9

Financial Instability and Speculative Bubbles: Behavioural Insights and Policy Implications

Michelle Baddeley

1 Introduction

Common fallacies gained ground in the aftermath of the global financial crises of 2007/2008, including the fallacy that almost all economists were caught completely unawares, and that only a small handful foreshadowed the instability and crisis to come. Just one (and not the only) example of the ways in which this was an unwarranted indictment of academic economists as a whole, was a conference held in Gonville and Caius College, Cambridge in September 1999. At this conference a number of academic economists, including John McCombie and myself, presented papers around the broad theme of global economic and financial crises. For our contribution, John and I emphasised that speculative episodes are relatively common, and the financial crises that unfold in their wake are not anomalous. From the mid-twentieth century onwards, many economists, especially those from heterodox traditions, have built on the heritage of ideas from economists including John Maynard Keynes and Hyman

M. Baddeley (✉)
University of South Australia, Adelaide, SA, Australia

P. Arestis (ed.), *Alternative Approaches in Macroeconomics*,
https://doi.org/10.1007/978-3-319-69676-8_9

Minsky to unravel the economic, social and psychological foundations of speculation and financial instability.

Ours was not an original hypothesis. Economic historian Charles P Kindleberger, amongst others, emphasised this theme continually, and to general audiences, ever since the first edition of his book *Manias, Panics and Crashes: A History of Financial Crises*, published in 1978. He observed that speculative bubbles and financial crises, and not only in standard types of assets such as stocks, shares and currencies, were common from the seventeenth century onwards. Charles Mackay foreshadowed even Keynes in his histories of speculative and other frenzies in his 1841 book *Extraordinary Popular Delusions and the Madness of Crowds*. Our aim in 1999 was to show that speculative manias are not a new phenomenon, and also to address the revisionist interpretations from some economists, including Peter Garber, who argued that psychological explanations along Minsky-Kindleberger lines were not the simplest explanation possible. This was a development from previous empirical studies, for example, as outlined in Flood and Garber (1980), which had focussed on outlining empirical support for the hypothesis that speculative bubbles do not exist at all.

Various developments following the crisis, alongside the growth in the influence of behavioural finance, have meant that there is more consensus now than there used to be about the causes of speculative bubbles and the financial crises which often ensue. Developing the chapter that John McCombie and I wrote following the 1999 conference, in this chapter, I will outline some of the key ideas we explored at the time. Our aim then was to use the two historic episodes of Tulipmania and the South Sea Bubble to assess the interpretation that speculative bubbles can be explained as rational bubbles—where rationality is defined in the strict, mathematical sense associated with the rational expectations hypothesis. The years since 1999 have not only been marked by significant economic and financial instability, they are also the years marking the ascent of behavioural economics and finance. Our analysis did touch on some of the insights from Robert Shiller and others working in behavioural finance at the time. Robert Shiller's book, a general audience book, *Irrational Exuberance*, which outlines many of the key insights, was first published in 2000. Robert Shiller and others in behavioural finance have

developed new, richer insights since then. This chapter will explore how new insights around behavioural finance can bring in a more substantial rejoinder to the rational expectations school hypothesis of rational speculative bubble. In the first part of this chapter, I will clarify the definition of a speculative bubble and then outline the key insights that John and I explored in our 2001 chapter. I will then re-assess our analysis in the light of recent developments in behavioural finance. I will conclude with a discussion of policy implications and lessons. Overall, this chapter will argue that the mismanagement of the financial crisis and the speculative episodes which preceded were not a reflection of all economists' ignorance or ineptitude. The problem was not that economists did not know or did not want the world to know some of the dangers of modern capitalism for international financial stability. The problem was, and possibly still is, that there was little consensus across the various 'tribes' that make up the population of academic economists and the 'tribes' that have the most political and commercial influence are not those who have explored the dangers.

2 What Is a Speculative Bubble?

Charles Kindleberger described speculative bubbles as fluctuations characterised by rapid price increases, followed by a more rapid collapse. Kindleberger (1978) defined these events, where an asset's price rises just because investors expect it to rise, as speculative bubbles. A more technical definition is when the price of the asset deviates from its fundamental value, where the fundamental value is defined in terms of the present value of the asset's earnings over its lifetime. A speculative bubble occurs when the asset's price follows any path that does not track the fundamental value of an asset; for example the fundamental value of a share will be driven by dividends growth, and a speculative share price bubble emerges when a share's price grows more rapidly than dividends growth.

There are a number of logistical problems with this definition, including problems around how to calculate the discount rate in present value calculations. But for speculative bubbles such as Tulipmania, there

are more substantial logistical constraints because it is hard to see that a single tulip bulb, on its own, will be worth much at all—unless someone plants it in the ground and grows flowers from it and so on. There are too many uncertainties. Forecasting the value of a share over its lifetime is problematic but possible, at least in some circumstances. For the tulip bulbs of Tulipmania, it can be hard to even imagine what its fundamental value might be. Given more than one potential paths for asset price growth, assuming rational expectations and efficient markets, and only one tracking growth in fundamental value, every other path is consistent with a speculative bubble.

2.1 Rational Bubbles

In our 2001/2004 chapter we outlined different conceptions of bubbles from across the different economics disciplines (Baddeley and McCombie 2001/2004). The dominant paradigm then, and still to a lesser extent now, is the rational bubble paradigm, for example, as outlined by Blanchard and Watson (1982) who investigate the evolution of rational bubbles by exploring what is possible in theory, as opposed to what is likely in reality. In our chapter, John and I structured our theoretical analysis around three broad theories of speculation, popular at that time: the rational bubbles models, as championed by Garber (1989, 1990); the contagion bubbles that allowed in some social influences, though in a largely mathematical way; and the 'irrational' bubbles described in the heterodox literature. However, the word 'irrational' is too strong and too loaded a term to be of very much use. It does not follow logically that if something is not black, therefore it is white. Just because speculative activity is not rational in the very strict, confined ways in which some economists describe it, it does not follow that it is completely irrational either. Human behaviour is much more subtle and modern psychology allows that decisions and choices that might seem wrong-headed to a mathematical robot in fact reflect complex interactions between different thinking styles. This is true for our eco-

nomic and financial decision-making too, as I will explore in a later section.

In our 2001/2004 chapter, we categorised these three theories of speculative bubbles according to different variants of assumptions about rationality, financial market efficiency and risk versus uncertainty. With risk, very broadly and simplistically, the emphasis is on a distinction between 'Knightian' quantifiable risk and 'Knightian' unquantifiable uncertainty. Divergent conceptions of risk and uncertainty underpin divergent explanations for bubbles which focus on starkly different ranges of factors as the catalysts to the genesis and subsequent collapse of speculative bubbles and manias. These different understandings of risk and uncertainty find their way through to the different models of bubbles. In the rational bubbles literature, investors are balancing risk that they can measure and match with their risk preferences.

2.2 Rational Expectations Bubbles

As noted above, our 2001/2004 chapter focussed on exploring the revisionist models of asset price fluctuations consistent with strong assumptions of rationality. Rational expectations theorists assume quantifiable risks, where subjective probability estimates coincide with an objective probability distribution. Two related assumptions are critical to this approach. In the revisionist literature the more nuanced hypothesis is that speculative bubbles do exist, but they are consistent with strong assumptions about rationality. The difference can be understood if we bring together rational expectations and efficient markets. The early analyses of Flood and Garber (1980) and others were focussed on the idea that financial markets efficiently process all new information and any differences between the observed and fundamental values of an asset which will be traded away by rational agents. These early models were essentially founded on the argument that speculative bubbles do not exist (e.g. see Flood and Garber 1980). This is a hard assertion to defend so in their revisionist explanations, Garber (1989, 1990) and others are allowing

that financial markets are not informationally efficient but rational agents can nonetheless retain their strict form of rationality even though asset prices deviate from fundamental value. Early models assumed both strong form of rational expectations and information efficient financial markets; revisionist models relaxed the efficient markets hypothesis but retained the assumption of a strong form of rational expectations. Instead, Garber (1989, 1990) suggested that speculation is more easily explained as a rational response to changing risk and uncertainty.

In our 2001 chapter, we used the episodes of Tulipmania and the South Sea Bubble to test the power of rational bubbles models and theories, concluding that the rational bubbles argument was not consistent with the evidence. Part of our analysis was based on the foundations of theories of rational bubbles. Blanchard and Watson (1982) describe rational bubbles as just one of the possible outcomes in a stable, ergodic world in which decision-makers form rational expectations, where rationality is defined strictly in terms of optimising agents who are assumed to be able efficiently to process information and news, as if they are mathematical machines. Risk is assumed to be quantifiable and subjective estimates of probability are assumed to coincide with objective probability distributions and the data generating systems which govern reality. In the rational bubbles research, a speculative bubble is defined as a path in an asset price which diverges from the fundamental value of that asset. For a stock or share, its fundamental value will be the discounted value of expected future dividends and this fundamental value will follow a random walk in that all changes are unpredictable and that asset prices adjust quickly to all news. Expectations in a world of rational speculative bubbles parallel the rational choice decision-making associated with rational expectations macroeconomics. Asset markets are assumed to be populated with perfectly rational and identical agents, all adopting the same optimising decision-making rules. Risk is assumed to knowable and quantifiable and investors are assumed to be able to match these risk with their own stable risk preferences. These investors operate in a world that is ergodic, that is, it is immutable and changing only in

response to exogenous shocks—paralleling the assumptions from real business cycle theory, the sister theory for business cycles. As noted above, they form subjective expectations, subjective in the sense that they are based on the information available to them at the time. These subjective expectations coincide with an objective probability distribution (Muth 1961). This world is ergodic, immutable, fixed and risk is assumed to be measurable. How can a speculative bubble emerge in such a world?

A number of rational bubble theorists, including Shleifer and Summers (1990) and Blanchard and Watson (1982), focus on the issue of timing. A speculative bubble persists because rational investors do not know for sure when the bubble will burst. Uncertainty plays a role not only reflecting uncertainty about the time path of the bubble but also because uncertainty about fundamentals is consistent with holding an asset that is not tracking fundamental value. Whilst the bubble continues to grow then speculators can rationally expect to make money if they are able to sell assets in a liquid market. Thus rational speculators can trade in speculative bubbles even whilst the asset's price deviates from its long-term fundamental value, *if* speculators have chances to sell assets quickly at a profit.

To capture this, Blanchard and Watson (op. cit.) assume that returns on assets will be driven to the point at which arbitrage will cease, assuming either finitely lived agents, successive generations of entrants or trading in a perpetuity. In these conditions, the return on the asset will be defined by the following condition:

$$R_t = \frac{p_{t+1} - p_t + x_t}{p_t} \tag{9.1}$$

where R is the return on the asset, p is the asset price and x is the dividend. For a given information set Ω commonly known by all investors, the expectations of return, conditional on the information set, will be:

$$E\left(R_t \middle| \Omega_t\right) = r \tag{9.2}$$

Taking the expectation of R_t and noting that p_t and x_t will be known at time t:

$$\frac{E\left(p_{t+1}\middle|\Omega_t\right)-p_t+x_t}{p_t}=r \tag{9.3}$$

It follows that:

$$E\left(p_{t+1}\middle|\Omega_t\right)-p_t+x_t=rp_t \tag{9.4}$$

Solving this gives p_t^* which is the present value of expected future dividends:

$$p_t^*=\sum_{\infty}^{i=0}\left[\frac{1}{1+r}\right]^{i+1}E(\cdot) \tag{9.5}$$

For this arbitrage condition, Blanchard and Watson (1982) show that rational bubbles are *a possibility* given that solutions to this condition take the general form:

$$p_t=p_t^*+c_t \tag{9.6}$$

where c captures deviations from fundamental value. It is the 'bubble' term in the evolution of the asset price. Note that this model allows that rational bubbles are mathematically possibile, not that they are likely. It also implies multiple equilibrium paths and all but one of these time paths will be a speculative bubble. The single time path when the asset price tracks the fundamental value is the non-bubble path. The model is also consistent with the idea that the c term will grow over time, and so bubbles will grow over time. This model suggests that the probability that the asset price will track the fundamental value is vanishingly small, which seems anomalous with the broader rational expectations approach.

Without further assumptions to narrow down the possible time paths, this model seems to imply that asset prices are almost always going to follow a speculative bubble time path. Whilst speculative bubbles are common, even heterodox economists would not claim that anything else is virtually impossible.

In terms of explaining why a bubble bursts, Blanchard and Watson (op. cit.) state that there is a probability π that the bubble will continue in any given period, and it follows that the probability of a crash is $(1-\pi)$. Depending on their risk preferences, some investors will continue to hold the asset whilst $\pi > 0$. The evolution of this probability will depend on how long the bubble has lasted and the extent of the deviation between the asset price and the fundamental value. So, if the asset price has risen far beyond fundamental value and/or the bubble has lasted a long time, then the asset price will have to rise even more to compensate new entrants to the market for the increasing risk that the bubble will collapse soon.

2.3 Bayesian Bubbles

An alternative model of rational bubbles, but one associated with weaker assumptions about rationality, connects with the herding and information cascade models of Banerjee (1992) and Bikhchandani et al. (1992, 1998), in which rational agents are not fully informed in the ways assumed by rational expectations theorists. Instead they are using Bayesian reasoning processes on the basis of limited information to infer probabilities via an application of Bayes's rule (see also Chamley 2003, for a survey of these models). The essential idea parallels some of Keynes's insights (as explored in more depth below) around the idea that people may sometimes assume that others around them know more than they do. When we observe other people's actions, we incorporate that information into our own information sets, and the balance of this social information about others' actions is balanced against private information we may have to update our prior probabilities. Bayesian herding and information cascade models found their way into behavioural finance, for example, in

the work of Avery and Zemsky (1998) amongst many others (see, also, Devenow and Welch 1996; Drehmann et al. 2005). With information cascades and herding in financial models, speculators look at the price that other speculators are paying and use this information to update their own probabilistic expectations of what will happen to the asset price in the future. So speculators are still assumed to be strictly rational in the sense that they are aiming to maximise utility and they are using Bayes Rule to optimise, but this mathematical rule requires lower levels of cognitive power than are assumed for the rational expectation bubbles.

2.4 Contagion Bubbles

There are a number of limitations in the theory of rational bubbles, and alternatives were developed that allow a softer set of assumptions about rationality, uncertainty and financial market efficiency. In our 2001 chapter, we focussed on the contagion bubble model presented by Topol (1991), which was particularly interesting because it represented a compromise between the extremes of rational and irrational bubbles. Topol (op. cit.) develops an analysis that essentially builds an encompassing approach based around a general model of contagion bubbles in which the extent of rationality is determined by the influence of social influences via mimetic contagion. Topol's model starts from an approach consistent with some elements of rational expectations theory but with weaker assumptions about rationality and expectations, though still allowing that probability is quantifiable and the coincidence of subjective expectations and objective probability distributions, as consistent with the rational expectations models above. Whilst Topol's baseline model does embedding implicit assumptions of quantifiable risk and an ergodic world, if mimetic contagion dominates, then Topol's model has many features in common with heterodox and post-Keynesian models of a non-ergodic world.[1]

What is the essence of Topol's mimetic contagion model? He argues that our capacity for rational decision-making is constrained and so his model presents an alternative to models embedding extreme assumptions about rationality. With these weaker assumptions about rationality, if

each individual speculator is unsure, then asset prices are partly driven by collective views. Speculators infer something about what other speculators think from the prices they are willing to pay for assets. This insight is consistent with Keynes's ideas about social influences in financial markets, as we will explore in more detail below.

The time path of bubbles is driven by mimetic contagion given a different set of assumptions to those in rational expectations theory. Topol assumes incomplete information and given this lack of information held by the individual, speculators will extend their information sets by looking to the prices that other speculators are willing to pay. Topol's model is different in that it does allow a less extreme view of rationality than is seen in rational expectations and Bayesian models, but still assumes that people are able to apply relatively sophisticated mathematical decision-making rules. Speculators adjust their price expectations as they see others adjusting their price expectations. Via a process stochastic aggregation, this generates an additive learning process via which speculators are weighting the different sources of information including other buyers' prices, other sellers' prices and the 'agent-efficient price', which reflects the fundamental value. This gives the following model:

$$p_t = w_b p_b + w_s p_s + w_F p_F \tag{9.7}$$

where p_b is the price paid by other buyers, p_s is the price paid by other sellers, p_F is the agent-efficient price, driven by fundamental value, and w is the weight assigned to each of these different price signals, with the weights summing to one:

$$w_b + w_s + w_F = 1 \tag{9.8}$$

Topol's model can be understood as an encompassing model because when $w_F = 1$ and $w_b = w_s = 0$, his model reverts to a rational expectations model, consistent with Blanchard and Watson's model if p_F corresponds to Eq. (9.6). On the other hand, when $w_F = 0$, the bubble path is driven entirely by perceptions about prices that other speculators are paying. To

capture the uncertainty dimension, Topol looks at the variance of prices and shows that mimetic contagion generates excessive volatility and cross-correlations, but when mimetic contagion disappears (that is, when the weights on others prices revert to zero) excess volatility is eliminated and the bubble collapses. Given Topol's quantitative definition of uncertainty (with which many heterodox economists would take issue, see below), he shows that the mimetic contagion weights are driven by uncertainty: when the variance of p_F is small, the mimetic contagion weights, that is the weights on other buyers and seller prices, will be small. Stock price movements and the bubbles which emerge therefore reflect a process of social transmission and mimetic contagion of stock price movements.

To recap on its essence, Topol's model is an eclectic, encompassing model which, in its general form, can capture the extremes of assumptions about rationality—from the strong rationality assumptions associated with rational expectations bubbles through to bubbles explained using weaker versions of rationality assumptions such as those associated with some heterodox approaches. With strict assumptions about rationality, including assumptions about informationally efficient financial markets, all agents with access to the same information and able instantaneously to arbitrage away price differentials, then all agents will converge on the same 'true' model (assuming also that a 'true' model exists, i.e. assuming an ergodic world). With these assumptions, Topol's model becomes a rational expectations bubble model.

At the other extreme, with its emphasis on herding and mimetic contagion, it can also be made consistent with some (not all) interpretations of Keynes (1936, 1937) analyses of financial market instability and in particular his famous insight that when we do not know what to do, then it makes sense to rely on information we can infer from others' decisions. Topol and Keynes also converge in terms of their emphasis on the idea that herding and conventional choices are more likely to dominate when uncertainty is endemic; though Topol sets this out in a more mathematical form in terms of the weights assigned to others' prices as uncertainty is increasing.

Topol's (1991) ideas also parallel the insights from Keynes (1936, 1937) about uncertainty. Conventions are not needed when we are certain. Conventions are necessary when knowledge is shrouded by uncertainty. Then, to paraphrase Keynes, it is necessary to rely on judgement of the rest of the world, because perhaps others are better informed. Nonetheless Topol's contagion bubbles do still sit more easily with a rational bubbles view of the world, in which decision-making is driven by mathematical reasoning. Also, whilst Topol does not specifically address this theme in detail, his contagion bubbles do also assume an ergodic, certain world in which systems are stable and unchanging, except in response to exogenous shocks.

In our 2001 chapter, we identified a number of problems with Topol's model, including that the dynamics cannot be captured via reference to individual differences in preferences or behaviour (Baddeley and McCombie 2001/2004). Also, Topol's model does not easily allow for a non-ergodic unstable world though he does allow that with strong enough forces of mimetic contagion, ergodicity will no longer prevail and then the world will be more like the Keynesian-Minskian world, as described below. More generally, Topol's model only requires that ergodicity lasts for as long as it takes a speculator to infer the state of the world in which they are operating.

2.5 Keynesian Bubbles

Using the term 'irrational' loosely, the models on which heterodox economists draw have their roots in Keynes (1936), Minsky (1992), and Kindleberger (1978). These models often assume that the world is non-ergodic, that is, it is not a stable system. Reality is changeable and bubbles are created by endogenous instability within the system. From the heterodox traditions, and specifically the post-Keynesian traditions, this sort of information and stability is not achievable. The future is not only unknown it is also unknowable and immeasurable (Davidson 1996; Palley 1993). This theme connects Keynes's insights with the Minskian models. An essential insight from Keynes is that speculators are not preoccupied by fundamentals. Instead, speculators are focussing on predict-

ing the average opinion of average opinion and speculative bubbles are the consequence. So Keynes's analysis is not consistent with a rational expectations approach, which makes strong assumptions not only about rationality but also about information. Keynes (1936) explicitly emphasises that asset valuations do not coincide with fundamentals when he observes: 'certain classes of investment are governed by the average expectation of those who deal on the Stock Exchange as revealed in the price of shares rather than by the genuine expectations of the professional entrepreneur' (p. 151).

Another set of insights from Keynes that are not captured in the rational expectations literature, and that link with subsequent insights from heterodox and post-Keynesian economics, are the relationships between speculative bubbles and financial instability in the macroeconomy driven by interactions between speculators' financial choices and the fixed asset investment decisions of entrepreneurs. Speculation will connect with entrepreneurial investments in fixed assets because, as Keynes (1936) observes, 'there is no sense in building up a new enterprise at a cost greater than that at which an existing one can be purchased' (p. 151). Financial markets provide liquid sources of finance. These connections between speculators and entrepreneurs drive macroeconomic fluctuations. Booms and busts in financial markets link to expansionary and contractionary phases in the macroeconomy.

Financial markets connect speculators and entrepreneurs because entrepreneurs look to financial markets not only for financing their fixed asset investment projects but also for signals about the likely future potential of these investments (e.g. as explored in q theories, including both Tobin's mainstream q theories and post-Keynesian interpretations). So, when speculative bubbles dominate, the real economy will be adversely affected. Fixed asset investment will fall, a reverse multiplier will kick in, and instability will spread from financial markets through the macroeconomy. The crisis will be compounded as general instability and uncertainty lead to an increase in the propensity to hoard money via increases in precautionary and speculative demands for money. The economy will not be self-equilibrating; 'uncontrolled' and 'disobedient' business psychology,

collapses in the state of confidence, and collapses in the state of credit will make the economy resistant to the usual monetary therapies (Keynes 1936, p. 317).

In some interpretations, Keynes's analysis of speculation and financial instability is not inconsistent with softer assumptions about rationality. So the nature of Keynes's assumptions about rationality versus irrationality of speculators (and entrepreneurs) is unclear. Some of the more persuasive literature on Keynes's views around rationality analyses the evolution of Keynes's ideas from his early work on probabilistic decision-making, as outlined in *A Treatise on Probability* (1921) (TP). Keynes did explore ideas around Bayesian decision-making in TP, and these ideas connect with the Bayesian bubble models noted above. One set of interpretations of Keynes argue that there is a continuity of ideas from TP through to *The General Theory of Employment, Interest and Money* (1936) and his *Quarterly Journal of Economics* article 'The general theory of employment' (1937). According to these continuity interpretations, Keynes was not setting out a model of human decision-making in which behaviour is fundamentally irrational. Nonetheless, given unmeasurable risk or 'Knightian uncertainty', the strict rationality assumptions embedded within neo-classical models (as the precursors to the rational expectations models of the 1960s and 1970s onwards) are not plausible.

Keynes's ideas share something in common with Topol's model too, with his focus on limited information and uncertainty. As uncertainty increases, it is harder for people to assign precise numbers to their expectations and so they rely more on socio-psychological influences. Uncertainty will also link to what Keynes calls the 'state of confidence', and this confidence not of an individual in their own expectations but instead captures general confidence in the economy as a whole. Speculation in unstable stock markets can play a significant de-stabilising role under these conditions. As Keynes (1936) observes: 'Speculators may do no harm as bubble on a steady stream of enterprise. But the position is serious when enterprise becomes the bubble on the whirlpool of speculation. When the capital development of a country become a by-product of the activities of a casino, the job is likely to be ill-done' (p. 159).

Keynes's ideas set a foundation for Hyman Minksy's analyses, focussing on the idea that the seeds of financial crisis are planted during bubble

phases when euphoria is at its height. In Minksy (1992) speculation is more obviously linked to what some might call 'irrational' but more accurately could be described as 'psychological' influences. These psychological influences connect speculation with financial crisis, with financial crisis having its roots in earlier euphoria, including the euphoria associated with speculative bubbles. Minsky (1982) draws on some insights from Keynes in linking financial markets and speculative bubbles with fluctuations in the macroeconomy more widely. He adds into his analysis the role played by endogenous forces in money and financial markets, and argues that these are crucial catalysts to bubbles and crises.

In common with Keynes, Minsky is showing how financial crises are the inevitable consequence of the fluctuations that characterise capital systems; and speculative bubbles are the catalyst for crises. Euphoria plants the seeds of crisis. Specifically, Minsky develops some of Keynes's insights around the interdependencies of financial markets and real economic activity. He focuses on the 'deviation-amplifying complementarities' that develop during economic expansions but planting the seeds of subsequent financial crisis which inevitably follow. This links to the idea developed by Keynes that fixed asset investment drives real macroeconomic activity. Fixed asset investment is also a key determinant of profits (an idea also developed in Kaleckian models).

Minsky's fundamental innovation to Keynes's model is in a much clearer analysis of different types of finance and their impacts on investment and macroeconomic performance more generally. He focuses on three sources of finance: hedge finance, speculative finance and Ponzi finance. When cash flow into a company exceeds the cash flow out, this is the safest form of finance, which Minsky called hedge finance. Speculative finance is sustainable if current conditions persist because it is characterised by near-term cash flow which at least matches immediate costs, mainly the interest cost of debt; and expectations of future cash flow at least match cash outflows in the future, namely, repayments of capital. Ponzi finance is the most unstable form because it is characterised by businesses taking on more debt in order to match their current financial obligations. It is unsustainable and is founded on expectations of bonanzas in the future. These expectations can sometimes be justified in expansionary phases but are not at all justifiable when an economy starts

to go into reverse. One of the crises of modern capitalism emphasised by Minsky, paralleling Keynes (1936) idea that private investment will never be sufficient to ensure full employment, is that unsustainable Ponzi finance is a part of many long-term investment projects.

The impacts from this unsustainability emerge when economies start to change. In tranquil phases, holding cash is less lucrative so fixed asset investment increases and the price of capital assets increases concomitantly. In terms of the three forms of finance, there will be a portfolio shift towards speculative and Ponzi finance. This process is generated endogenously by the characteristics of the system and this marks the start of a speculative bubble phase as, increasingly, investments are funded by expectations of future bonanzas. The financial structure of the macroeconomy starts to show signs of instability. As this instability increases, reflecting the increasing dominance of Ponzi finance, the system becomes more and more fragile, and more sensitive to changes in interest rates. Any increases in short-term interest rates mean that tranches of hedge finance units become speculative finance units, and tranches of speculative finance units become Ponzi finance units. Endogenous processes kick in to raise interest rates still further. As increases in short-term interest rates become more rapid and sustained, this leads to rises in long-term interest rates; so expectations of long-term sustainability start to shift. Rising interest rates also erode the present value of future profits, leading to what Minsky defines as 'present value reversals'. Present value reversals have two sets of consequences. First, new investments will fall because profit expectations are falling. The price of capital assets will fall as a consequence and this will erode businesses' capacity to fulfil their financial commitments. Second, the justification for Ponzi finance starts to look more and more shaky. Short-term deficits in cash flow turn into long-term deficits in cash flow, thus increasing the chance of default. To avoid default, holders of Ponzi finance will try to sell their assets in order to meet their financial obligations. From a loanable funds perspective, these processes are also exacerbated by shifts in the balance of investment demand and demand for finance. As investment demand rises relative to the supply of loanable funds, demand for finance rises and so interest rates increase. Demand for finance becomes more inelastic, fuelling further rises in interest rates.

2.6 Behavioural Bubbles

In our 2001/2004 paper, John McCombie and I focussed on the difference between rational bubbles and contagion bubbles. We argued that contagion bubbles could be used as a general model and adapted to capture the rational versus irrational extremes. What are the new insights we could have included in our analysis if we had been writing our chapter now? Since we wrote our chapter in 2001, behavioural finance has burgeoned in influence, though elemental insights from behavioural finance were being published by economists such as Richard Thaler (2005), from the 1970s onwards.

We touched on themes relating to behavioural finance but without exploring the range of ideas in great depth. In our 2001 chapter we did reference some of the early work in behavioural finance, specifically Robert Shiller's (1981, 1990, 2000) analyses of speculative bubbles. For example, we cited Shiller's study in which he uses survey methodologies to explore how financial investors form their expectations of asset price fluctuations, and he discovered that most people herd by following 'popular models'. Essentially, speculators are trend-spotters and tend to buy only after prices have begun to rise (Shiller 1990). In this section, I will develop our 2001 analysis by exploring in much more depth the ways in which behavioural finance can be used to explain speculation, focussing in particular on the role of herding and social influences. Modern analyses of these influences have many parallels with early insights from Keynes (1936, 1937). Connecting socio-psychological influences from behavioural finance with Keynes's parallel insights is consistent with a post-Keynesian model of speculation and represents less of a compromise with the unrealistic models from the rational bubbles literature, and to a lesser extent the contagion bubbles literatures. Behavioural bubble models also link to the insights from Minsky in which, as explored above, speculative bubbles are generated during euphoric phases, which are often interpreted as reflecting irrational decision-making. This decision-making is not so much irrational as psychological.

Another theme that we connected with from a behavioural, psychological perspective was the links between Keynes and Minsky and behavioural or psychological explanations for speculation. As noted

above, both Keynes and Minsky focussed on links between speculative episodes, financial crises and macroeconomic instability, with speculative bubbles acting as the main triggers for more widespread instability. Entrepreneurs will also be affected by the euphoria developing in financial markets. When financial markets are buoyant, entrepreneurs' animal spirits and urges to act will be buoyant too. As Keynes (1936) observes: 'Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits – of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities' (p. 161).

These ideas link to another set of insights from behavioural economics that can be applied to the analysis of speculative bubbles: the dual process thinking models popularised in Kahneman (2011). The idea here is that we have different thinking styles—fast, intuitive, automatic thinking (System 1) versus slower, more deliberative, cognitive thinking (System 2). System 1 might be associated with what some economists refer to as 'irrationality'. These ideas are also explored by neuroeconomists who use neuroscientific techniques to capture how emotions feed into financial decisions; for an example see Lo et al. (2005). The social influences that distract people away from private information about fundamental value are associated with complex interactions of neural structures usually associated with emotional versus cognitive decision-making (see, e.g. Baddeley et al. 2007, 2010; Burke et al. 2010).

In the context of speculative bubbles and financial instability, the dual process approaches of Kahneman (2011), and others, connect economic psychology with Keynes's earlier insights about the different decision-making systems driving our decision-making, including speculators and entrepreneurs. It is important to note that Keynes (1936) himself emphasised that this is not necessarily a reflection of irrationality: 'We should not conclude from this that everything depends on waves of irrational psychology. On the contrary, the state of long-term expectation is often steady, and, even when it is not, the other factors exert their compensating effects' (p. 161). In financial markets similar interactions of dual thinking processes will determine our choices; and Keynes (1936) extends his insight beyond financial markets and even beyond economics

to many facets of our decision-making: 'We are merely reminding ourselves that human decisions affecting the future, whether personal or political or economic, cannot depend on strict mathematical expectation … it is our innate urge to activity which makes the wheels go round, our rational selves choosing between the alternatives as best we are able, calculating where we can, but often falling back for our motive on whim or sentiment or chance' (pp. 162–163).

Keynes's insights about animal spirits also connect with insights from psychology about the role of optimism bias in human decision-making (Baddeley 2014, 2016, 2017). Keynes (1936) observed that instability from speculation is compounded from instability generated by psychological influences: 'there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than on mathematical expectation, whether moral or hedonistic or economic. Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits – of a spontaneous urge to action rather than inaction' (p. 161).

Some neuroscientists argue that optimism bias is a trait that characterises healthy adults, perhaps acquired for evolutionary reasons, and the absence of optimism bias is often a feature of depression (see, e.g. Sharot 2011). How can this explain speculative bubbles? If we allow that optimism bias is mirrored by pessimism bias, then speculative bubbles and crashes are generated from expectations built on precarious foundations. This euphoria cannot last. Shifting psychological influences have traction when disillusioned entrepreneurs realise that their expectations of future profits cannot be justified. Optimism bias is replaced by pessimism bias and bubbles are followed by crashes, partly a reflection of these shifts in mood and sentiment. The impacts spread to the real economy as speculative bubbles create financial instability, dampening enterpreneurs' investment, output and employment decisions.

Another key theme connects Keynes and economic psychology is the influence of social influences, including conventions and herding. When economies are very fragile, the state of confidence will be at low ebb. Without knowledge, people will be forced to rely on the rest of the world for information. Then herding and crowd psychology will overwhelm pri-

vate information. Speculators realise that their perceptions about asset prices and profits from investments are built on precarious foundations. With no firm anchor for expectations, herding will generate instability and volatility. When these social influences are overwhelming, in a world of uncertainty any assumptions about individuals' capacity to be rational versus irrational are irrelevant, because the crowd takes on a nature of its own. This takes us back to Victorian conceptions of the crowd, whether crowds of speculators or political protestors, for example as explored by Gustave le Bon (1895) and Charles Mackay (1841). In crowds, individual's identity is lost and the crowd develops a nature of its own. As le Bon (1895) observed:

> … however like or unlike be [the individual's] mode of life, their occupations, their character, or their intelligence, the fact they have been transformed into a crowd puts them in possession of a sort of collective mind which makes them feel, think, and act in a manner quite different from that in which each individual of them would feel, think and act were he in a state of isolation ... the intellectual aptitudes of the individuals, and in consequence their individuality, are weakened …. (pp. 11–12)

Aside from economic psychology, behavioural finance also introduces some new perspectives on speculation. Richard Thaler and others have identified a range of behavioural anomalies that can illuminate the problem of speculative bubbles. Richard Thaler's insights are also informed by psychologists Daniel Kahneman and Amos Tversky, particularly their insights about the role of heuristics and biases in decision-making and the 'prospect theory' alternative to expected utility theory of risk (Tversky and Kahneman 1974; Kahneman and Tversky 1979). Kahneman and Tversky (op. cit.) focus on the idea that we make decisions with respect to reference points. We respond asymmetrically to losses versus gains. This links to the idea of loss aversion: we are far more upset about losing something than we are pleased when we gain the equivalent amount. Benartzi and Thaler (1995) develop these insights in their analysis of myopic loss aversion in financial markets, combining behavioural theories of time inconsistency from David Laibson and others (see, e.g. Laibson 1997; and also Frederick et al. 2002, for a survey). Anomalous financial decisions, for example, in favouring bonds over stocks even whilst there are persistent differentials in returns favouring stocks over

bonds, reflect an interaction of present bias with loss aversion. Speculators are disproportionately focussed on the short-term fluctuations in share prices, over very short time horizons. This myopia combines with their loss aversion, so they avoid stocks because they are avoiding potential losses over short periods of time (Benartzi and Thaler 1995). Financial investors would do better if they shifted their time horizons towards the long-term and/or had more symmetric responses to losses versus gains.

3 Policy Implications and Conclusions

Policy implications depend on the model of speculation that policymakers hold in their minds. If Keynes and Minksy are right, then conventional styles of monetary policy will not work in averting financial crises. The financial crises of 2007/2008 illustrate the point: the fashion for inflation targeting was at the very least an irrelevance in their aftermath. The jury is still out on what were called 'unconventional' monetary policies viz. quantitative easing. Whether or not quantitative easing was successful is still a question that needs much more empirical investigation. Many commentators argue that it was not enough and that austerity policies were exactly the wrong thing to do. True to Keynes, following financial crises, expansionary fiscal policy is required because monetary policy can only do so much in a world of profound pessimism, uncertainty and liquidity traps.

What can behavioural finance add to these policy prescriptions? First, behavioural finance allows that there are significant constraints on speculators' ability to judge fundamental values of assets. These constraints reflect limits on information, the presence of uncertainty—none of which preclude rationality in themselves. But these combine with some behavioural biases. Whilst these biases do not imply that everyone is always making mistakes, in the context of the profound uncertainty and substantial social influences that take hold during speculative episodes, the constraints on rational decision-making are likely to be overwhelming. Also, given the ideas outlined above about how crowds often take on an identity and mission that is completely different to those of the individuals within it, then financial policies focussed on assuming that each speculator is autonomous are likely to be misguided. Financial policy and

financial regulation should be designed to allow that individual speculators may lose their individual autonomy when joining a crowd of other speculators, particularly when those other speculators are spread across large and complex international networks. Uncertainty and poor information magnify unstable speculation. Given that an individual speculator's capacity for rationality is likely to be severely constrained in complex financial markets given an uncertain world and poor information. Policymakers could also do what they can to slow decision-making down so that the fast thinking does not dominate slower, more reflective and deliberative styles of decision-making. This gives a behavioural justification for the 'throwing sand in the wheels' arguments used by advocates of Tobin taxes, developing from Eichengreen et al.'s (1995) prescriptions originally devised in the context of international financial instability.

Finally, in looking back over the chapter that John McCombie and I wrote in 2001, what conclusions did we come to then? We argued that financial crisis and deflationary influences are signs on inefficient market processes, driven by endogenous fluctuations. In the face of these perverse and unstable market processes, capitalist economies need strong support from robust financial policies to limit the evolution of speculative bubbles. In this government spending will play a role in ensuring that fixed asset investment is not overly sensitive to the influences of speculation. We also argued for financial regulation because, without it, private speculation would drive unsustainable rises in asset prices. We argued that, in these circumstances, central banks should be willing to take on the role of lender of last resort and to float-off untenable debt structures when financial crises emerge (Baddeley and McCombie 2001). Our words seem prescient now, but in truth we were not the only economists espousing this view. Our analysis mirrored a substantial consensus from across the heterodox and post-Keynesian communities. More financial regulation, not less, was needed. Financial instability is an inherent feature of capitalist systems, and speculative bubbles are part of it, an insight well-explored in Keynesian, post Keynesian and heterodox literature ever since Keynes first explored related insights in the 1920s and 1930s. So the conventional wisdom about economists' ignorance is not well-founded. Many economists had predicted, and could explain, the 2007/8 financial crises. The problem was that these economists were not the economists with influence over the financial services sector and financial regulators.

Notes

1. Although Topol does allow that if mimetic contagion is powerful enough, the world may no longer be ergodic.

References

Avery, C., & Zemsky, P. (1998). Multidimensional uncertainty and herd behavior in financial markets. *American Economic Review, 88*(4), 724–748.

Baddeley, M. (2014). Rethinking microfoundations of macroeconomics: Insights from behavioural economics. *European Journal of Economics & Economic Policies: Intervention, 11*(1), 99–112.

Baddeley, M. (2016). Behavioural macroeconomics: Time, optimism and animal spirits. In R. Frantz & S. Mousavi (Eds.), *Routledge handbook of behavioural economics – Routledge international handbooks*. New York: Routledge.

Baddeley, M. (2017). Keynes's psychology & behavioural macroeconomics: Theory and policy. *Economic and Labour Relations Review, 28*(2), 177–196.

Baddeley, M., & McCombie, J. S. L. (2001/2004). An historical perspective on speculative bubbles and financial crises: Tulipmania and the South sea bubble. In P. Arestis, M. Baddeley, & J. S. L. McCombie (Eds.), *What global economic crisis?* Basingstoke: Palgrave Macmillan.

Baddeley, M, Christopoulos, G., Pillas, D., Schultz, W., & Tobler, P. (2007). *Herding and social pressure in trading tasks: A behavioural analysis* (Cambridge working papers in economics, no. 730). Cambridge: Faculty of Economics, University of Cambridge.

Baddeley, M., Burke, C., Tobler, P., & Schultz, W. (2010). *Impacts of personality on herding in financial decision-making* (Cambridge working papers in economics, no. 1006). Cambridge: Faculty of Economics, University of Cambridge.

Banerjee, A. (1992). A simple model of herd behavior. *Quarterly Journal of Economics, 107*(3), 797–817.

Benartzi, S., & Thaler, R. (1995). Myopic loss aversion and the equity premium puzzle. *Quarterly Journal of Economics, 110*, 73–92.

Bikhchandani, S., Hirshleifer, D., & Welch, I. (1992). A theory of fads, fashion, custom, and cultural change as informational cascades. *Journal of Political Economy, 100*(5), 992–1026.

Bikhchandani, S., Hirshleifer, D., & Welch, I. (1998). Learning from the behavior of others: Conformity, fads, and informational cascades. *Journal of Economic Perspectives, 12*(3), 151–170.

Blanchard, O. J., & Watson, M. W. (1982). Bubbles, rational expectations and financial markets. In P. Wachtel (Ed.), *Crises in the economic and financial structure*. DC Heath: Lexington.

Burke, C., Baddeley, M., Tobler, P., & Schultz, W. (2010). Striatal BOLD response reflects the impact of herd information on financial decisions. *Frontiers – Human Neuroscience, 4*, article 48.

Chamley, C. P. (2003). *Rational herds: Economic models of social learning*. Cambridge: Cambridge University Press.

Davidson, P. (1996). Reality and economic theory. *Journal of Post Keynesian Economics, 18*(4), 479–508.

Devenow, A., & Welch, I. (1996). Rational herding in financial economics. *European Economic Review, 40*, 603–615.

Drehmann, M., Oechssler, J., & Roider, A. (2005). Herding and contrarian behavior in financial markets: An internet experiment. *American Economic Review, 95*(5), 1403–1426.

Eichengreen, B., Tobin, J., & Wyplosz, C. (1995). Two cases for sand in the wheels of international finance. *The Economic Journal, 105*, 162–172.

Flood, R. P., & Garber, R. J. (1980). *Speculative bubbles, speculative attacks and policy switching*. Cambridge, MA: MIT Press.

Frederick, S., Loewenstein, G., & O'Donoghue, T. (2002). Time discounting: A critical review. *Journal of Economic Literature, 40*(2), 351–401.

Garber, P. M. (1989). Tulipmania. *Journal of Political Economy, 97*(3), 535–560.

Garber, P. M. (1990). Famous first bubbles. *Journal of Economic Perspectives, 4*(2), 35–54.

Kahneman, D. (2011). *Thinking, fast and slow*. London: Allen Lane/Penguin.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica, 47*(2), 263–291.

Keynes, J. M. (1921). *A treatise on probability*. London: Macmillan/Royal Economic Society.

Keynes, J. M. (1936). *The general theory of employment, interest and money*. London: Macmillan/Royal Economic Society.

Keynes, J. M. (1937). The general theory of employment. *Quarterly Journal of Economics, 51*(2), 209–223.

Kindleberger, C. P. (1978). *Manias, panics and crashes*. New York: Wiley.

Laibson, D. (1997). Golden eggs and hyperbolic discounting. *Quarterly Journal of Economics, 112*, 443–478.

Le Bon, G. (1895). *The crowd: A study of the popular mind*. Lexington: Maestro Reprints.

Lo, A. W., Dmitry, V., Repin, B. N., & Steenbarger, B. N. (2005). Fear and greed in financial markets: A clinical study of day traders. *American Economic Review, 95*(2), 352–359.

Mackay, C. (1841). *Extraordinary popular delusions and the madness of crowds* Lexington KY: Maestro Reprints.

Minsky, H. P. (1982). *Inflation, recession and economic policy*. Brighton: Wheatsheaf.

Minsky, H. P. (1992). *The financial instability hypothesis* (Levy Institute working paper WP74). New York: Levy Institute of Bard College.

Muth, J. F. (1961). Rational expectations and the theory of price movements. *Econometrica, 29*(3), 315–335.

Palley, T. I. (1993). Uncertainty, expectations and the future: If we don't know the answers, what are the questions? *Journal of Post Keynesian Economics, 16*(1), 3–18.

Sharot, T. (2011). *The optimism bias: Why we're wired to look on the bright side*. New York: Pantheon Books.

Shiller, R. J. (1981). Do stock prices move too much to be justified by subsequent movements in dividends. *American Economic Review, 71*(3), 421–436.

Shiller, R. J. (1990). Speculative prices and popular models. *Journal of Economic Perspectives, 4*(2), 55–65.

Shiller, R. J. (2000). *Irrational exuberance*. Princeton: Princeton University Press.

Shleifer, A., & Summers, L. H. (1990). The noise trade approach to finance. *Journal of Economic Perspectives, 4*(2), 19–33.

Thaler, R. (2005). *Advances in behavioural finance*. New York/Princeton: Russell Sage Foundation/Princeton University Press.

Topol, R. (1991). Bubbles and volatility of stock prices: Effect of mimetic contagion. *Economic Journal, 101*, 786–800.

Tversky, A., & Kahneman, D. (1974). Judgement under uncertainty: Heuristics and biases. *Science, 185*, 1124–1131.