GEORGE COOPER THE ORIGIN OF FINAL CRISTING CENTRAL BANKS, CREDIT BUBBLES AND THE EFFICIENT MARKET FALLACY

"Awesomely lucid" – *The Independent* "A must read"– *The Economist*

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The Origin of Financial Crises

Central banks, credit bubbles and the efficient market fallacy

by George Cooper

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Praise for The Origin of Financial Crises

"A must-read"

- The Economist

"Awesomely lucid" - Dominic Lawson, The Independent

"The most intellectually enriching analysis I have found" - Alistair Blair, Investors Chronicle

"A well-written book...Cooper's most novel doctrine is that investors do not have to be irrational to generate bubbles." - Financial Times

"George Cooper framed it so well in his book"

- Wall Street Journal

"Eerily entertaining"

- Andrew Bast, Newsweek

"Beautifully dissects a complex issue and rightly puts the problem of financial stability centre stage"

- Economic Record

"It is refreshing to read something so forthright"

- Actuary magazine

"Insightful, clear and compelling" - suite101

About the Author

Dr George Cooper is a fund manager and cofounder of Alignment Investors, a London-based asset manager. He has worked for Goldman Sachs, Deutsche Bank and J.P. Morgan in both fund management and strategy roles.

Prior to joining the City, George worked as a researcher at Durham University.

He lives in London with his wife and two children.

Acknowledgements

During my years as a fixed income analyst I have been lucky enough to have had the opportunity to discuss, debate, and, not infrequently, argue about financial market instability and central bank policy with some of the financial markets' finest analysts. I owe a broad debt of gratitude both to former colleagues, clients and a few senior central bankers for having helped develop and refine some of the ideas discussed here.

For helpful suggestions on the draft manuscript I owe thanks to Philip Maidens, Richard Williams, Dr Wendy Hamilton and Stephane Monier. I am also eternally grateful to my wife and family for their patience during the writing process.

Preface to the Paperback Edition

Two years ago when this book was first published I was concerned that its description of the policy mistakes leading up to the crisis that began in 2007 may have been too forthright. Two years on, with the appetite for serious reform of our financial system already fading, I have the opposite concern. I have therefore taken the opportunity of this new edition to be just a little more blunt with some elements of the analysis while at the same time giving greater emphasis to potential financial market reforms.

In response to the requests of a number of readers I have also added a recommended reading list covering some of the book's source materials together with some of the better post-bubble literature. An updated version of this list is maintained at <u>www.george-cooper.net</u>.

George Cooper April 2010

Preface to the Original Edition

This book has been written, in response to the current credit crisis, to explain why the global economy, and the US economy in particular, finds itself caught in a seemingly endless procession of asset price bubbles followed by devastating credit crunches. It describes the processes that generate these cycles and the reasons behind the policy mistakes that have, of late, tended to exacerbate them.

My aim is to bring an understanding of financial instability and central banking to as wide an audience as possible in the hope that this will bring with it an informed discussion of how macroeconomic policy should be reformed. If we are to break out of this damaging cycle of booms and busts, all participants in the economy must recognise the proper role and limitations of macroeconomic policy. Politicians and voters must acknowledge that it is neither possible nor desirable to use fiscal and monetary policy to immediately counteract any and all economic downturns. Central banks must return to their core purpose of managing the credit creation process and must learn to resist political and private sector pressure for an endless credit-fuelled economic expansion.

The central thesis of this book is that our financial system does not behave according to the laws of the Efficient Market Hypothesis, as laid down by the conventional wisdom of today's prevailing economic theory. The Efficient Market Hypothesis describes our financial system as a docile animal that, left to its own devices, will settle into a steady optimal equilibrium. By contrast, this book argues that our financial system is inherently unstable, has no steady-state equilibrium and is habitually prone to the formation of damaging boom-bust cycles. It is argued that this instability requires central banks to manage the credit creation process. However, it is also explained how central bank policy can inadvertently slip from providing a stabilising influence on economic activity to one that, over time, amplifies boom-bust cycles and destabilises our economies.

It will be argued that the US Federal Reserve has inadvertently slipped into a mode of monetary policy that is generating a series of ever-larger credit cycles and which, if continued, will significantly impair the prospects of what is still the world's most important and most vibrant economy.

George Cooper April 2008

1

Introduction

'The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else.'

John Maynard Keynes

1.1 Lopsided Policy

The first years of this millennium were marred with a corporate credit crisis, this being the hangover of a credit binge associated with the stock market boom of the late 1990s. Just as this crisis ebbed we found ourselves engulfed in a housing boom and, sure as night follows day, this boom has then morphed into its inevitable credit crunch. The proximity of these boom-bust cycles has fuelled the popular perception that financial crises are becoming larger and more frequent. The following chapters will explain why this popular perception is correct.

Toward the end of the book I make some policy suggestions that, it is hoped, could begin to dampen the current chain of overlapping boombust cycles. The overall thrust of these suggestions is that avoiding the financial tsunamis comes at the price of permitting, even encouraging, a greater number of smaller credit cycles. And also at the price of requiring central banks to occasionally halt credit expansions. That is to say, the central banks must be required to prick asset price bubbles. Key to the success of any such policy will be a political climate that accepts the need for symmetric monetary policy; excessive credit expansion should be fought with the same vigour as is used to fight excessive credit contraction. As things stand neither politicians nor voters are ready for such tough love and central bankers have neither the stomach nor inclination to deliver it. In large part this is because economists have taught us that it is unwise and unnecessary to combat asset price bubbles and excessive credit creation. Even if we were unwise enough to wish to prick an asset price bubble, we are told it is impossible to see the bubble whilst in its inflationary phase. We are also told, however, that by some unspecified means the bubble's camouflage is lifted immediately as it begins deflating, thereby providing a trigger for prompt fiscal and monetary stimulus.

In recent years this lopsided approach to monetary and fiscal policy has been further refined into what has been described as a "risk management paradigm", whereby policy makers attempt to get their retaliation in early by easing policy in anticipation of an economic slowdown, even before firm evidence of the slowdown has been accumulated. This strategy is perhaps best described as pre-emptive asymmetric monetary policy.

To followers of orthodox economic theory, based on the presumption of efficient financial markets, this new flavour of monetary policy can be justified. Yet, current events suggest these asymmetric policies have gone badly wrong, leading not to a higher average economic growth rate, as was hoped, but instead to an unsustainable level of borrowing ending in abrupt credit crunches.

1.2 Efficient Markets – More Faith Than Fact

'The bare outlines of a competitive profit-and-loss system are simple to describe. Everything has a price – each commodity and each service. Even the different kinds of human labor have prices, usually called "wage rates".

'Everybody receives money for what he sells and uses this money to buy what he wishes. If more is wanted of any one good, say shoes, a flood of new orders will be given for it. This will cause its price to rise and more to be produced. Similarly, if more is available of a good like tea than people want, its price will be marked down as a result of competition. At the lower price people will drink more tea, and producers will no longer produce so much. Thus equilibrium of supply and demand will be restored. 'What is true of the markets for consumers' goods is also true of markets for factors of production such as labor, land, and capital inputs.'¹

Who could possibly argue with the above passage? It was written by one of the world's most respected economists and is no more than a statement of the common-sense principle of supply and demand. When the demand for a particular product goes up, so does its price, which is then followed by an increase in supply. According to this theory, prices jostle up and down keeping supply and demand in perfect balance. With just a little more thought we can stretch the argument further and convince ourselves not only that this process generates a stable equilibrium state, but that it also ensures the best possible arrangement of prices, leading to the optimal allocation of resources. If a better, more-economically productive, allocation of resources could be achieved, then those able to make better use of the resources would be able to pay more for them, causing prices to change accordingly. Naturally, if markets tend toward an optimal arrangement of prices, with the most productive allocation of resources, this configuration must also be a stable equilibrium situation. The upshot of all of this is what is known as the laissez-faire² school of economic theory, which argues that market forces be given free rein to do as they choose. The logic of the laissez-faire school being that, if free markets naturally achieve an optimal equilibrium, any interference with market forces can at best achieve nothing, but more likely will push the system away from equilibrium toward a sub-optimal state. The prevailing laissez-faire

¹ Economics, Paul A. Samuelson, p39, fourth edition.

² 'Laissez-faire' has been adopted as a shorthand phrase implying a strategy of allowing markets to operate with complete freedom, unhindered by any form of management, regulation or other government interference.

school therefore requires the minimisation, even elimination, of all forms of interference with the operation of market processes.

It also follows from the efficient market philosophy that only external adverse shocks are able to push markets away from their natural optimal state, as, by definition, an equilibrium-seeking system cannot internally generate destabilising forces able to push it away from equilibrium.

1.3 A Sleight of Hand

Now re-read Samuelson's passage, only this time look out for the sleight of hand in the final sentence:

'What is true of the markets for consumers' goods is also true of markets for factors of production such as labor, land, and capital inputs.'

The passage provides a convincing explanation of how equilibrium is established in the marketplace for goods, but when it comes to the markets for labour, land and capital inputs, there is no explanation of the mechanisms through which equilibrium is established. For these markets we are offered nothing better than proof by assertion. This logical trick is pervasive in economic teaching: we are first persuaded that the markets for goods are efficient, and then beguiled into believing this to be a general principle applicable to all markets. As the recent banking crisis shows, it is unsafe to assume that all markets are inherently stable.

1.4 The Market for Bling

We can easily find a counter example to Samuelson's well-behaved supply-and-demand-driven markets. In the marketplace for fine art and luxury goods, demand is frequently stimulated precisely because supply cannot be increased in the manner required for market efficiency. Who would pay \$140,000,000 for a Jackson Pollock painting if supply could be increased in proportion to demand? The phrase "conspicuous consumption" was coined by the economist Thorstein Veblen to describe markets where demand rose rather than declined with price. Veblen's theory was that in these markets it was the high price, the *publicly* high price, of the object that generated the demand for it. Veblen argued that the wealthy used the purchase of high-priced goods to signal their economic status.³ Veblen was the original economist of bling – if you've got it you want to flaunt it.

Fortunately for the high priests of market efficiency, Veblen's observations can be dismissed as minor distortions within an overall economic environment that responds in a rational manner to higher prices. That is to say, even at a price of \$140,000,000, the market for Jackson Pollock paintings is irrelevant to the wider economy.

1.5 When the Absence of Supply Drives Demand

While the markets for bling can be dismissed as economically irrelevant, there are other much more important markets which also defy the laws of supply and demand as described by Samuelson. While Veblen identified the rare conditions in which high prices promoted high demand, we can also consider the much more common situation in which low or falling supply promotes high demand.

Today's oil markets are a case in point, where constrained supply periodically prompts higher speculative demand. While consumers of oil are reducing their oil purchases in response to supply constraints and

³ The Theory of the Leisure Class, Thorstein Veblen, first published 1899.

higher prices, speculators (investors) in oil often move in the opposite direction and increase their purchases.

This simple observation of how consumers and speculators respond in different ways to supply constraints gives us the first hint that a fundamentally different market mechanism operates in the markets for assets than that which dominates the markets for goods and services. This effect is not confined just to today's unusual oil market: who would invest in the shares of a company if that company were in the habit of issuing more stock whenever its share price rose above a certain level?

As a rule, when we invest we are looking for an asset with a degree of scarcity value, one for which supply cannot be increased to meet demand. Whenever we invest in the hope of achieving capital gains we are seeking scarcity value, in defiance of the core principle that supply can move in response to demand.

To the extent that asset price changes can be seen as a signal of an asset becoming more or less scarce, we can see how asset markets may behave in a manner similar to those of Veblen's market for conspicuousconsumption goods. In Veblen's case it is simply high prices that generate high demand, but in asset markets it is the rate of change of prices that stimulates shifting demand.

Frequently in asset markets demand does not stimulate supply, rather a lack of supply stimulates demand. Equally price rises can signal a lack of supply, thereby generating additional demand, or conversely, price falls can signal a glut of supply, triggering reduced demand.

1.6 Introducing the Efficient Market Hypothesis

To economists the importance of efficient markets lies not in the markets' pricing mechanism directly, but rather in the ability of the pricing mechanism to maximise economic output via an optimal allocation of resources. To financial professionals the emphasis is more directly on the pricing of the items being traded. Financial theory has refined and extended the implications of market efficiency into an additional set of laws describing how markets must behave as a consequence of their being efficient.

The key message of the Efficient Market Hypothesis is that asset prices are *always and everywhere* at the correct price. That is to say, today's market prices, no matter what they are, correctly reflect assets' true values, based on both current economic conditions and the best estimate of how those conditions will evolve in the future. According to this financial theory any asset price movement must be generated by external "shocks". To the efficient market school the constant price changes observed in financial markets are the result of those markets responding to a constant stream of new information.

The Efficient Market Hypothesis has no room for asset price bubbles or busts. Under this theory the wild asset price swings commonly referred to as bubbles are nothing more than markets responding to changing fundamentals. People outside of the world of economics and finance may be amazed to know that a significant body of researchers are still engaged in the task of proving that the pricing of the NASDAQ stock market correctly reflected the market's true value throughout the period commonly known as the NASDAQ bubble. To these researchers the NASDAQ Composite Index was correctly priced at 1,140 in March 1996, also correctly priced at 5,048 in March 2000, and again correctly priced when, in October 2002, it had returned to a price of 1,140. The intellectual contortions required to rationalise all of these prices beggars belief, but the contortions are performed, none the less, in the name of defending the Efficient Market Hypothesis.⁴

The idea that markets are always correctly priced remains a key argument against central banks attempting to prick asset price bubbles. Strangely, however, when asset prices begin falling the new lower prices are immediately recognised as being somehow wrong and requiring corrective action on the part of policy makers.

Another interesting result of the Efficient Market Hypothesis is that it can be used to infer the manner in which asset prices move, which in turn allows for the calculation of the entire probability distribution of potential future asset returns. Sadly, these theoretical distributions tend not to fit with the reality of financial markets, which in practice tend to generate extremes of both positive and negative returns that simply cannot be explained with the statistical models derived from the Efficient Market Hypothesis. The clash between the theoretical statistics predicted by efficient markets and those observed within real financial markets is known as the "fat tails" problem.⁵ One recent example of the fat tail problem occurred with huge losses in one of the world's largest hedge funds. These losses were described by the firm's chief financial officer as resulting from the fund suffering adverse '25-standard deviation events, several days in a row'. It is difficult to convey just how

⁵ The term "fat tails" refers to the tendency for distributions of asset returns not to follow bellshaped "normal" distribution curves, but instead to have an excess of events recorded in wings or tails of the distribution. Frequently asset return distributions look quite unlike normal distributions and can often be double-peaked.

Recently Nassim Taleb has popularised the fat tails problem in his book *The Black Swan*. The term black swan is now shorthand for an event which occurs outside the range of previously anticipated possibilities.

⁴ See "Was There a Nasdaq Bubble in the Late 1990s?" L Pastor, Pietro Veronesi, (*Journal of Financial Economics*), Vol 81, Issue 1, July 2006. The paper's answer to the question posed in its title: '*Not necessarily: a firm's fundamental value increases with uncertainty about average future profitability, and this uncertainty was unusually high in the late 1990s*' – apparently we should pay more for companies about which we know less! One suspects this wisdom has yet to reach Warren Buffett.

Introduction

improbable a pair of back-to-back 25-standard deviation losses really is, but by my estimate its probability is roughly:

Statistically speaking, a pair of 25-standard deviation events is not an example of bad luck; it's an example of bad statistics and bad science. Improbabilities such as these properly belong to the realm of Douglas Adams.⁶

Were these claimed 25-standard deviation events unique, it would be possible to gloss over the inconsistencies between real life and theoretical forecasts, but in finance statistical impossibilities are quite literally an everyday occurrence. Each and every day financial markets move in ways that simply cannot be explained by our theories of how these markets work.

Nevertheless, despite overwhelming evidence to the contrary, the Efficient Market Hypothesis remains the bedrock of how conventional

⁶ Douglas Adams was the author of the science fiction trilogy *The Hitchhiker's Guide to the Galaxy*. The reference here refers to his bizarre idea of powering a space ship using an infinite improbability drive. Another of his bizarre spaceship propulsion ideas was the Bistromathics drive. Bistromathics is that odd flavour of mathematics found only in restaurants, where the total value of the bill bears no relation whatsoever to the sum of the prices of the individual items purchased.

Bistromathics was also the engine of the structured credit market which played such a big part in fuelling the recent credit crisis. The engine of the structured credit market was the process of packaging loans together and then reselling slices, or tranches, of the package separately. As with Douglas Adams' bistro bills, in the structured credit market the 'value' of the tranches added up to more than the value of the sum of the individual loans. With poetic irony one of the deals which kicked off the structured credit market was a deal issued by J.P. Morgan in 1997 called Bistro (Broad Index Secured Trust Offering). The story of the structured credit market and the Bistro deal is told in Gillian Tett's book *Fool's Gold*.

wisdom views the financial system, the key premise upon which we conduct monetary policy and the framework on which we construct our financial risk systems.

1.7 We Already Have a Better Theory

Fortunately, there is an alternative theory of how financial markets operate, one that is fully able to explain the most recent credit crunch, and one that, with a little thought, can also explain the erratic behaviour of financial markets. The theory in question is the Financial Instability Hypothesis, developed by the American economist Hyman P. Minsky. Minsky himself credited many of his ideas to another great economist, John Maynard Keynes, whose famous 1936 book *The General Theory of Employment, Interest and Money* provided a comprehensive refutation of the idea of efficient markets.

Among my collection of obscure and unfashionable economics books I have one written, in 1975, by Hyman Minsky titled simply *John Maynard Keynes*. My copy of this book, which was until 2008 out of print, is stamped on the top, bottom and inside cover, with the words 'DISCARDED' in bright red letters. According to its markings the book comes from the Erie City & County Library, Pennsylvania, where it sat largely unread since 1977.

Discarded is a fair way to describe how the finance and economics communities have, up until very recently, treated Minsky's Financial Instability Hypothesis and Keynes' refutation of efficient-market theory. For now, conventional wisdom remains with the Efficient Market Hypothesis; however, this latest financial turmoil has shaken at least some of the faithful and the term "Minsky Moment" has now made its way into the popular press as a phrase describing the point at which a credit cycle suddenly turns from expansion to contraction.

In the following chapters I hope to bring some of Minsky's wisdom to a wider audience and show how the processes he identified fall easily into agreement with the behaviour of real financial markets.⁷ At the same time I aim to highlight some of the logical inconsistencies in what passes for today's conventional wisdom on matters of macroeconomic policy, while also explaining how these inconsistencies have resulted in dangerously destabilising monetary policy.

1.8 Internal or External?

The key difference between the Efficient Market Hypothesis and Minsky's Financial Instability Hypothesis comes down to the question of what makes the prices within financial markets move. As discussed, efficient market theory says that markets move naturally only toward equilibrium, and after reaching equilibrium they remain in this quiescent state until influenced by a new, unexpected, *external* event. The emphasis here is on the external nature of the forces causing financial markets to move. By contrast, Minsky's Instability Hypothesis argues that financial markets can generate their own internal forces, causing waves of credit expansion and asset inflation followed by waves of credit contraction and asset deflation.

The implications of Minsky's suggestion are that financial markets are not self-optimising, or stable, and certainly do not lead toward a natural optimal resource allocation. In short, Minsky's arguments attack the

⁷ While I believe I have stuck to the spirit of Minsky's message I have not slavishly followed the details of how he presented his arguments, which are at times unnecessarily technical for a wider audience. I should also note that many of the essentials of Minsky's theory had already been presented by Irving Fisher in 1933 and, according to Minsky, also by Keynes in 1936.

very foundation of today's laissez-faire economic orthodoxy, as did those of Keynes before him.

Answering the question of whether or not Minsky is correct boils down to the challenge of identifying processes, internal to the financial markets, which may build upon themselves, becoming strong enough to push the markets away from any given equilibrium position. If processes such as these can be identified, then the Efficient Market Hypothesis must be rejected and with it today's accepted wisdom on how to conduct macroeconomic policy.

Two internally-generated destabilising forces have already been introduced in the form of supply, or the lack thereof, as a driver of demand in asset markets and asset price changes as a driver of asset demand. The bulk of the rest of the book will follow Minsky's lead and focus on explaining the much more powerful destabilising forces generated within the banking system and the credit creation process broadly.

1.9 Money Market Funds – a Banking System in Miniature

In the US, money market mutual funds are a common feature of the financial landscape. Many of these funds are what is known as "stable-dollar" funds, and are constructed to mimic the behaviour of traditional bank current accounts.

To investors, these stable-dollar money market funds appear to walk and talk like any ordinary bank account. Cash can be paid into, and withdrawn from, the funds on a daily basis, and any holdings within the fund accrue interest each day. As with any bank account, investors in stable-dollar money market funds expect to get back the money they have paid into the fund, *plus* interest. As for bank accounts – where it is considered unacceptable to lose or fail to repay a depositor's money on demand – in these funds, also, losses, or the failure to return an investor's cash on demand, are considered unacceptable.

The object of stable-dollar money market funds is to provide investors with a rate of interest usually available only on longer-term deposit accounts, while at the same time giving investors instant access to their cash.⁸

1.9.1 Stable dollar US money market funds – as banks

The little bit of financial alchemy which gives investors both high interest and instant access to their cash works as follows: many small individual investors treat the fund like a bank deposit account, making small deposits and withdrawals each day. On most days the investors' deposits and withdrawals more or less cancel each other out, leaving the fund's overall assets roughly unchanged from one day to the next. The individual investors see constantly moving streams of money, whereas the fund manager sees a largely stagnant, and therefore investable, pool of money. The managers are able to use the statistical averaging of the fund's flows for the benefit of the fund's investors.

Usually only a small fraction of the fund's balance is ever in active use at any one time. This fraction is kept at hand to meet the ebb and flow of the investors' deposits and withdrawals. The rest of the money is lent out through the commercial money markets, typically for several months at a time. By lending the money for longer periods the fund manager is able to earn higher interest rates for the clients of the fund. As a result the shareholders enjoy both instant access to their funds and

 $[\]frac{8}{8}$ In the money markets it is normal to receive higher rates of interest when committing to deposit funds for longer periods. Typically savers wanting instant access to their cash will receive the lowest rates of interest while those willing to deposit money for a few months at a time will receive a higher interest rate. The interest rates offered even on deposits of just a few months are often substantially higher than overnight rates.

the higher interest rates of term deposits.⁹ This all works fine until the moment comes when a large number of investors decide to ask for their money back at the same time.

1.9.2 Conflicted objectives

Each day these funds calculate the average interest rate earned on all of their loans, and from these calculations work out what rate of interest the funds can afford to pay their investors. These rates are available for the funds' investors and potential investors to inspect on a daily basis. The US money market fund business is an intensely competitive industry, producing a constant pressure on fund managers to offer the best possible interest rates. Those funds consistently offering uncompetitive interest rates quickly find their investors withdrawing their cash and placing it into competitor funds offering higher rates.

In money markets, as with most debt markets, the way to earn the highest rates of interest is to make loans for the longest possible periods to the lowest-quality least-reliable investors. The pressure for high money market yields therefore encourages fund managers toward a high-risk lending strategy. But this strategy runs into direct conflict with the money-market fund's commitment to give back all of the investor's money, plus interest earned, without the risk of losses.

1.9.3 An introduction to bank runs

In the event of a loan defaulting within one of these money market funds, the fund manager must calculate the effective interest rate on that particular loan as negative – in effect spreading the loss of the loan out over the remainder of its original life and allocating that loss

 $[\]frac{9}{9}$ To be precise they enjoy higher-term deposit rates only on that fraction of the fund's money that the manager feels comfortable in investing for longer periods, though this is typically more than 90% of the fund's assets.

proportionately across all of the deposits in the fund. In this way, even small defaults could reduce the fund's average yield considerably, thereby encouraging some investors to withdraw their funds. As a result of these withdrawals the fund manager will be forced to reallocate the losses across the now smaller pool of remaining investors. The loyal investors will then suffer an even lower interest rate, which in turn will cause further investor defections and a still heavier allocation of losses to the remaining truly faithful investors. What may have started as a minor default, affecting only a tiny fraction of the fund's assets, can quickly spiral into a self-fulfilling cycle of withdrawals. The end result of which is to leave the last few investors holding all of the losses – in financial markets, loyalty frequently does not pay.

The potential for a minor credit default to snowball into the collapse of an entire fund is an example of an inherent instability generated when an institution tries to combine the incompatible objectives of guaranteeing to return an investor's capital, while, at the same time, putting that capital at risk.

I have described this destabilising process with reference to money market mutual funds; however, this problem is common to the entire deposit-taking banking system. The crises at the British Northern Rock bank and the US Bear Stearns bank followed the same self-reinforcing pattern of deposit withdrawals. These institutions, as all banks do, had taken in deposits, promised to repay those deposits on demand, but at the same time lent out the deposits, sometimes for as long as thirty years, in the form of risky loans. Once depositors began to suspect that the banks were suffering losses, and that other depositors may already be ahead of them in withdrawing their money, a bank run was triggered.¹⁰

¹⁰ Technically the failure of Northern Rock was caused not by actual defaults but by the fear of future defaults, causing both retail investors and the commercial money market-lenders to refuse to lend to the bank.

This basic conflict between guaranteeing return of capital while also putting that capital at risk is a key channel through which financial instability can be, and recently has been, generated. Bank runs flagrantly violate the Efficient Market Hypothesis, and yet neither mainstream economic nor financial market theory makes any attempt to integrate these processes into their models of market behaviour.

1.10 Memory and Risk

The existence of bank runs has been well understood in finance for hundreds of years, yet their presence is entirely ignored by financial theory, and, therefore, by financial risk systems. In mathematical terms they can be modelled using what is known as a positive feedback process. Positive feedback systems are those in which an event at one time causes more of that same event to occur in the immediate future; investors withdrawing money today cause more investors to withdraw money tomorrow.

Positive feedback processes require current and future events to be influenced by history, that is to say they exhibit a form of memory. The ability or inability of past events to influence future events provides another way of characterising the difference between the Efficient Market Hypothesis and the Financial Instability Hypothesis. As will be explained later, an essential element of the Efficient Market Hypothesis is the idea that the next move in an asset's price must be entirely random and therefore uninfluenced by any previous price movement. It is this property that allows financial analysts to build estimates of probability distributions of future asset price movements. In turn, these probability distributions permit the development of the quantitative financial risk systems on which banks, analysts, ratings agencies and regulators now rely. If, in contrast to the principles of market efficiency, financial markets do exhibit a form of memory-driven behaviour, and have even a slight tendency to repeat recent actions, these quantitative risk systems will systematically under-represent the true risks in the financial system. Put differently, building financial risk systems on the premise of the Efficient Market Hypothesis requires these systems to ignore the possibility of scenarios like bank runs. That is to say, our risk systems may be inherently designed to work only when they are not required.

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