EC371

Term Paper

Identify the distinctive characteristics of ‘behavioural finance’ compared with ‘orthodox finance’ paying particular attention to the analysis of asset market efficiency. Apply your analysis to (iii) bubbles in asset prices.

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Introduction

This paper aims to highlight the key characteristics of orthodox finance (OF) and behavioural finance (BF) by exploring the differences in the underlying assumptions regarding individual investor behaviour and their implications for asset market efficiency. Section one will present the theoretical underpinnings of OF theories, rooted in the assumption of rational decision-making. The BF approaches to investor behaviour considered in section two include insights from other social sciences (perhaps most importantly from psychology), as well as examines the case of limited arbitrage. The final section will be dedicated to the analysis of asset price bubbles, both from the OF and BF point of view.

Section One: What is meant by "orthodox finance"?

Barberis and Thaler (2005) note that most OF theories rely on the assumption of rational agents, therefore one criterion this paper will adopt to distinguish OF from BF is the notion of rationality. What does *rationality* exactly entail? The authors argue that rationality is essentially two-fold. First, when new information reaches the agents, they incorporate this into their beliefs correctly, in accordance with Bayes' law.[1] Second, agents make decisions according to Savage's Subjective Expected Utility (SEU) (p.1, 2005). In general, the theory of expected utility[2] provides a framework to evaluate choices under uncertainty where a rational agent makes decisions in order to maximise her expected utility. The expected utility of an agent is determined by a von Neumann-Morgenstern type utility function, and in case of SEU the respective weights used are the subjective probabilities the agent assigns to each of the possible outcomes, reflecting her "degree of belief". [3] It is important to note that the agent's

[1] Bayes' law says that $\Pr(Y|X) = \Pr(X|Y) \cdot \Pr(Y) \,/\, \Pr(X)$ where $\Pr(Y|X)$ is the posterior probability and $\Pr(Y)$ is the prior probability.

[2] This exposition of the theory of expected utility draws upon Chapter 8 Uncertainty and Risk in Cowell, Frank A. *Microeconomics: Principles and Analysis*, Oxford University Press, 2006

[3] Formally: $SEU = \sum \Pr(x_i) \cdot U(x_i)$ where $\Pr(x_i)$is the probability that outcome x_i is realised (with the property that $\sum \Pr(x_i) = 1$) and $U(x_i)$ is the utility the agent obtains from that outcome.

utility for each possible outcome is defined over her final wealth, as BF models often formulate this in terms of gains and losses. The agent's attitude towards risk also depends on the shape of the utility function: a concave utility function implies a risk-averse agent, a linear function implies a risk-neutral agent and similarly, a convex function implies a risk-loving agent. As the shape of the utility function does not change with wealth, the agent's attitude towards risk is constant. In addition, the usual assumptions regarding agents' preferences (such as completeness, transitivity and continuity) are assumed to hold.

Building upon the rational behaviour of individual investors, the Efficient Markets Hypothesis (EMH) – which lies at the heart of OF – predicts asset markets to be informationally efficient. Hence it asserts that asset prices "fully reflect" all available information and the price of an asset is equal to its fundamental value. The term fundamental value is inherently ambiguous; nonetheless normally it is assumed to be "the net present value of its future cash flows, discounted using their risk characteristics" (p. 2, Shleifer, 2000). The empirical evidence gathered[4] – especially before and during the 1970s – also appear to support the predictions of the EMH concluding that "with but a few exceptions, the efficient markets model stands up well" (p.383, Fama, 1970). Despite the strong empirical support, it is of crucial importance to note that market efficiency in itself is not empirically testable. As Fama (1991) points out "It must be tested jointly with some model of equilibrium, an asset-pricing model." (pp.1575-76). Hence an appropriate benchmark for determining asset prices (for example the Capital Asset Pricing Model) is needed against which the prediction of the EMH is evaluated. Essentially we face the joint hypothesis problem, since evidence in support of or against market efficiency will always be conditional upon the model used and the different models used as a benchmark could lead to varying conclusions. Therefore, rejection of the EMH could imply

[4] For example, see Fama, Eugene F., 1970, Efficient capital markets: A review of theory and empirical work, Journal of Finance, Vol. 25 Issue 2, pp.383-417

inefficient markets, as well as incorrectly specified or used asset pricing models. A major implication of this joint hypothesis problem is that "precise inferences about the degree of market efficiency are likely to remain impossible" (p.1576, Fama, 1991). Indeed, contradictory evidence – such as Shiller's paper[5] that found stock market prices to be far too volatile – largely contributed to the development of behavioural alternatives.

In addition to the theoretical and empirical evidence presented by Fama (1970), Shleifer (2000) also concludes that the EMH essentially relies on three main theoretical pillars. First, investors are rational decision-makers; second, the trading activities of the occasionally irrational investors cancel out (one notable case being when these investors' trading strategies are not correlated) and therefore do not have an influence on asset prices and third, rational arbitrageurs eliminate the deviations from their fundamental values caused by irrational investors (p.2). For the third argument to hold a key assumption is that there are no limits to arbitrage and therefore if a profit opportunity is created by irrational investors (also called noise traders), then the arbitrageurs will step in taking advantage of this situation and ultimately drive the asset's price back to its fundamental value. In short, OF asserts that a mispricing could only occur momentarily, which is contrary to the BF view as it will be explained in the next section.

Section Two: Behavioural approaches to asset pricing

What happens if the fundamental assumptions of OF theories no longer hold? BF essentially considers the cases of limited arbitrage and potential deviations from rational behaviour described in the section above. Therefore it allows for the possibility of asset market inefficiency and as a consequence asset prices could deviate from their fundamental values for

[5] Shiller, Robert J., 1981, Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?, *The American Economic Review*, Vol. 71 No. 3, pp.421-436

rather extended periods of time. Similarly to the case of OF, the possible conclusions drawn regarding market efficiency are also founded on the behaviour of individual investors.

1) Limits to Arbitrage

BF argues that arbitrage in real world settings is far from the idealised textbook case, where arbitrage is risk-free and requires zero initial outlay. Barberis and Thaler (2005) believe that a mispricing, a deviation in the asset's price from its fundamental value, cannot always be 'corrected' by rational arbitrageurs since these strategies are often risky and costly (p.3, 2005). The risks associated include fundamental risk and noise trader risk, but implementation costs such as commissions or restrictions in short sales of assets could also present substantial problems. Shleifer (2000) observes that "the effectiveness of arbitrage relies crucially on the availability of close substitutes for securities whose price is potentially affected by noise trading" (p.13). Due to the fact that close (or perfect) substitutes are almost never available, arbitrageurs – who after having identified the mispricing look for a substitute security – cannot eliminate all fundamental risk (p.5, Barberis and Thaler, 2005). The authors push this argument further and conclude that even in the presence of perfect substitutes (and also ignoring possible implementation costs), "noise trader risk is powerful enough, that even with this single form of risk, arbitrage can sometimes be limited" (p.7, 2005). Noise trader risk refers to the idea that the existing mispricing can become more severe in the short-run due to investors' unoptimistic prospects, which can result in early liquidation and potentially large losses for arbitrageurs (p.5, Barberis and Thaler, 2005)[6]. The above arguments suggest that a mispricing may not always be immediately eliminated by rational investors, as it is supposed by the proponents of the EMH.

[6] This is further supported by the agency problem argument, when investors provide the money, but arbitrageurs manage it. Therefore if news about the widening mispricing reaches investors, they might force arbitrageurs to liquidate early and subsequently "Fear of such premature liquidation makes him [the arbitrageur] less aggressive in combating the mispricing in the first place." (Barberis and Thaler, 2005, p.5).

2) Psychological foundations of Behavioural Finance

The behavioural approaches to the analysis of individual investor behaviour are concerned with the way psychological factors affect the decision-making process. Meanwhile several such approaches exist; Shefrin (2002) identifies two major themes: heuristic-driven bias and frame dependence. In the following some of the psychological factors will be briefly discussed, but this list is by no means exhaustive.

Heuristics "refers to the process by which people find things out for themselves, usually by trial and error" (p.13, Shefrin, 2002). Consequently, heuristics can be regarded as 'rules of thumb', inferences drawn from past experiences (trials and errors) to help agents simplify the complex cognitive process of decision-making. Contrary to the axioms and assumptions of OF, the underpinnings of BF do not rely on rational agents who act according to Bayes' law or maximise their expected utility. Agents might base their decisions on incomplete or imperfect information, which could lead to systematic errors and biases.

Tversky and Kahneman (1974) identify and describe three heuristics which they consider to be relevant for forming beliefs about the likelihood of an uncertain situation by agents: representativeness, availability, and adjustment and anchoring.

- representativeness

  Shefrin (2002) defines ***representativeness*** as "judgments based on stereotypes" (p.14). Tversky and Kahneman (1974) conclude that when evaluating the probability of an object belonging to a class, people may base their prediction on the extent to which they perceive the object to be representative of the class in question, by the degree of similarity between them (p.1124). One consequence of this is that probabilities are not

established according to Bayes' law – in contrast with the underlying assumption of OF – since the prior probability is not taken into account. The authors also examine the heuristic of ***conservatism*** which essentially states that under representativeness the sample size does not have an effect on the probabilities leading to the underestimation of posterior probabilities, which violates Bayes' law (p.1125, 1974). An illustration of representativeness with regards to finance is the winner-loser effect, considered by Shefrin (2002). Drawing upon previous research, he points out that analysts appear to view past 'winning' stocks with – perhaps excessive – optimism and form opinions about past 'losers' quite pessimistically (p.16, 2002).

- availability

  The heuristics of ***availability*** refers to the fact that people predict probabilities of future events by recalling similar events from their past experience. Tversky and Kahneman (1974) state that these probabilities are likely to suffer from biases as, for example, people usually recall recent occurrences easier (and thus overestimate their frequency) than the ones that took place a significant time ago (p.1127). They also argue that when agents are asked to estimate probabilities based on the ease with which they can image a situation that they have never encountered or have no recall of, the estimates are susceptible to biases as "the ease of constructing instances does not always reflect their actual frequency" (p.1127, 1974).

- adjustment and anchoring

  Tversky and Kahneman define the phenomenon of ***anchoring*** as the estimates being "biased toward the initial values" (p.1128, 1974) and therefore regards these as the results of an insufficient adjustment process from given initial values. Using

> experiments they show that agents' estimates can be influenced (and therefore are biased towards) an anchor, even if the process by which the anchor is generated is known to them and they are aware that this has no relevance to the question posed. When it comes to the formation of subjective probabilities a key insight Tversky and Kahneman offer is the phenomenon of ***over-confidence***. Over-confidence is perhaps best described as an illusion, an overestimate that people have about their own capabilities and knowledge of the world. Therefore when asked to construct confidence intervals these are normally too narrowly defined (p.1129, 1974).

Frame dependence refers to the fact that the decision-making process is affected by the way the problem is presented. Tversky and Kahneman (1981) argue that investors' preferences differ from the ones implied by the expected utility model used in OF models, and propose that agents actually evaluate the outcomes of uncertain situations in terms of gains and losses (with respect to a reference point with an assigned value of 0). In what is known as prospect theory, they define a value function and a weighting function with the following properties: "we propose that the value function is commonly S-shaped, concave above the reference point and convex below it" (p.454, 1981) and the weighting function is normalised such that $\pi(0)=0$ and $\pi(1)=1$, remarking that "the function is not well behaved near the endpoints" (p.454, 1981), implying that people tend to overweight the low probabilities and underweight them in the medium and high range (p.454, 1981). An important consequence of this particular property of the weighting function is that people tend to be risk-averse when a lottery is presented to them as a decision between gains (they prefer sure gains over the uncertain outcome) and they appear to be risk-loving when the question is formulated in terms of losses (they prefer the uncertain outcome over sure losses). This clearly contradicts the position held by OF which assumes attitude towards risk to be constant. Another key finding of Tversky

and Kahneman (pp.456-457, 1981) is that when faced concurrent decisions, people normally use a "minimal account" when evaluating the outcomes, meaning that the decisions made do not take into account previous decisions. However, they also note that sometimes a "more inclusive account" is used and therefore previous decisions are factored into the current one. The authors conclude that "Because of the nonlinearities of the evaluation process, the minimal account and a more inclusive one often lead to different choices" (p.457, 1981), again contradicting the choices that would have been made by a rational decision-maker.

Section Three: Can and do bubbles exist?

What is a *bubble*? Meanwhile no unique definition exists; Kindleberger (2005) defines it as "any deviation in the price of any asset or a security or commodity that cannot be explained in terms of the 'fundamentals'."(p.25). Despite the relative simplicity this particular definition suggests, detecting bubbles is by no means an easy task. Even if it were possible to detect them, how large these deviations must be that asset price fluctuations are considered to be bubbles? Again, a benchmark is required for establishing the fundamental values.

OF and the EMH in particular predict efficient markets, where sustained deviations of asset prices from fundamental values cannot persist due to the intervention of arbitrageurs. Strictly speaking, they generally do not support theories that regard extreme asset price fluctuations as bubbles. Garber (1990) echoes this point of view arguing that, for example, during the Dutch Tulipmania in the 17th century the rising prices of tulip bulbs could be interpreted as justified, since their fundamental value also increased over that time period (one such explanation would be that the tulip bulbs in question had been infected with a particular virus which increased their value and hence were eventually sold at a higher price compared to the 'standard' varieties of the bulbs) (p.38). Based on historical data about bulb prices, he

concludes that this early episode of rapid price increase – and the subsequent fall in prices that followed – does not correspond to a bubble.

Contrarily to OF theories, behavioural approaches are consistent with the existence of asset price bubbles. Barberis (2013) examines the case of the US housing bubble with regards to the formation of investor and consumer beliefs and their preferences. He concludes that the representativeness heuristic described earlier (and perhaps to a certain extent conservatism as well) has largely contributed to the continuous rising of housing prices as home buyers based their predictions about future prices on past values, extrapolating into the future while "they drew overly strong inferences from these small samples" (p.16). Notably, he observes that this problem of 'overextrapolation' was not limited to home buyers, but also involved financial intermediaries, as well as credit rating agencies without which the bubble could not have developed (pp.17-18, 2013). Besides representativeness, over-confidence also played an important role: again, Barberis (2013) considers the case when the importance and accuracy of a favourable piece of information is overvalued by investors and hence drives the asset's price up (pp.16-17). Lastly, he also mentions the "house money" effect which is directly related to the "minimal account" or "more inclusive account" problem. In the context of the housing bubbles it means that investors might exhibit lower levels of risk aversion after past experiences of gains (and thus use a "more inclusive account" in the evaluation process) and therefore could easily keep increasing the prices by further purchases (p. 17, Barberis, 2013).

In addition to the psychological explanations of deviations from fundamental values; Shiller (2003) discusses the possibility of costly or even impossible short sales and argues that "Short-sale constraints could be a fatal flow in the basic efficient markets theory" (p.98). Including the psychological costs of short selling in his analysis, he notes that in accordance

with Tversky and Kahneman's prospect theory arbitrageurs might refrain from short selling as it entails potentially unlimited losses which they prefer less as an outcome (p.100, 2003).

Conclusion

This paper has presented both the OF and BF approaches to individual investor behaviour and consequently to asset market efficiency. Section one focused on the EMH which clearly dominated the way of thinking about asset markets until the 1980s when – in response to the growing number of anomalies OF may not have been able to explain – the behavioural theories explained in section two started to appear. These have significantly contributed to our knowledge of the psychological underpinnings of the decision-making process, providing a rather interdisciplinary approach. The last section illustrated the markedly different positions the two approaches take when it comes to the question of asset price bubbles in the context of the 17th century Tulipmania and the recent US housing bubble.

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