From Market Anomalies to Behavioural Finance

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People's Illusions About Randomness

- In his book 'Beyond Greed and Fear' Professor Shefrin reported the following experiment on his MBA students:

- Divide the class into two groups A and B

- Group A: Toss a coin one hundred times and record the sequence of heads and tails that result

- Group B: Imagine that they are tossing a coin and to record the outcome of an imaginary sequence of one hundred tosses

- Professor Shefrin did not know whether a student is from Group A or B. By looking at the sequence turned in by a student, he can give with reasonably good accuracy whether the student is from A or from B

How Can He Tell ?

- By counting the number of runs (=R) in a sequence

- A run is a continuation of heads or tails, for example, the sequence

  – H H T T T H T H H H has 5 runs

  – H T H T H T T H T H has 9 runs

Probability Distribution of R

- If a sequence of 100 H/T is truly random (Group A) the number of runs R should satisfy:
  - E(R) =50.5
  - R follows a normal distribution
  - Std(R) =4.97
  - Chance of having more than 60 runs is only 5%
- Common biases exhibited by Group B:
  - Too many runs of length one or two
  - Too few runs of length five or more.
  - In a sequence of five random symbols, the chance of having only one run is 1/16
  - The number of runs is unduly large for people from Group B, most likely to have more than 60 runs.
- Those with more than 60 runs are classified as B
- Those with 60 or less runs are classified as A

What Do We Learn from This Experiment

- Why people have these biases?

  ---representativeness heuristic (Tversky and Kahneman(1974)) (relying on stereotype, insensitive to sample size, the law of small number)

- What is perceived by group B as random is actually not random

- What is perceived as not random can actually be random. People see trends in stock prices

- A lady whom I respect very much studied diligently results of a 'Fan-Tan' game in casinos in Macau. She thought she saw patterns there

Systematic Biases Can Cause Anomalies

- If gamblers in a Fan-Tan game err in the same direction, they won't change the results of a Fan-Tan game

- However, if investors err in the same direction, they can change the prices in a stock market

- Thus investors' systematic biases in forming belief may create non-randomness in price movement, which is at odds with the efficient market hypothesis

The Efficient Market Hypothesis (EMH)

- Security prices always fully reflect the available information
  - Weak form: available information≡historical prices
  - Semi-strong form: available information ≡ all publicly available information
  - Strong form: available information ≡ all information including insider information
- EMH rules out the effectiveness of trading systems based on currently available information.
  - It discourages active money management.
  - Both fundamental analysis and technical analysis will not be effective

History of development

- Proposed by Eugene Fama in 1970
- Much empirical support in 1970s
- 'There is no other proposition in economics which has more solid empirical evidences supporting it than the EMH'---Michael Jensen (1978)
- Numerous market anomalies are observed in 1980s
- I myself have been involved in observing some anomalies in the Hong Kong stock market. I, II, and III

III : Technical Trading in the Hong Kong Stock Market

$$p_t = HSI \quad at \quad day \quad t$$

$$ma_t = \frac{1}{10}\sum_{i=1}^{10} p_{t-i+1}$$

- Consider the following technical trading rule:
  - If $p_t \geq ma_t$, invest in the stock market
  - If $p_t < ma_t$, hold cash

Performance of the trading rule in four periods

	Jan 1, 70--Dec 31, 79	Jan 1, 80--May 5, 86	May 6, 86--Mar 4, 93	Mar 5, 93--Mar 27, 97
Annualised return for the trading strategy	36.63%	14.79%	12.23%	6.34%
Annualised return for Buy and Hold	18.86%	12.58%	20.32%	17.79%

Computation Details

- Transaction costs have been taken into account
- Other pairs of moving averages
  - 1 day vs 20 days
  - 2 day vs 20 days
  - 10 days vs 50 days

  all give similar results
- Profit opportunity does vanish eventually, which is in support of EMH
- Profit opportunity does not vanish as fast as suggested by EMH (money lying in the street)
- Is that a characteristic of a developing market?

Trading Performance in the Futures Market

	Jan 1, 70--Dec 31, 79	Jan 1, 80--May 5, 86	May 6, 86--Mar 4, 93	Mar 5, 93--Mar 27, 97
Annualised return for the trading strategy	36.63%	14.79%	12.23%	6.34%
Annualised return for Buy and Hold	18.86%	12.58%	20.32%	17.79%
Annualised return for trading in the futures market	----	----	47.41%	6.35%

Computation Details

- Transaction costs have been taken into account
- Other pairs of moving averages
  - 1 day vs 20 days
  - 2 day vs 20 days
  - 10 days vs 50 days

  all give similar results
- Profit opportunity does vanish eventually, which is in support of EMH
- Profit opportunity does not vanish as fast as suggested by EMH (money lying in the street)
- Does financial innovation leads to profit opportunities?

Some Well-known Market Anomalies

- Many market anomalies were observed : excessive volatility puzzle, the equity premium puzzle, slow adjustment of stock prices to earning announcements, initial under-pricing in IPO, prices of the closed-end fund, good performance of small-sized stock, good performance of value stocks,….

- Loser stocks out-perform winner stocks
    - DeBondt & Thaler (1985)

- Winner stocks out-perform loser stocks
    - Jegadeesh & Titman (1993)

Contrarian Trading Strategy

- Use a three year horizon to classify stocks into winners and losers

- Extreme winners are the stocks that perform the best, and lie in the top tenth percentile, extreme losers lie in the bottom tenth percentile

- Form a contrarian strategy by buying the losers and selling the winners

- Five years later, loser portfolios gain an abnormal return of 30% while winner portfolios drop an abnormal return of -10%

Momentum Trading Strategy

- Use a six month period as a formation period
- Use a six month period as a test period
- Buying winners in the formation period and hold them in the test period
- Earn a compounded excessive return of 12.01% per year on average

EMH on the defensive

- If there is mis-pricing in the market , there should exist arbitrageurs to make it right
- Market anomalies are results of data snooping?
- Has risk been adjusted properly?
- Some anomalies can be explained by more sophisticated pricing models
- Test of market efficiency is a simultaneous test of market efficiency and a asset-pricing model

Behavioural Finance on the Offensive

- Limits of arbitrage
- Experimental evidence from cognitive psychologists on the systematic biases that arise when people form belief, or make preference
  - Overconfidence
  - Wishful thinking
  - Representativeness (relying on stereotype)
  - Conservatism

– Anchoring

– Self-attribution

– ……

- Propose models which incorporate investors' non-rational behaviour as part of the model. Psychological biases in judgement are part of the model assumptions.

  These models can explain quite a number of anomalies observed in the market.

Behavioural Models that Explain Overreaction and Underreaction

- – Barberis, Shleifer, and Vishny (1998)
- – Odean (1998)
- – Daniel, Hirshleifer, and Subrahmanyam (1998)
- – Hong and Stein (1999)
- – Grinblatt and Han (2002) explain momentum by investors' disposition behaviour

The Disposition Behaviour

- The tendency of investors to hold onto their losing stocks to a greater extent than they hold onto their winners

- Inconsistent with the standard neoclassical framework

- Can be justified by prospect theory, regret theory,…, etc.

- Empirically verified
  - Accounts at large brokerage firms
  - Over various countries
  - Professional investors also, but stronger for independent investors
  - Professional futures traders
  - In experimental markets

Market commentators' advice to investors

- Investors phone in for commentators' advice on stock investments
- In advising whether an investor should dispose of a particular stock, they usually asked, 'at what price did you acquire the stock?'

Disposition Behaviour Can Explain the Momentum Effect

- Intuition behind : disposition investors tend to have higher demand for losing stocks than for winning stocks
- This produces a spread between the fundamental value of the stock and the market price of the stock
- There exists mechanism that forces market prices to revert to fundamental values
- Grinblatt (2002) :There are two types of investors :

    a fraction (=1-c) of them are ' rational' investors,

    a fraction (=c) of them are 'disposition' investors

 Demand functions from these investors are set up which depend on market price and the fundamental price of the stock. Solution of equilibrium price supports the momentum effect. The larger is c , the more conspicuous is the momentum effect.

Overreaction can result from a rational expectation model

- In 'Competing theories of financial anomalies' Brav & Heaton (2002) gave a 'rational' explanation to market underreaction and overreaction

- μ_t = a stock's dividend at day t, $\mu_t = \mu$ (a constant),but μ is unknown. Investors use a Bayesian approach to estimate μ . This will result in overreaction

Underreaction can result from a rational expectation model

- In a time-varying environment, say there is a change point somewhere:

$$\mu_t = \begin{cases} \mu_1 & 1 \le t < n \\ \mu_2 & n \le t < N \end{cases}$$

- The investors know that there is a change point but are not sure where it is, adopting a Bayesian approach can result in underreaction

- Parameter uncertainty can explain some other anomalies as well (Brennan and Xia (2001))

Conclusion

- Hirshleifer(2001) 'Investor Psychology and Asset Pricing': "In an area that is just coming of age, many new prospects are open. This is an exciting time for the field of asset pricing