thought it wouldn't work."

By inventing its own electronic reading device, Amazon essentially set out to disrupt its physical bookselling operation, which was its first business and at the time still its best. The company had also just watched Apple's iPod and iTunes devastate traditional music retailers—and undermine its own CD sales. Bezos knew what fate awaited industry incumbents, like Kodak, that were unable or unwilling to adjust their analog business models. Following the lessons of Harvard professor Clayton Christensen's The Innovator's Dilemma almost to the

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letter, Amazon spawned an independent subsidiary called Lab126 in faraway Silicon Valley to develop the e-reader.

The success of the Kindle subsequently upended the balance of power in the publishing industry, brought Apple into the bookselling market with its iBookstore, and eventually led to a U.S. Department of Justice lawsuit alleging collusion and price-fixing by Apple and five large publishing companies. Apple is fighting the allegations.

STORY: Apple's Slim iMac Far Outshines the New iPad Mini

Still, Amazon remains in a predicament similar to the one it faced when Bezos decided to create the Kindle. Media sales continue to account for a third of the company's overall revenue. With music, movies, and books transitioning into purely digital formats, it has to move quickly to stake out its position as a leading provider of that content. It's taken competitive steps over the past year, such as funneling resources into Prime Instant Video, a free movie-streaming service for members of Amazon's Prime two-day shipping club. Netflix CEO Reed Hastings recently estimated that Amazon is losing up to a billion dollars a year on the effort. Amazon says it does not comment on individual investments.

On Nov. 15, Amazon also began shipping its newest Kindle tablets, including the Wi-Fi version of the Kindle Fire HD 8.9-inch, which sports an iPad-like screen. At $299 for the 16 GB model, it's cheaper than comparable tablets from Apple and Google and funnels customers into the universe of Amazon digital content, likely converting them into more voracious online shoppers as well. "People don't want gadgets, they want services," Bezos told Charlie Rose in a Nov. 16 interview. "For us, the hardest piece has been integrating, in a very, very simple way for customers, the vast Amazon content ecosystems."

(By Brad Stone, Business Week, November 19, 2012)

<u>Article 1 Questions:</u>

1. What makes the success of Kindle? Explain your answers. (10%)
2. What is Christensen's "the innovator's dilemma" and how it does relate to Amazon's Kindle? (10%)
3. In your point of view, what are the pros and cons for electronic reading devices, such as Kindle? Sate your opinions. (10%)

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[ARTICLE 2] Difference Engine: End of the electric car?

A couple of dozen electric cars with fuel cells under the bonnet (in place of the more usual flat-pack of batteries beneath the floor) have been zipping around your correspondent's neighborhood for the past few years. Most are FCX Clarity models from Honda, all in the same rich crimson color. A couple of others are silver F-Cell station wagons made by Mercedes-Benz. These experimental vehicles are leased to selected users for trial periods while their manufacturers see how the hydrogen-fuelled cars survive the cut and thrust of Los Angeles' traffic.

So far, most seem to have acquitted themselves rather well. Meanwhile, their drivers can feel rightly smug about the only emission from the exhaust pipes being water vapor. Another plus is that the fuel-cell vehicles are largely free of the "range anxiety" that plagues battery-powered electric cars, such as the Nissan Leaf. Both the Honda and the Mercedes have ranges not that far short of comparable petrol cars—ie, 190 to 240 miles (300 to 380km).

Sooner or later, though, they have to return to one of only five hydrogen-refueling stations open to the public in the greater Los Angeles area. But once there, their tanks can be refilled in minutes, rather than the hours needed to recharge a battery car.

And there's the rub. Given further refinement, plus economies of scale, fuel-cell vehicles ought to be an attractive alternative to present-day motoring, if only hydrogen-refueling facilities were more common. As it is, outlets are fewer and farther between than charging stations for electric vehicles or even pumps for compressed natural gas.

Apart from the usual chicken-and-egg problem, the plant and equipment needed for producing, distributing and storing hydrogen is hugely expensive. Unlike the industrial hydrogen used to make ammonia fertilizer, or for converting heavy oil fractions into petrol, the hydrogen needed for fuel cells must be 99.999% pure. That rules out all the cheaper ways of making it, other than electrolysis of water.

There are problems on the distribution side, too. Because hydrogen has the smallest molecule of all, it leaks through practically everything. In particular, it embrittles steel and causes corrosion, hastening crack propagation in the process. Pipelines and storage tanks have to be specially lined at additional cost.

Unlike fossil fuels such as petrol or diesel, hydrogen is not a source of energy in its own right. It is merely a means for storing electricity generated in a power station and delivering it to the motor driving the wheels of an electric vehicle—in much the same way as a battery works. And as free hydrogen does not occur in useful quantities in nature, it has to be made by using electricity to crack water into its constituent elements.

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In California, despite the many solar installations and wind farms, the electricity coming out of the plug is neither green nor clean, being derived predominantly (ie, 62%) from fossil fuel. During cheap-rate periods at night—when electric vehicles tend to be recharged and electrolysis plants are running flat out—most of California's electricity is imported from coal-fired power stations out of state. Thus, like electric vehicles, hydrogen cars contribute their share of greenhouse gases as well.

Certainly, moving the emissions from the vehicle's exhaust pipe to the power station makes it easier to control the pollution. So, the question becomes whether there is a more efficient way of packaging electricity for use in vehicles, other than charging batteries or making hydrogen by electrolysis of water?

A growing body of opinion seems to think liquid air is the answer (or, more specifically, the nitrogen component that makes up 78% of air). It is not exactly a new idea. Air was first liquefied in 1883, using essentially the same process as today—ie, compressing it to 200 atmospheres, cooling it to -190°C, and then letting it suddenly expand and condense. The process turns 1,000 liters of transparent gas into 1.4 liters of light blue liquid.

As long as its storage container is well insulated, liquid air can be kept at atmospheric pressure for long periods. But on exposure to room temperature, it will instantly boil and revert back to its gaseous state. In the process, it expands 700-fold—providing the wherewithal to operate a piston engine or a turbine.

Liquid nitrogen does an even better job. Being considerably denser than liquid air, it can store more energy per unit volume, allowing cars to travel further on a tankful of the stuff. Weight for weight, liquid nitrogen packs much the same energy as the lithium-ion batteries used in laptops, mobile phones and electric cars. In terms of performance and range, then, a nitrogen vehicle is similar to an electric vehicle rather than a conventional one.

The big difference is that a liquid-nitrogen car is likely to be considerably cheaper to build than an electric vehicle. For one thing, its engine does not have to cope with high temperatures—and could therefore be fabricated out of cheap alloys or even plastics.

For another, because it needs no bulky traction batteries, it would be lighter and cheaper still than an electric vehicle. At present, lithium-ion battery packs for electric vehicles cost between $500 and $600 a kilowatt-hour. The Nissan Leaf has 24 kilowatt-hours of capacity. At around $13,200, the batteries account for more than a third of the car's $35,200 basic price. A nitrogen car with comparable range and performance could therefore sell for little more than half the price of an electric car.

A third advantage is that liquid nitrogen is a by-product of the industrial process for making liquid oxygen. Because there is four times as much nitrogen as oxygen in air, there is inevitably a glut of the stuff—so much

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so, liquid nitrogen sells in America for a tenth of the price of milk.

Finally, a breakthrough in engine design has made liquid nitrogen an even more attractive alternative than the lithium-ion batteries used in electric cars. An invention made by an independent British engineer called Peter Dearman dispenses with the costly heat exchanger that is needed to vaporize the liquid nitrogen quickly. Instead, a small amount of water and anti-freeze (eg, methanol) is injected into the cylinder just as the liquid nitrogen is drawn in, causing it to boil and expand rapidly—thereby forcing the piston down inside the the cylinder. “Without that,” says Mr Dearman, “you had to have a multi-stage engine, which is cumbersome, inefficient and expensive.”

The Institution of Mechanical Engineers in London, the leading standards-setting and registration body for the profession, was so impressed with the Dearman Engine Company’s developments that it has now established a working group comprising engineers, academics, government officials and industry leaders, to explore ways of exploiting liquid-nitrogen technology.

If the nitrogen vehicle—with its lower overall cost and rapid refueling capacity—proves to be the solution to zero-emission motoring that electric vehicles once promised, where does that leave the new generation of hydrogen fuel-cell cars?

According to Honda, a fuel cell driving an electric motor is two to three times more efficient than an internal-combustion engine. Unfortunately, a fuel-cell vehicle is even more expensive to build than a battery car. The third generation of Honda’s 100 kilowatt fuel-cell stack developed for the Clarity is reckoned to have cost around $350,000 a unit. The Mercedes stack probably cost much the same. That is one reason why Honda built only 200 Clarity cars and Mercedes a mere 70 F-Cells.

In recent years, carmakers are reckoned to have more than halved the manufacturing cost of their fuel-cell stacks. Installed, they now probably run to $1,500 a kilowatt of capacity. Nevertheless, that still leaves them an order of magnitude or more pricier than internal-combustion engines. Squeezing yet more cost out of their fuel cell’s proton-exchange-membrane technology will not be easy.

That said, seven new fuel-cell cars were exhibited at the recent Paris Motor Show. Admittedly, most were concept models, but all were fully functional. So the industry seems to be hedging its bets on battery-powered electrics. But is it backing the right technology?

While he is at odds with some of the best brains in the business, your correspondent cannot help but think that—like battery-powered electric vehicles before them—the fuel-cell cars running around his neighborhood today are destined to occupy at most a 3% niche in the market. And though still a long shot, nitrogen would

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seem to have a better chance of fulfilling the role hydrogen was once expected to play.

(The Economist, Oct 15th 2012)

Article 2 Questions:

4. A number of car manufacturers have had their electronic car lines. According to the article, what are the problems for electric cars? (10%)
5. What are the advantages for liquid-nitrogen cars? (10%)
6. Although the cost of manufacturing fuel-cell engines has been reduced, why do they still prefer making internal-combustion engines? Explain the reasons. (10%)
7. Do you agree that nitrogen vehicles would be the next generation of hydrogen fuel-cell cars? Why or why not? Explain your opinions. (10%)

[ARTICLE 3] Why are social enterprises thriving in the UK?

Social enterprises use business methods to tackle problems in society and despite the austerity, many are thriving with twice as many reporting growth last year as conventional businesses.

Andy Bradley is selling compassion to the NHS (National Health Services). Dominic Boddington is selling hope for difficult pupils to schools. They both used to work in the public sector but have decided that to improve public services you need to be in business.

They have set up social enterprises - businesses that have social change for good as their primary motive rather than profit.

Frameworks 4 Change was set up by Andy Bradley to sell compassion training to healthcare providers, including the North Essex Partnership Foundation Trust, the first NHS body to commission him.

He grew up in a care home run by his parents and was shocked when he started working in the NHS himself and found not all nurses were as compassionate as his mother had been.

Free thinking

So he set about devising a training course teaching a series of habits nurses can adopt to make sure they are always compassionate, regardless of how busy they are. Nurses that are not compassionate enough should be sacked, he believes.

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During the course he teaches which body language to avoid, how to listen properly and why it is important to care for your colleagues.

It is proving very popular with a team of dementia nurses in Colchester who have had several months training.

"It's so powerful," says senior dementia practitioner Leigh Rippon. "The response from one of my male patients was that it felt like he was being cared for by a friend rather than just a technician."

Andy Bradley's ambition is to change the culture of nursing entirely and there is certainly a gap in the market for that.

Last month Prime Minister David Cameron said "the whole approach to caring in this country needs to be reset" if we want "dignity and respect" for patients.

But Andy Bradley says that change will not come from within the NHS:

"There are certain cultural norms around who does what and how things get done that tend to get broken down when you're in another space, people are less limited in their thinking.

"It's not that there isn't some really great thinking in the NHS and local authorities, it's just that sometimes it's really difficult to release it."

In their controversial Health and Social Care Bill, the government envisages a greater role for social entrepreneurship in the NHS. Successive governments have promoted it- Tony Blair mentioned social enterprise in his very first speech as prime minister- and it continues to grow.

In the last month alone a new social enterprise academy has opened, the government has announced £1m funding for young social entrepreneurs and a major bank has agreed to fund 500 grants worth up to £25,000.

'Rocky patches'

Social enterprises are also bucking the gloomy economic trend. Last year 58% of social enterprises grew compared with 28% of mainstream small and medium-sized businesses.

Celia Richardson, director of campaigns at Social Enterprise UK, says social enterprise is thriving because economic times are hard.

"They see opportunities in market failure, so these are the perfect conditions for the social enterprise sector.

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"It's a win-win situation because we're looking for sustainable growth. Social enterprises spot the social problem and the social opportunity first but they use business methods and create wealth to solve them."

Celia Richardson admits that social enterprise is not immune to the economic downturn - especially those which are reliant on public sector customers, such as Respect 4 Us.

It was set up in 2010 by two teachers, Dominic Boddington and Liz Easton to provide alternative education for teenagers in Norwich who had dropped out of school or were at risk of being excluded.

A number of schools send their most difficult pupils there. They have 38 students on their books at the moment, but public money is tight and some months Liz and Dominic do not know if they will get paid.

"We've really jumped in and followed our beliefs and hoped it would work," says Liz Easton, "and it has worked but there are rocky patches. It's a bit scary sometimes but you have to have that commitment.

"It would be lovely to crack the web around all these grant structures and to have some help but not at the cost of our independence, because if we had to bend our thinking to meet somebody else's expectations we wouldn't be us."

Their approach is "education on the sly" combining map-reading skills with bike-riding, numeracy with woodwork, and literacy with cookery.

The teenagers and adults prepare and eat meals together and the staff are constantly giving encouragement - even though often all they get in return is sarcasm or bad language.

It seems to be working. At the end of last year all of the teenagers they had worked with went into further education or training.

Sixteen-year-old Levi has been going to Respect 4 Us for over a year after dropping out of school, which he says was a "waste of time."

"This is the only place I haven't been kicked out of. I was class clown at school. If a teacher told me to do something I'd just lash out and wreck the classroom but Respect have straightened me out.

"I have more respect for them than I ever had for my teachers and I've learned more here than I ever learned at school."

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Dominic Boddington agrees with Andy Bradley's view that truly innovative approaches to public service are only possible when you are outside the system:

"The great thing is that we are completely free to decide for ourselves how to deal with particular situations. We're free of the national curriculum, we're free of targets, we're free of people looking over our shoulders all the time. It's an utterly fantastic place to work."

(By Charlotte Ashton, BBC News, 21 February 2012)

Article 3 Questions:

8. What is the difference between social enterprises and non-profit organizations (NPOs)? (10%)
9. What is the purpose for social enterprises? Why do social enterprises need to use business methods? (10%)
10. According to the article, social enterprises grow even though the economic times are hard. How could this happen? State your opinions. (10%)

備 註	試 題 隨 卷 繳 交

國立政治大學 102 學年度碩士班招生考試試題

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微積分

注意事項：1、請將算式以及推導過程臚列清楚。
2、每題 10 分，注意時間的分配。

一、 請問 $\lim\limits_{x\to 0}\dfrac{e^x-1}{x}=$ 多少？請列出求解過程。

二、 請求出以下微分方程的一般解：$e^y dx+(xe^y+2y)dy=0$

三、 如果 $\dfrac{dy}{dx}=D^1 y$ 代表 x 對 y 的 1 階微分，$D^n y$ 代表 n 階微分;

求 $D^n\left(\dfrac{7x}{(x+2)(3x-1)}\right)=?$

四、甲、乙兩船由同一地點沿著互相垂直的航線行駛，甲船時速是 6 公里，乙船時速是 8 公里。請問開船兩小時後，兩船的相離速度是多少？

五、 試求 $4y=x^2-2\log x$,自 $x=1$ 到 $x=4$ 繞 y 軸所生的區面面積為何？

六、 試求 $\int_0^{\pi}\int_x^{\pi}\left(\dfrac{\sin y}{y}\right)dydx$ 之值？

七、 已知 $y=e^{-x}\ln x$，試求 $\dfrac{dy}{dx}=?$

八、試求不定積分 $\int\dfrac{x}{1+x^4}dx=?$

九、試求 $r=1+\cos\theta$ 內部與圓 $r=1$ 內部相交共有區域的面積？

十、何謂「微積分基本定理」？這定理的重要性何在？
你在前面 9 題中有用到這個定理嗎？

備註	試題隨卷繳交

國立政治大學 102 學年度碩士班招生考試試題

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第一題 (60 分):

請任選(A)題或是(B)題作答：

(A) 2012 年的諾貝爾生理學或醫學獎殊榮由日本籍的山中伸彌 (Shinya Yamanaka)和英國籍的約翰古爾登爵士(Sir John B. Gurdon)獲得。他們得獎的理由是「發現成熟細胞可被重编成多功能細胞」 (for the discovery that mature cells can be reprogrammed to become pluripotent)。他們的研究內容發現在細胞重編過程中，可以讓成熟細胞具備胚胎幹細胞功能，使這些幹細胞能夠用來形成不同組織類型。(1) 請解釋他們兩人各自做了些什麼重要的實驗去証明成熟細胞能恢復胚胎幹細胞功能； (2)並請解釋為什麼他們的發現是近代醫學生技工程最重要的發現。

(B) 2012 年的諾貝爾化學獎殊榮由美國的羅伯特·萊夫科維茨 (Robert J. Lefkowitz)及布萊恩·科比爾卡(Brian K. Kobilka) 共同獲得。他們得獎的理由是他們對「G 蛋白偶聯受體的研究」(for studies of G-protein-coupled receptors)。(1) 請解釋何謂 G-protein-coupled receptors (GPCRs) 及他們兩人各自做了些什麼重要的實驗去証明 GPCRs 在人體中的作用； (2)並請解釋為什麼他們的發現是近代醫學及化學中最重要的發現。

第二題 (40 分)

新修正的台灣專利法已在 2013 年 1 月起生效，經濟部智慧局長王美花表示，這次大翻修可分為 6 大面向，包括申請程序面、實體審查面、擴大保護面、侵權救濟面、強制授權面以及專利學發面，新法上路後將對我國生技業產生利多。

1. 請說明何謂專利? 為何世界各國要給發明人專利權呢? 您認為給專利權的先决條件是什麼? 很多人認為專利限制了科學的發展，但也有很多人認為專利鼓勵科學的發展，您的見解為何? 請說明您的意見與理由。
2. 經濟部智慧局長認為新修正的台灣專利法對我國生技業是利多， 請您解釋為什麼專利法修正會對我國生技業產生利多? 這個法律是偏袒我國某個產業的法律嗎? 對我國其他產業公平嗎? 對其他國家同樣的產業公平嗎?

備註	試題隨卷繳交

考試科目	經濟學	所別	科技管理與智慧財產研究所 學士後甲組	考試時間	2月23日(六) 第 1 節

經濟學

請遵守考試規則，並儘量輔以圖形及符號來說明

一、(40 分)

假設產業中的每一個廠商有相同的邊際成本 C，產業的需求曲線是 **P=A – BQ, Q=q1+q2**。請問在以下各種市場結構下，均衡的價格 **P**、產業產量 **Q**、兩個廠商的產量 **q1,q2** 及利潤以及「消費者剩餘」「社會福利淨損失」分別是多少？

（1） Cournot 雙占（2）Bertrand 雙占 （3）合作雙占 （勾結）

(4) 請由以上答案，說明為何政府要限制廠商彼此勾結。

二、(20 分)

日本政府在安倍首相的主導下，企圖讓日圓大幅地貶值，以振興日本經濟。

請問(1)為什麼日圓貶值能振興日本經濟？有何利弊？

(2)日圓貶值對台灣及美國的產業經濟分別有何影響？

三、(10 分)

何謂「市場失靈」？如果市場不失靈那會怎樣？哪些因素會使得市場失靈？為什麼？請分別說明之。

四、(10 分)

台灣的廠商流行外包代工，韓國企業卻傾向垂直整合，請以經濟學的觀念，分析各自的利弊得失！

五、(20 分)

請用圖形及符號說明

（1）何謂規模經濟？（2）何謂學習曲線？

（3）何謂網路外部性？（4）何謂轉換成本？

備註	試題隨卷繳交

國立政治大學102學年度碩士班招生考試試題

考試科目	民法	所別	科技管理與智慧財產研究所 智慧財產組	考試時間	2月23日(六)第1節

第一題：30%

何謂往取債務？何謂赴償債務？一債務究為往取債務，抑或赴償債務，應如何認定？

第二題：30%

何謂違法行為？違法行為之歸責事由（歸責原則）如何判定，試舉例說明之。

第三題：40%

試從權利之內容及權利之作用，分別就權利加以分類，並舉例說明之。

備註	試題隨卷繳交

考試科目	經濟學	所別	商學院各系所（科管與智財所科技管理組學士後甲一般生除外）	考試時間	2月23日(六)第一節

Multiple Choice (1 point each)

Identify the letter of the choice that best completes the statement or answers the question.

1. When marginal cost is rising, average variable cost
   A. must be rising.
   B. must be falling.
   C. must be constant.
   D. could be rising or falling.

2. When goods are not excludable
   A. the good will be produced as a private good but not as a public good.
   B. the good will not be produced since no one values it.
   C. the free-rider problem prevents the private market from supplying them.
   D. everyone can have all they want and the good will have a zero price.

3. The Coase theorem suggests that private markets may not be able to solve the problem of externalities
   A. if the government does not become involved in the process.
   B. when the number of interested parties is large and bargaining costs are high.
   C. if the firm in the market is a monopoly.
   D. if some people benefit from the externality.

4. The substitution effect of a wage decrease in the work-leisure model results in the worker choosing to
   A. work less than before.
   B. work more than before.
   C. possibly work more or less than before.
   D. work more with a higher level of consumption.

5. Suppose a tax of $1 per unit is imposed on a good. The more elastic the supply of the good, other things equal, the
   A. smaller is the response of quantity supplied to the tax.
   B. larger is the tax burden on sellers relative to the tax burden on buyers.
   C. larger is the deadweight loss of the tax.
   D. All of the above are correct.

備註	試題隨卷繳交

考試科目	經濟學	所別	商學院各系所（科管與智財所科技管理組除外）學士後甲一般生	考試時間	2月23日(六) 第一節

6. If a monopolist faces a downward sloping market demand curve, its
   - A. average revenue is always less than marginal revenue.
   - B. marginal revenue is greater than the price of the units it sells.
   - C. average revenue is less than the price of its product.
   - D. marginal revenue is always less than the price of the units it sells.

7. Comparing marginal revenue to marginal cost
(i) reveals the contribution of the last unit of production to total profit.
(ii) is helpful in making profit maximizing production decisions.
(iii) always reveals whether a firm is making an economic profit.
(iv) tells a firm whether its fixed costs are too high.
   - A. (i) and (ii) only
   - B. (iii) only
   - C. (ii) and (iii) only
   - D. All of the above are correct.

8. In a world with only two countries, the noncooperative outcome to an "arm race" game clearly
   - A. could not be considered a waste of economic resources.
   - B. is bad for society.
   - C. is the best possible outcome for society.
   - D. is optimal for one player at the expense of the other.

9. When a profit-maximizing firm in a monopolistically competitive market is producing the long-run equilibrium quantity,
   - A. it will be earning economic profit.
   - B. its demand curve will be tangent to its average total cost curve.
   - C. its average revenue will equal marginal cost.
   - D. its marginal revenue will exceed marginal cost.

10. Workers displaced by trade will eventually find jobs in
   - A. another country.
   - B. the government sector.
   - C. the industries in which the country has a comparative advantage.
   - D. a different company in the same industry.

備註	試題隨卷繳交

考試科目	經濟學	所別	商學院各系所（科管與智財所科技管理組學士後甲一般生除外）	考試時間	2月23日(六)第一節

11. A citizen of Japan uses previously obtained U.S. dollars to purchase the Kindle e-book readers from the United States. This transaction

A. increases Japan net capital outflow, and increases U.S. net exports.
B. increases Japan net capital outflow, and decreases U.S. net exports.
C. decreases Japan net capital outflow, and increases U.S. net exports.
D. decreases Japan net capital outflow, and decreases U.S. net exports.

12. Which of the following shifts aggregate demand to the left?

A. an increase in the price level
B. a decrease in the money supply
C. an increase in net exports
D. Congress passes a new investment tax credit

13. Policymakers who control monetary and fiscal policy and want to offset the effects on output of an economic contraction caused by a shift in aggregate supply could use policy to shift

A. aggregate supply to the right.
B. aggregate supply to the left.
C. aggregate demand to the right.
D. aggregate demand to the left.

14. Judith sells cars. In 2012 she added $500,000 to her inventory. $200,000 of this addition was from used cars she purchased, while the remaining $300,000 was from her purchases of newly manufactured cars. How much of Judith's inventory is included in 2012's GDP?

A. $0
B. $200,000
C. $300,000
D. $500,000

15. The Consumer Price Index measures the level of prices in a given year relative to some base year and is calculated using a weighted average of prices for a typical bundle of goods. The weights are

A. the same for each good.
B. equal to the share of income spent on each good in the base year.
C. equal to the share of income spent on each good in the current year.
D. different across goods but assigned randomly.

備註	試題隨卷繳交

考試科目	經濟學	所別	商學院各系所（科管與智財所科技管理組學士後甲一般生除外）	考試時間	2月23日(六)第一節

16. Assume that autonomous consumption equals \$400 and disposable income equals \$2000. If total consumption equals \$1600, then the marginal propensity to consumption is

A. 0.2
B. 0.6
C. 0.8
D. 1.0

17. Suppose that from a new checkable deposit, Bank A holds four million dollars in vault cash, sixteen million dollars on deposit with the central bank, and two million dollars in required reserves. Given this information, we can say Bank A faces a required reserve ratio of

A. 5%
B. 10%
C. 15%
D. 20%

18. Everything else held constant, in the market for reserves, when the federal funds rate is 3%, raising the discount rate from 4% to 5%

A. has an indeterminate effect on the federal funds rate.
B. raises the federal funds rate.
C. lowers the federal funds rate.
D. has no effect on the federal funds rate.

19. The quantity theory of inflation indicates that if the aggregate output is growing at 6% per year and the growth rate of money is 10%, then inflation is

A. 4%
B. -4%
C. 1.6%
D. 0.6%

20. If the required reserve ratio is 10%, currency in circulation is \$200 billion, checkable deposits are \$400 billion, and excess reserves are \$0.4 billion, then the M1 money multiplier is about

A. 0.60
B. 3.50
C. 1.50
D. 2.50

備註	試題隨卷繳交

考 試 科 目	經濟學	所 別	商學院各系所（科管與智財所科技管理組學士後甲一般生除外）	考 試 時 間	2月23日(六)第 一 節

Problems and Short-essay Questions

Please answer the following questions IN SEQUENCE. All questions may be answered in either Chinese or English.

1. Consider a competitive market whose demand is given by $Q(P) = 500 - 50P$. There are 200 identical firms in the market, each producing with a technology characterized by the total cost function, $TC(q) = 4 + 0.02nq + q^2$, where n and q denote the number of firms and quantity produced by each firm, respectively. Apparently, each firm's marginal cost is increasing in the number of firms coexisting in the market.

a. (5 points) How much profit does each firm make in the short-run equilibrium?

b. (15 points) In the long run, firms can freely enter or exit the market. How many firms are there in the market when it reaches the long-run equilibrium? How many units of output does each firm produce in the long-run equilibrium? What is the corresponding marginal cost?

2. Suppose, for a specific good, the excess demand function of the home country is $P = 2 - Q$ and the excess supply function of the foreign country is $P = 1 + Q$. Answer the following questions.

a. (10 points) What are the equilibrium price and the home country's quantity of import under free trade?

b. (10 points) Suppose the home country imposes an ad valorem tariff. Calculate the optimal tariff the government should levy if it wants to maximize the welfare of its citizen.

3. a. (6 points) Give two major reasons that support a downward-sloping aggregate demand (AD) curve?

b. (7 popints) Explain in detail how the several rounds of quantitative easing (QE) implemented by the Federal Reserve system could possibly affect the AD curve in the U.S.?

c. (7points) Given that the current interest rate is already very low (the real interest rate is reportedly negative), how could another round of QE (say QE4) boost up the U.S. economy?

4. (20 points) This is a question about the expectations theory of the term structure of interest rates. Consider 1-year zero-coupon bond and 2-year zero-coupon bond. Both bonds have the same face value of \$1. Today's 1-year interest rate on the 1-year bond is 10%. Investors are risk-neutral.

a. Suppose that investors expect that the 1-year interest rate on the 1-year bond next year will be 10%. There is no uncertainty, meaning that investors assume that the 1-year interest rate next year will be exactly 10%. Given these information, according to the expectations theory of term structure, what would be today's 2-year interest rate on the 2-year bond?

備 註	試題隨卷繳交

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b. Now the expected rate is still 10%, but suppose there is uncertainty: with probability 1/2 the 1-year interest rate on the 1-year bond next year will be 12%, and with probability 1/2 the 1-year interest rate on the 1-year bond next year will be 8%. What would be today's 2-year interest rate on the 2-year bond in this case?

c. Continue from (b) above, but now suppose the investors are risk-averse. In this case, today's 2-year interest rate will be higher or lower than your answer in (b)? Why?

備註	試題隨卷繳交