Bubbles and fads in asset prices - some theory

There are numerous examples throughout history where asset prices have appeared to deviate from intrinsic or fundamental values in a sustained way. In chapter 6 tales of tulip and dot com mania were recanted, but there are have been many other episodes where asset prices have risen substantially only to unwind later. In this global applications box we offer some basic theory on growing bubbles and fads (see Camerer (1989) – 'Bubbles and fads in asset prices', *Journal of Economic Surveys*, for a more comprehensive description) explaining how these often large and persistent movements in asset prices can be explained.

Growing bubbles- these arise when investors are encouraged to purchase an asset due to expectations of future increases in an asset price. Purchasing an over-priced asset (in terms of it fundamental value) can still be consistent with rational behaviour if there is an expectation that the asset will become more over-priced in the future.

Fads- are mean reverting deviations from intrinsic values caused by social or psychological forces. These could be like those that cause fashions in political beliefs or consumption goods.

Growing bubbles

If markets are efficient then an asset should be valued according to its expected future discounted returns given the information available at the time. Returns consist of any dividend payments (D) and the future asset price (P) at which the asset can be sold (capital gains/losses).

$$P_{t} = \frac{E[D_{t+1}|I_{t}]}{1+r} + \frac{E[P_{t+1}|I_{t}]}{1+r}$$

If the future expected price is governed by the same fundamentals then the efficient current asset price equals the present discounted value of all future dividend payments.

$$P_t = \sum_{i=1}^{\infty} E(D_{t+i}|I_t) / (1+r)^i$$

If asset prices become subject to a bubble (B) then the current price will exceed the fundamental value.

$$P_{t}^{B} = \sum_{i=1}^{\infty} E(D_{t+i} | I_{t}) / (1+r)^{i} + B_{t}$$

For a bubble to persist its value must grow. It is intuitive as to why this must be. If an asset becomes over-priced relative to its fundamental value investors will only

continue to purchase or hold the asset if the bubble term is expected to grow, so there is some positive return to investing in the bubble term. Otherwise the asset will be sold pushing prices back towards fundamental valuations and the bubble element in prices will disappear. For a bubble to continue it must grow at least at the rate of interest- this represents the opportunity cost faced by investors in terms of the returns they could achieve by investing in an alternative asset such as government bonds.

If a bubble grows indefinitely at the interest rate then:

 $B_{t+1} = (1+r)B_t$

Then the present discounted value of the future bubble is:

$$B_t = \frac{E[B_{t+1}]}{1+r}$$

Hence the efficient current asset price is equal to:

$$P_t^B = \sum_{i=1}^{\infty} E(D_{t+i} | I_t) / (1+r)^i + B_t$$
 as above.

This demonstrates that providing the bubble grows at the required rate an asset price that is overvalued relative to fundamental value can be consistent with efficient markets as the bubble term is correctly prices in the current value of the asset. Unless the bubble rises at the rate of interest the discounted value of the bubble will recede and it will deflate naturally.

This model though assumes that the bubble will grow forever. The reality is that bubbles burst at some point and asset prices return to fundamental values. Therefore, why would an investor purchase an asset subject to a bubble when it is known that the bubble will disappear to zero in finite time?

Suppose that the bubble will pop with the probability p each period, and hence continue with the probability (1-p). In this case, all that is required is that the bubble rises at the rate:

$$B_{t+1} = \frac{\left(1+r\right)}{\left(1-p\right)}B_t$$

Therefore, the expected value of the bubble next period is:

$$E[B_{t+1}] = (1-p)\left(\frac{(1+r)}{(1-p)}B_t\right) + p(0) = (1+r)B_t$$

So, even if the bubble will eventually burst, all that is required for the bubble to continue to grow is that its expected growth rate is equal or greater than the interest rate. One of the principal reasons why a bubble will continue even though it is expected to burst is due to investors being optimistic about their relative trading ability. Purchasing an over-priced asset is essentially a negative sum game because in the long run some investors will lose out when the bubble disappears. If though an investor is confident that they will exit the market at the right time they can still stand to make positive profits even though the overall sum is negative.

There are two further considerations regarding growing bubbles. A key condition for a growing bubble to arise is the absence of market limits, meaning the assets can be traded indefinitely. For example, bonds have a fixed maturity date with a terminal valuation. The terminal value prevents bubbles from commencing because investors can start with the final valuation and work back towards the present.

Second, how might prices deviate from intrinsic values in the first place? One possibility is that because information gathering is costly markets may only aggregate and reveal information gradually. Therefore, in the short run when information is less than perfect prices might become divorced from fundamentals. An alternative hypothesis is that arbitrage is weaker than the efficient markets hypothesis would suggest because arbitrageurs face liquidation if losses are made in the short-term, even though their strategies would yield positive long term profits. Therefore, if assets become mispriced due to the actions of uniformed traders, the mispricing might persist because arbitrageurs are worried that mispricings will become greater before eventually correcting, limiting the initial arbitrage position.

Fads

Prices drift away from intrinsic values because fads or fashions in asset markets arise from social forces.

$$P_{t}^{F} = \sum_{i=1}^{\infty} E(D_{t+i} | I_{t}) / (1+r)^{i} + F_{t}$$

Unlike a bubble, a fad represents a temporary or transitory movement in asset prices relative to fundamental values. The evolution of a fad may follow this process:

$$F_{t+1} = CF_t + e_t$$

where 0 < C < 1. Here the fad disappears slowly, so it has a medium term but not a long term impact on asset prices. This is how we'd expect a fashion to behave. Alternatively, if C = 1 + r then the fad is a growing bubble, and if C = 0 the fad disappears immediately. Distinguishing between a fad and a bubble could be difficult, especially if C is close to 1. Strictly speaking, it also possible for a fad to be negative implying that it is unfashionable to hold certain assets in which case -1 < C < 0. Why might investors buy an asset even though the fad is purely transitory? One reason is that people get utility from holding certain assets. Collectibles such as artwork would be one example, if status is connected to the holding of a particular asset it may be held even though it is overprice relative to intrinsic values.

Market psychology is certainly a factor. Belief fads refer to mass changes in beliefs about future intrinsic values. It could be fairly easy for these to form as there are fairly powerful coordinating forces in stock markets. Because investors tend to be judged on relative rather than absolute performance there are strong incentives to conform to any market trends and perceptions. The Keynesian notion of the beauty contest- i.e. that successful traders are those that are best at predicting what average opinion expects average opinion to be, would certainly explain how fads and fashions may form in market beliefs.

Some evidence on fads in expected returns is offered by DeBondt and Thaler ('Does the stock market overreact?', *Journal of Finance*, 1985). They find that there is an overreaction to the best and worst performing stocks, and then subsequent rebound in asset prices to correct for this overreaction. This could be consistent with fads, either upwards or downwards, in asset prices.