統計方法學「前傳」
-- 「貝氏認識論」簡介
Bayesian Epistemology

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Coin Flipping experiment
Randomness vs. Capability debates

- Why can a firm stand still? Because of luck or Capability?
- Only one out of 1,024 (2^{10}) firms can luckily survive in 10 year
- Why top 10% competitive performers can sustainably survive more than 40 years long (Henderson et al, SMJ 2011)?

Statistics: Bernoulli error in signaling capability vs. luckiness

- Can the number of wins is a signal of superior capability?
  - 111111111110000000
  - 101010101010101010
  - 110010011100101011
- Will this lucky event decay or carryover overtime? or, simply, a one-time "accident"? (zero order vs. first order in product innovations)

Marketing: Stochastic Choice Behavior

「數據分析」
2014 年 10 月，9 卷 5 期，頁 23-46

線上消費者再購行為之探討：
機率分配和迴歸因子模型方法的比較

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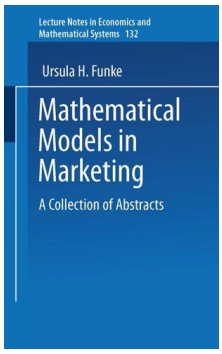
摘　要

本論文為一實徵研究方法論的綜合論述，主要探討機率分配和迴歸因子模型在電子商務線上消費者再購行為實徵研究的適用情境。文章架構在 2003 年經濟學克拉克獎得主，對人類個體行為有深刻理解的實證經濟學者史蒂芬・李維特（Steven D. Levitt）一系列實證經濟學論述中，所揭櫫如何做好實徵研究的重要各面向。本篇論文除指陳若干使用「決定論」即傳統迴歸因子模型的線上消費者再購行為的實徵文章可能存在的問題，而再整理國外過去以「機率論」研究線上消費者再購行為的行銷科學相關文獻，同時以國內實際的電子商務資料驗證，並透過便於產學界應用的 MS-EXCEL 試算表實作計算。藉由實證分析線上消費者再購行為發現，應用機率分配模型確實可以作好預測未來銷售狀況，並可據以解釋再購行為的內隱機制。由於電子商務網站的客戶大多屬於非訂定合約（Non-contractual）型客戶，本論文亦討論以機率論為主體出發，加入迴歸因子為輔，對一般電子商務網站的客戶再購行為研究的可能性，這逆向思考將有別於一般以迴歸因子模型處理線上消費者再購行為議題的研究。

關鍵字：再購行為、機率分配模型、實徵研究



Psychology: law of small number

- Will the lucky event decay or carryover overtime (i.e., capability)? or simply a one-time luckiness?
- Is the absolute value or "the perception of that absolute value" defining the "luckiness"?
- What is the drivers of that luckiness (vs. capability)?
- e.g., "the law of small numbers" in sports betting or stocks buying

Psychological "Hot Hand" effect: Drivers of **Randomness**

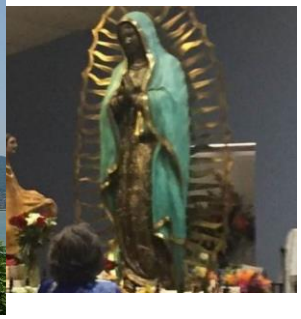
- **Hot hand**: Basketball players who make a home-run are more likely to hit the next shot than players who miss a shot
- **Hot hand *fallacy*** (Gilovich, Vallone, and Tversky, 1985): people seem to have difficulty thinking properly about independent events; a successful shot or "home-run strike" might boost the observers' (gamblers') *subjective probability* of another hit.

陽岱鋼決定了！成自由球員　日職搶人大戰開打

Financial Investment: Gambler's fallacy

- **Gambler's fallacy** —the belief that, for random events, runs of a particular outcome (home-run strike or arising stock price) will be balanced by a tendency for the opposite outcome, i.e., a streak of "lucky" events is likely to end.
- **Bandwagon effect: c**onsider an investor who believes that the performance of an investment fund is a combination of the banker's ability and luck. Convinced that luck should reverse, the investor might over-infer the current banker is above (or below) average, that will yield unusual performances.

Religion: Miracle 神蹟



Philosophy: Fatalism (宿命論)

- Suppose that a student is considering whether to study for an exam.
- He reasons that if he will pass the exam, then studying is wasted effort.
- Also, if he will not pass the exam, then studying is wasted effort.
- Therefore, whatever will happen, studying is wasted effort (inertia).
- launch a new product or product differentiation in China

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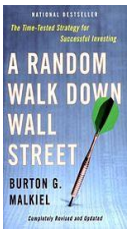
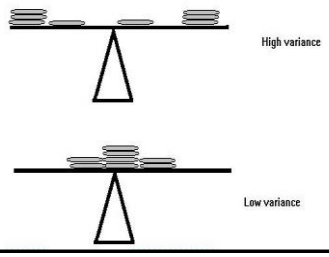
Economics: Random Walk with EMH

- The Efficient market hypothesis (EMH)
- An economist strolling down the street with a companion when they come upon a $100 bill lying on the ground. As the companion reaches down to pick it up, the economist says "Don't bother--if it were a real $100 bill, someone would have already picked it up."
- Levinthal (1991, ASQ), Denrell (2004, MS)



Organizational Management:
Inertia, near-Random Walk, and growth trap

- Tendency of an object stay at rest
- Superior performance from pure random process if chance events accumulate over time.
- any internal/external disturbance changes the steady state



Summary #1:
宿命論、組織惰性與隨機漫步

- 從哲學認識論(epistemology)的角度，宿命論傾向於忽視立即前因(準備考試)和偏遠後置(考試過關)的發展過程，並假設二者之間為互斥事件，意即

$$\text{Prob}(p|q) = 0 \qquad (1)$$

- 公式(1) 的p代表績效，q為有效的組織活動，Prob (p|q) 為組織活動條件機率下的企業績效。
- 由於組織相信其處於相對命中注定的位置，任何的內外力施壓無法增加、減少、或撼動其既有的前置位置。而這種不管行動或不行動都會達到一樣結果，就如同一個人上下左右不分的酒後亂步，而組成一連串的隨機軌跡，數學統計模型稱之為隨機漫步。
- 財務投資行為的領域，Bachelier (1900)是第一個利用隨機漫步模型描述股票價格走勢的學者，認為在股票市場中有一半的人預期股價會上漲，另一半的人則預期股價會下跌，因此整體投資人對市場的預期獲利為零，他並預期獲利的分布趨近於常態分配，即後來所謂的有效市場假設(EMH, efficient market hypothesis) Bachelier發現每期股價的變動是相互獨立，投資者無法藉由上一期預測下一期，因此在均衡有效市場下，選股無法套利，因此股票價格會呈現隨機漫步的現象(Malkiel, 2011)。

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INFERRING SUPERIOR CAPABILITIES FROM SUSTAINED SUPERIOR PERFORMANCE: A BAYESIAN ANALYSIS

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Cumulative Advantage

- Matthew effect 馬太效應: a social agent gains a small advantage over other agents, that advantage will compound over time into an increasingly larger advantage. (Robert Merton, 1968)
- Matthew effect: "the rich get richer and the poor get poorer," the root of inequality (against *equalityism*)
- This is one form of determinism (or tautology) such that Prob (performance), pi, is defined by the past performance (yi); and the capability (Ci) pi = yi = ci
- → can the "luck" (external networking effect vs. internal competitive advantage) cumulate advantage?
- → will the "luck" change from asset to liability (e.g., Microsoft, HTC, Intel), i.e., Cumulative advantage can be a fatal assets at later stage

Path Dependence (on environment)

- Orchestra conductor decide not to practice, because he reasons the team's talent pools and just finish one 盛大演奏
- If contests are independent, i.e., environment is violate, industry changes frequently, W=0, Pi = Ci

  →if 找死, my organizational DNA will help me. (initial condition, intercept exists, i.e., determinism, capability will yield)
- If contest are dependent, i.e., environmental is stable (near equilibrium), W=1, pi = yi,t-1

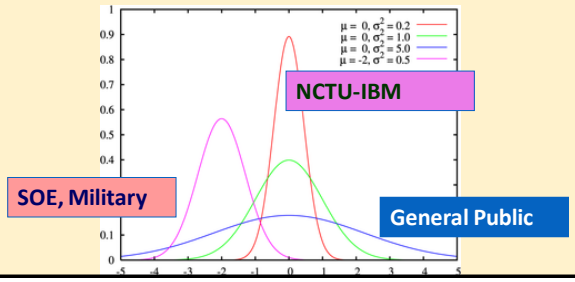
  → if 等死, my "luck" will help me. (the random walk phenomena)

External (Network) Effects

- Path dependence (luck is cumulative)
- Self-accelerating (increasing return, Matthew effect)
- Self-prophesying 自我預言 in SWOT analysis (determinism)
- Organizational DNA (never changes, i.e., inertia)
- → strong assumption on all the positive parameters, i.e., Ci>0, Yi>0, W>0

Heterogeneity 異質性

- Is the heterogeneity generated from internal capability or external luck?
- Can the luck be internalized (or managed) by the firm?
- Is the capability distributed as a normal curve or a beta distribution, such that causes competitive advantage and superior performance?



Rational Optimality

- If company possesses VRIN (Valuable, Rare, Imperfectly Imitable and Non-substitutable) resource, and
  - If the cumulative process is path-dependence,
    - With efficient routine (DNA)
- Therefore the company can generate sustainable and above average performance
- This is determinism, also called tautology
- → c> 0; w>0

Epistemology 知識論(認識論) in Scientific Reasoning

'*We should not look for truth, but should only become conscious of our own opinions. We should not question nature but only examine our consciences. At most I can question nature so that it will give me data as elements of my judgments, but the answer is not in the facts; it lies in my state of mind, which the facts cannot compel but which nevertheless can spontaneously feel itself compelled by them.*' (de Finetti 1989, p. 180)

我們不應該尋求真理，而只應該意識到自己的意見。我們不應該質疑自然，而只是審視我們的良心。 至多我可以質疑大自然，這樣它就會把數據作為我判斷的要素，但答案不在於事實；它存在於我的心態，事實不能強迫，但卻可以自發地感受到它們自己的強迫。

Source: Taroni, Franco, Silvia Bozza, Alex Biedermann, Paolo Garbolino, and Colin Aitken, 2010, Data Analysis in Forensic Science: A Bayesian Decision Perspective, Wiley

Epistemology 知識論(認識論) in Scientific Reasoning

- How do we know?
- How do know what we know?
- Do we really know what we know?
- "I am confident that BitCoin will fail, But how do I know that?"
- "How do I know the information that I "know" is not true?
- How indeed do we know we think we really "know"?

Epistemology in Scientific Reasoning
Meaningful theoretical progress is not…

- Accumulation of literature review
- Factor (or meta) analysis on citations (to figure the direction, most cited is not necessary the best)
- Confirmatory on other's works (SEM and control variables are guessing games)
- Balancing α and β (power test in SEM)
- (Big) Data mining (no hypothesis needed → GIGO)
- Correlation is not causation (predictive vs. prescriptive analytics)

Epistemology in Scientific Reasoning
統計歸納法的繆論

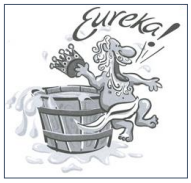
- **特定事件 (why question):** NHST (Null Hypothesis Significance Testing)
  - 35% of Hong Kongers buy apartments
- **統計歸納法則 (NHST, SEM, 系列問卷)**
  - For any major historical events happened in HK, 70% of chance the real estate price increased.
  - 90% of chance the population in HK will increase after 1997
  - 99% of chance China will support "basic Law."
- **結論：** Real estate price will increase 56% in 1998
- 統計歸納 could be weakened by adding further information or increasing sample size.

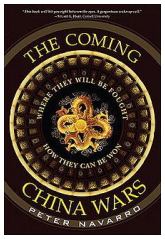
Epistemology in Scientific Reasoning

Why question的相關路徑

NHST/SEM is not the only answer to get to the "truth

- Construct
- Theory
- Theorem, axiom, law
- Proposition
- Hypothesis
- Rule vs. Rule of thumb
- Framework, idea, insight, thought, concept, algorithm, flows, eureka …

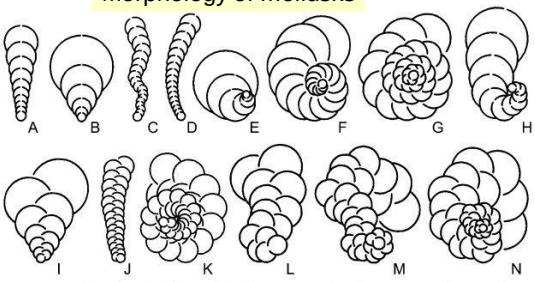




Morphology of Scientific Reasoning

規律, 定律, 法律, 法令, 法規
原理, 定理, 公理, 公設, 正則
規則, 法則, 准則, 原則, 通則
假說, 假設, 命題, 推理, 真理
先知, 偏方, 撇步, 自由心証

Morphology of mollusks



「千杯不醉葛藤花」

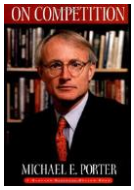
Why questions in "sharing economy"

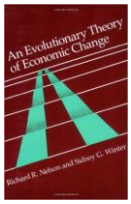
The "Why" question will guide you to construct further research

- Why people purchase online, instead of physical channels?
- Why the disruption of declining sales of traditional TV channel, newspapers, and magazines?
- Why the arising of "labor exploitation" platforms such as Uber and Airbnb?
- Why consumer are willing to publicize their privacy? Is FB, Google, or DeepMind safer to do so?
- Why arising of O2O, IOT, clouds, and data analytics?
- Why the blurred boundary among GAFA (BAT)?

Rationalism in strategic management

- Superior insight, superior capability, or superior "luck" (judgement, prospect) can account for resources difference.
- **AMC** awareness-motivation-capability ("High-Church")
- Top management team, positioning (偉大的舵手, "High-Church")
- S.W.O.T and Five-Force Analysis (SCP, determinism)
- Structure-Conduct-Performance (determinism)
- Industrial Organization (Game Theory)
- Evolutionary economics





Do we really know what we know (from Rationalism)?

認識論: SWOT策略分析

表 4-1 華碩電腦(Asus) 的 SWOT 分析

內部環境分析	
優勢(Strengths)：	劣勢(Weaknesses)：
製造能力強 品質優良 採購量大成本降低	工業電腦產品生產經驗不足 產品毛利低
外部環境分析	
機會(Opportunities)：	威脅(Threats)：
工業電腦產品應用面增加 國際大廠訂單釋出	PC 普及導致毛利下降

管理大師的智慧

Sustainable competitive advantage

差異化 → 競爭優勢

「差異化」(product Differentiation) 與
「相對低成本」(relative low cost) 戰略
能創造和保持公司的競爭優勢。

Microsoft
Microsoft Advertising
bing
MICROSOFT ADCENTER

中國市場的否證
Falsification cases in China

“Less version”**差異化 → 競爭優勢**

- *To this end, it deploys inductive logic to infer principles, theoretical claims, and/or ‘takeaway' from particular cases and other empirical evidence. However, the popularity of this approach does not ensure that the generalizations procured from induction are universally tested or even broadly supported.*

森林大火的起因

「香煙蒂（競爭優勢）→ 森林大火(企業成長)」

引起森林大火的**充分且必要條件**還需要包括有人抽煙、抽煙附近的草木是乾燥易燃的、抽煙者的口袋正好有一包香煙和一盒火柴、所有的火柴頭是乾燥的、抽煙附沒有救火設備。

- *INUS condition: sustainable competitive advantage is ‘an insufficient but necessary part of a condition [yielding sustained superior performance,] which is itself unnecessary but sufficient for the result’*

Porter (1985)的套套邏輯 (Tautology)

「競爭優勢」的三段論式邏輯推理(syllogistics) ：

- **大前提** (major premise)：
  「持續的競爭優勢」造就企業「高於行業水準的績效表現」
- **小前提** (minor premise)：
  「差異化戰略」能創造和保持「競爭優勢」
- **結論** (conclusion)：
  「差異化戰略」能造就企業「高於行業水準的績效表現」

Truism (恆真句)的套套邏輯

How is knowledge acquired?

- 恆真句(的同義反覆論述): C(A + B) = CA + CB
- 套套邏輯是指同義重覆。同義重覆的句子不可能被事實否証或推翻，因此恆真句沒有解釋能力。
- Survival of the fittest (適者生存)
- widow of the late Mr. Smith (已故史密斯先生的遺孀)
- 資源能力學派(RBV)：*VRIN principle (valuable, rare, inimitable, and non-substitutable) is a tautological argument.* 持久性的競爭優勢，來自公司有價值、稀有、不易被模仿、以及無法取代的企業資源。

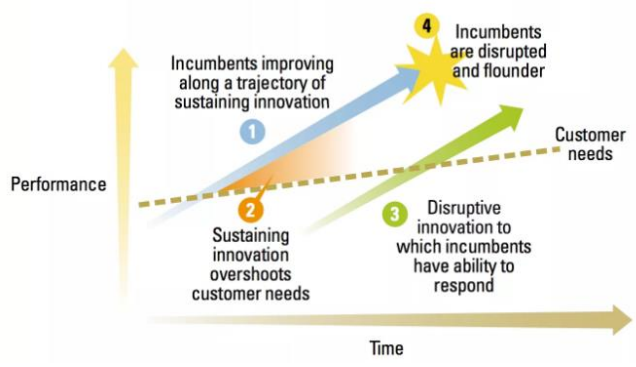
Summary #2:決定論與永續的優越績效

- 邏輯學上，循環論證為恆真句，因其過程並不涉及容觀事實(例如 a(b+c) = ab + ac或「適者生存」)，而只涵蓋立即前因(VRIO資源)和偏遠後置(優越績效)的對等關係，如下所示

$$\text{Prob}\,(p|q) = \text{Prob}\,(q|p) = 1 \qquad (2)$$

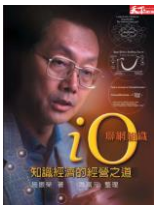
- 在《決定論》的因果邏輯推理中，結論 (p, 高於行業水準的績效表現) 可以百分之百被前提 (q, VRIO資源) 所蘊涵；同樣地，前提(差異化策略) 也可以百分之百的推定結論(企業高於行業水準的績效表現)。這兩個理論皆認為競爭優勢一旦建立就能永久持續存在，並不會隨著時間而消逝。

Q. Why theory of disruptive innovation a tautology?



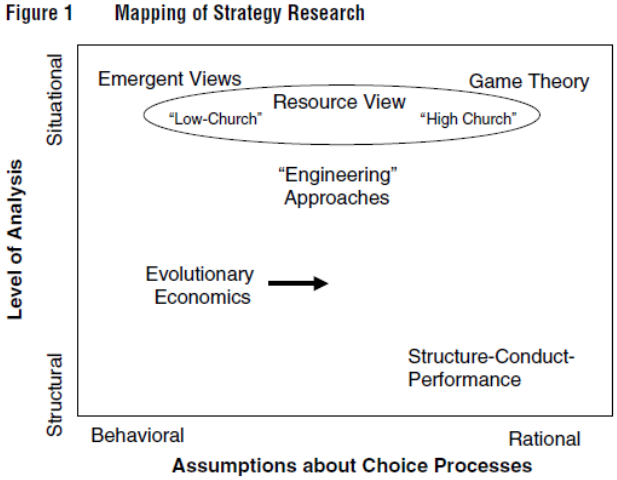
Q. Why all these strategic management books are tautology (truism)?

- SWOT analysis
- Competitive Advantage
- Core competency
- Disruptive innovations
- Resource-based theory (Barney 1991)
- Organizational DNA (Toyota vs. Nissan)
- 明天會更好(1997)。馬上就好(2008)。



Summary on Schools of Strategy Research

Figure 1 Mapping of Strategy Research



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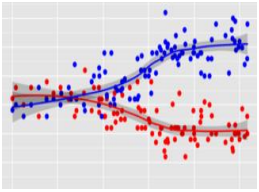
How do we know what we know?
Probabilistic Inductive Logic

- Induction by enumeration (計數 or列舉, i.e., sampling result): Every raven in a random sample of 3200 ravens is black. This strongly supports the hypothesis that all ravens are black.
- Inductive reasoning (***likelihoods***): a notion for cases where premises provide less than conclusive support for conclusions.

Bayesian Epistemology – 貝氏歸納推理
How is knowledge acquired?

- 患有糖尿病、高血压和高胆固醇的病人，得H1N1的機率較高。
- 1,000名的選民調查，有38%的人投綠不投藍。換句話說，95%的機率，有33%~43%的選民會投綠。
- 三星集團：1997年背負了十七兆韓圓債務而瀕臨倒閉的公司，在啟動了一系列的改革方案，包括捨棄用代工廉價商品搶進市場，重新重視品質、品牌、行銷與服務導向的重要，擴大垂直整合數位科技的相關產品，並持續宣誓超越產業龍頭。

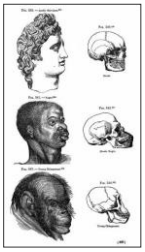
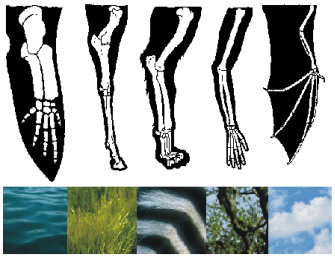
Bayesian Epistemology – 貝氏歸納推理
How the "vision" (subjective judgement) is formed?


- Consider, for example, a banker who knows, prior to the approval of an investment project, the successful rate of the new project is 10%, prob(q). In economic boom time, the chance for such project to yield above average profit is 50% Prob(p|q), while the recession time is only 5%, prob(p|~q). According to Bayes's theorem, the posterior probability that such project can yield above-average profit Prob (q|p), that approved by the banker who perceived the economic might be booming is (0.50)(0.10)/[(0.50)(0.10) + (0.05)(0.90)] = 53%

認識論
證據的「果」可以檢驗揭發真實的「因」

競爭優勢(因) → 高績效(果)

貝氏認識論

證據的「果」可以檢驗揭發真實的「因」

- prob(q) = .10 (10% of all firms have sustainable competitive advantages 10%企業具有持續的競爭優勢)
- prob(~q) = .90 (90% of all firms do not have sustainable competitive advantages)
- prob(p/q) = .50 (50% of all firms that have sustainable competitive advantages achieve sustained superior performance 50%具有可持續競爭優勢的公司可以實現持續的卓越績效)
- prob(p/~q) = .05 (5% of all firms without sustainable competitive advantages achieve sustained superior performance)
- 證據概率prob(p)和後驗證據概率概率(q/p)可以估計為

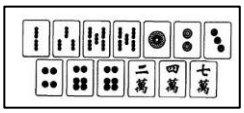
$$\text{prob}(q/p) = \frac{\text{prob}(p/q) \times \text{prob}(q)}{[\text{prob}(p/q) \times \text{prob}(q)] + [\text{prob}(p/\sim q) \times \text{prob}(\sim q)]} = \frac{\text{prob}(p/q) \times \text{prob}(q)}{\text{prob}(p)}$$

$$= \frac{(0.50)(0.10)}{(0.50)(0.10) + (0.05)(0.90)} = \frac{0.05}{0.095} = 0.53 \quad \text{(Powell, 2001 : 880)} \qquad (1)$$

貝氏認識論

證據的「果」可以檢驗揭發真實的「因」

- 以棋牌類的賽局為例，觀察到的財務績效(如ROIC，高投資報酬率)資料，是在檯面上各玩家打出的牌— P(p|q) 和P(p|~q)；玩家的博弈目的，是從檯面上的牌，去概似其他對手的出牌策略— P(q) 和P(~q)，並推測手中所掌控的牌(企業資源)的勝算率— P(q|p) 和P(~q|p)

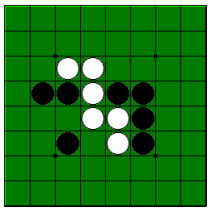


貝氏認識論

證據的「果」可以檢驗揭發真實的「因」

How is knowledge acquired?

- 從賽局的角度來說，組織每一次的策略抉擇(strategic choice)是一步棋，縱使是得天獨厚構型的組織，一旦犯了大錯，如同黑白翻轉棋(Reversi)的錯誤佈局，企業有可能會錯一步而「全盤皆輸」。



If we repeat the empirical test using 0.53 as the new prior (holding the likelihoods prob(p/q) and prob(p/~q) constant), we get prob(q/p) = 0.50 × 0.53/(0.50 × 0.53 + 0.05 × 0.47) = 0.9185. The 'trustworthiness' of this probabilistic reasoning *q causes p* has increased by 38.85 percent. This represents a refinement of the reasoning in light of new knowledge. If we repeat the empirical refinement one more time with 0.9185 as the new prior, we get prob(q/p) = 0.50 × 0.9185/(0.50 × 0.9185 + 0.05 × 0.0815) = 0.9912. A new round of evidence further confirms the causal role of sustainable competitive advantage.

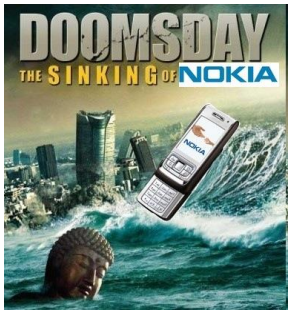
貝氏認識論

證據的「果」可以檢驗揭發真實的「因」

「決定論」vs.「機率論」

條件機率：

- 假設得天獨厚的組織發生錯誤的機率為0.2，未發生錯誤的機率則為0.8；同時假設這得天獨厚的組織，未發生錯誤並可以有卓越績效之機率為0.7，發生錯誤的組織但還可以有卓越績效的機率為0.55。
- 按貝式統計的推估，由於得天獨厚組織犯錯的機率比平均水準低；因此，卓越績效的機率會由原來的0.7微升為83.6% (=.7x.8/[.77.8+.55x52])。
- 但如果這得天獨厚的組織犯了大錯，發生錯誤的機率升為0.8，其績效的概率會在下一期驟降到24%(=.7x.2/[.7x.2+.55x.8]) 以及再下一期的9.8% (=.24x.2/[.24x.2+.55x.8])。



Summary #3: 競爭優劣勢的認識論1/2

- 貝氏機率學派(Hansen, Perry, and Reese 2004; Powell, 2001, 2002; Tang and Liou, 2010) 建議把單軌因果律的「競爭優勢造就卓越績效」的決定論論述，轉換成貝氏機率推論:「有持續性競爭優勢的組織，實現卓越績效的可能性較高」；亦即不斷言所有結果(卓越績效的證據)一定要遵循相同原因(持續性競爭優勢)，因為過往的持續性競爭優勢並不必然導致卓越績效

$$\text{Prob}(p) = \text{Prob}(p|q) \times \text{Prob}(q) + \text{Prob}(p|\sim q) \times \text{Prob}(\sim q) \qquad (3)$$

- 公式(3) 定義組織能有卓越績效的概率為Prob (p) ；組織能充份發揮競爭優勢的事前機率為Prob(q)，而組織不能充份發揮競爭優勢(即組織犯錯或競爭劣勢的呈現)的事前機率則為P(~q)；組織未發生錯誤並且可以有卓越績效的條件概似率(likelihood)為P(p|q)，而組織發生錯誤但是還可以有卓越績效的條件概似率為P(p|~q)。

Summary #3: 競爭優劣勢的認識論2/2

- 優勢與劣勢是相對(relativism) 的概念(即上述的「紅皇后效應」)，由於殊途同歸與因果模糊的交互作用，競爭優劣勢兩者會共存於組織的策略選擇內，並會在環境的變遷中快速交換易位(Powell and Arregle, 2007)。
- 貝式的演繹邏輯，是從已知或可觀察到的資料與物證(i.e., Prob(q)，Prob(~q)，Prob(p|q) 和Prob(p|~q))去重新推估因果的成因以及正確性(i.e., Prob (q|p)，在法學的研究領域稱為「證據(線索)會說話」 (causes in evidence)，哲學的研究領域則稱為認識論 (Bayesian epistemology) (Talbott 2008)。在隨機漫步的假設下，意即卓越績效與競爭優勢為獨立事件(即公式(1) 的Prob (p|q) = 0)，競爭劣勢或機運也可以有卓越績效。如果去除時間的因果必然律 (即公式(2) 的 Prob (p|q) = Prob (q|p) = 1)，則前因與後果毫無關聯，即《決定論》的套套邏輯論述(Prob(p) = Prob(q) =1) ，可以推論競爭優勢永遠可以造就卓越績效。

Q. Which “parameter” Prob(p), Prob(q), Prob(p|q), Prob(p|~q), Prob (q|p) and Prob (~q|p) accelerating Red Queen Competition?

"Now here, you see, it takes all the running you can do to keep in the same place."
The Red Queen, in Lewis Carroll's *Through the Looking Glass*

The Extension

$$\text{Prob}(\psi, \theta \mid Y) = \text{prob}(\theta \mid \psi, Y) \times \text{prob}(\psi \mid Y)$$

- Firm performance (Y)
- Competitive advantage (θ)
- Resource configuration (ψ), which is represented by resource bundles and their weights (x, λ)
- *Causal decision theory* interprets the probability of a state if one performs an act as a type of *causal probability* rather than as a standard conditional probability.

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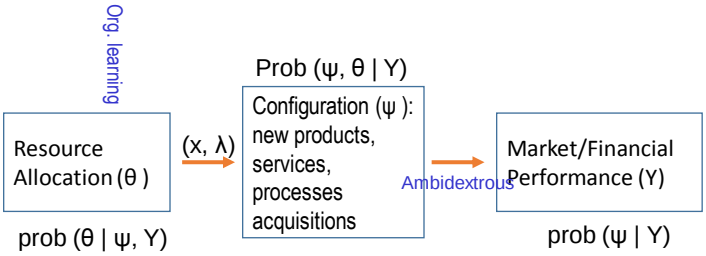
Causal Organizational Learning



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Learning as a process of change

- Organization learning as a adaptive process to cope with exploration of new possibilities and exploitation of old certainties (March 1991, Raisch, Birkinshaw, Probst, and Tushman 2009).
- Organizational change or restructuring is "codified" if a *prior* subjective probability prob (q) or state (including organizational routine, DNA, experience, and memory) is replaced by a *posterior* probability prob (q/p) that incorporate newly acquired information, evidence, or proposition (e.g., disruptive innovation)

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Ambidextrous as a simple learning process

- prob (q) = prob (q/p) (4)
- Prior proposition (i.e., exploration) such as information search, risk prone, discovery and experimentation capability, and innovation that was previously uncertain become certain, therefore, organization can exploit these certainties and to include activities such as refinement, selection, performance, implementation and execution.
- The formation of ambidextrous is to assign posterior probability prob (q/~p) to zero if the propositions inconsistent with p.
- prob(p) = 1, if the organization is fully learned and codified (in equilibrium) by all propositions and evidence (therefore competitive advantage is sustained).

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Learning for Market Imperfections

- The simple learning model requires organization to become absolutely certain about all evidence and also assume all propositions are true and known (e.g., the direction of disruptive innovation is known) (called "undersampling of failure" bias by Denrell 2003). But market imperfection, information dispersion, limited rationality, and market disequilibrium and asymmetry mechanism, the evidence (or market signals) we receive is often too ambiguous to justify (Cyert, Kumar, and Williams 1993).
- Therefore, the direct effect of leaning (and adoption) experience might alter posterior probability of proposition (because of the co-existence of prob(p/q) and prob (p/~q)), it can never raise prob(p) to 1 (Levinthal and March 1993). In other words, the proposition "sustainable competitive advantage" should render portable and disequilibrium (i.e., organization can never reach that state, or fully learned the market).

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Transmutation Learning

- An organization with the prior 0 < prob (q) < 1 has the learning experience to codify and change posterior probability prob (q/p), the post-learning posterior for any q should be

$$\text{Prob}(q) = \rho \times \text{prob}(q/p) + (1-\rho) \times \text{prob}(q/\sim p)$$

- The Bayesian learner reduces to simple learning if ρ = 1.
- Danrell, Fang, and Zhao (2013) have assume prob(q/~p) as a constant capability such that organizations can always visualize the future events.

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Summary#4: 組織價值重構學習1/2

- 但是組織學習的不確定性，並無法保證每一次的經驗學習都能獲取競爭優勢；反之，不學習終究無法獲取競爭優勢。紅皇后效應所造成的不完美市場的組織學習路徑可以定義為:

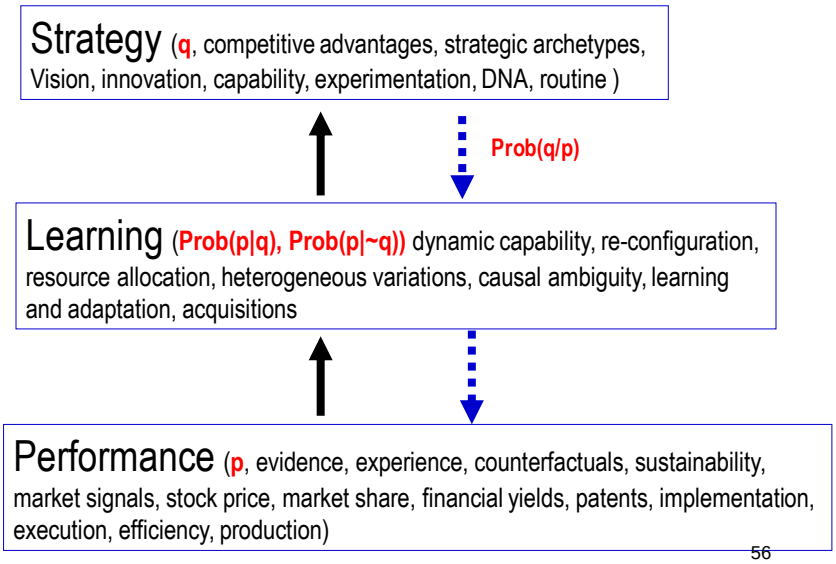
$$\text{Prob}(p) = \rho\ \text{Prob}(p|q) + (1-\rho)\ \text{Prob}(p|\sim q) \quad (5)$$

- ρ為組織學習或嬗變(transmutation) 的能力。如果ρ= 1, Prob(p) = Prob(p|q)，上述的學習路徑即為March (1991) 的簡單的能力學習；ρ= 0, Prob(p) = Prob(p|~q)，則為隨機漫步，由於任何的前置知識、訊息、事實、與績效佐證，可以完全事前預知，競爭劣勢(或機運) 也可以有卓越績效。

Summary#4: 組織價值重構學習2/2

- 嬗變學習的概念，指的是組織能具備隨時間蛻變的學習能力；組織除了能從市場中吸取正確的智慧，也能辨明(meta-cognition)過去錯誤的認知與經驗，進而領先競爭對手而維持相對優勢。根據上述的組織嬗變模型，事後機率的條件機率有兩個機制，一為組織內部的有機成長(主觀世界)學習，即ρ Prob(p|q) ；另一為組織的外部(客觀世界)學習，即(1-ρ) Prob(p|~q) 。從貝氏認識論的觀點，組織成長的養分，除了內部原有的有機成長外，還須要解讀、學習並納入合併外部紛亂的市場訊息，並重構或更新先前具有的組織結構、常規、資源或企業價值(priority)，進而啟動下一輪的組織變革。
- Cyert, et.al (1993)與Rumelt (1982)機運的來源是因為消費者的前置喜好效用函數的不可知性，以致造成企業犯錯。公式(5) 則把交易(transaction)的掌控權重回企業手中，企業須學習Outside-in 的市場訊息，經嬗變學習後，再inside-out重新出發。簡單地說，組織學習須同時能掌控機運與能力(astride luckiness and capability)，企業才能永續。這個可驗證命題，也本計劃最重要的學術研究貢獻。

Conclusion: Bayesian Learner



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