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Some implications of behavioral finance for international monetary analysis

Thomas D. Willett[1]

Abstract

This paper discusses some of the important insights from behavioral finance for international monetary and financial analysis. A broad approach to behavioral finance is advocated which includes analysis of the effects of uncertainty, perverse incentives, and complexity economics as well as the cognitive biases focused on in the initial contributions to behavioral finance. It offers reasons why capital mobility is often not perfect and expectations are sometimes not rational. Correctly interpreted it is not a wholesale attack on efficient market theory but rather argues that markets can behave differently at different times, being efficient sometimes and subject to destabilize or insufficiently stabilizing speculation at others and focuses on the conditions that make different types of behavior more likely. It helps provide insights into issues such as currency crisis, the effects of official intervention in foreign exchange markets, the international monetary trilemma, capital flow surges and reversals, the discipline effects of fixed exchange rates and international financial markets and why uncovered interest rate parity often does not hold.

Keywords

- behavioral finance
- capital flows
- efficient markets
- international monetary analysis
- open-economy macroeconomics

JEL codes: E7, F3, G4

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Introduction

Behavioral finance has become an important topic of research and analysis over recent decades.

However, its applications have been predominately to domestic financial issues. While there have been some important applications to international monetary analysis these have been much fewer.

The purpose of this paper is to sketch out some of the important insights from behavioral economics and finance for international monetary analysis. The focus will be particularly on applications to international capital flows.[2] Differing assumptions about the behavior of international capital flows have important implications for open economy macroeconomic analysis. These include such traditional topics as the effects of fixed versus flexible exchange rates on the strength of monetary and fiscal policies, the international transmission of disturbances, the international monetary trilemma, the effectiveness of sterilized intervention in the foreign exchange markets, the discipline effects of international financial markets over domestic monetary and fiscal policies, and the international contagion effects of crises as well as the more recent topic of capital flow surges and sudden stops.

The paper is organized as follows. We begin with a discussion of the nature of behavioral finance in Section 1. We argue that the behavioral approach is best broadly conceived to include a wide range of analysis that goes beyond simple optimizing models such as efficient market theory. These include not only behavioral biases such as were the focus of the earliest behavioral finance contributions, but the roles of factors such as complexity theory, mental models or narratives, perverse incentives, and the distinction between risk and uncertainty. It is stressed that these approaches should be seen as complements to efficient market theory, not complete substitutes as has been sometimes argued. Many potential cognitive biases have been identified. Section 2

[2] While not discussed in detail in this paper it also has important implications for the behavior of foreign exchange markets and macroeconomics. See, e.g., De Grauwe and Grimaldi (2006) and De Grauwe and Ji (2019).

discusses some of these that I have found to be most useful in my own research on international monetary issues as well as some of the other types of broader behavioral analysis. Section 3 considers in more detail implications for capital flows and international policy analysis. The last Section concludes.

1. What is behavioral finance?

A word about behavioral finance. As Illiashenko (2017) has argued "there is no simple answer to what behavioral finance actually is. There are many ways to define the field and its boundaries" (p. 29). Some of its more extreme advocates have viewed behavioral economics and finance as a replacement for the traditional assumptions made by economists of maximizing behavior and efficient markets and see the two approaches as battling one another.[3] A typical definition, especially in some of the earlier literature, was that behavioral economics and finance is based on the assumption of irrationality in place of the traditional rationality. A more reasonable view which has been adopted by many of the advocates of behavioral finance is the need for contingent analysis under which markets may behave differently in different situations and the need to analyse the conditions under which they are likely to behave in different ways. Such broader views have sometimes been described as analysis based on imperfect human behavior under realistic assumptions about limited information and mental abilities.

While much of the early discussion of behavioral economics and finance drew on the distinction between rational and irrational behavior, I believe that much of this debate has been of limited usefulness because once one moves beyond simple cases such as are often set up in laboratory experiments clear distinctions can often become difficult to make. For example, as Kay and King (2020) argue, the use of simple rules of thumb or heuristics that would clearly be irrational in a world of full information may prove to be quite sensible in a world of uncertainty. Thus, the use of narratives to aid decision-making can be quite rational, but it can make a considerable difference whether these narratives are roughly correct or false. And under uncertainty it is a judgment call whether some narratives that turn out to be wrong were rational to adopt under radical uncertainty. While attempting to make such distinctions can be intellectually interesting, from a practical standpoint this is much less important than attempting to discover under what types of circumstances different types of behavior are likely to occur and what are the effects of such behavior.

[3] For a more detailed discussion of behavioral finance see Willett (2022) and the extensive references cited there. That paper also covers the complementary areas of complexity economics and eco physics. Behavioral and neuro economics and finance often draws hypotheses from cognitive psychology and neuroscience. See also Barberis and Thaler (2002) and Bhoj (2019).

Rationality-irrationality should not be seen as an either-or concept. While we can identify extreme cases or clear rationality of irrationality there is a substantial gray area in between. As Steven Pinker (2021) argues, "(…) rationality is not a power that an agent either has or doesn't have" (p. 6). How should we define rationality? Pinker explains "As with most words in common use, no definition can stipulate its meaning exactly" (p. 36). In terms of applied analysis, we can focus on tendencies without having to label them as rational or irrational. One suspects that a major reason this issue has assumed such importance for many economists is that rationality has often been considered a fundamental aspect of economics. This need not be the case, however.

In financial markets this broad view of the behavioral approach does not reject the value of the Efficient Market Hypothesis (EMH) but views it as an important special case and analyses reasons why markets sometimes behave in ways that deviate from it. For example, Andrew Lo in his book on the adaptive markets (2019) describes efficient market theory as being not so much wrong as incomplete.

In my broad conception of the behavioral approach, it includes all of the factors that may lead to inefficient economic and financial outcomes. These include quite rational behavior under perverse incentive structures such as can be generated by factors like moral hazard and principal-agent problems, imperfect information and limited abilities to process information, as well as cognitive biases such as overconfidence and confirmation bias. It also draws on analysis from agent-based models, complexity theory and evolutionary analysis.[4]

Just as it is difficult to define the boundaries of behavioral finance it is difficult to draw a definitive history of its evolution. Some scholars have attempted to describe this evolution into different phases, but I have found this to be of limited usefulness and will not engage in such an exercise here. However, a few words of history are in order. The narrow version of modern behavioral finance is generally considered to have started with the contributions of Kahneman and Treversky and Thaler in the late 1970s and early 1980s, but aspects of the broader approach can be associated earlier with analysis of the implications of limited information with contributions such as Herbert Simon's concept of bounded rationality and Frank Knight's (1921) distinction between risk and uncertainty.[5]

In terms of macroeconomics and finance we have Keynes' argument in The General Theory that for "human decision-making affecting the future we cannot depend on strict mathematical expectation, since the basis for making such calculations does not exist. We calculate (…) where we can, but often falling back for our motives on whims, or sentiment, or chance" (p. 156, cited

[4] See, e.g., the analysis and references in Beinhocker (2007) and Bookstaber (2017).

[5] This distinction is particularly emphasized in the recent book by Kay and King. On the development of behavioral economics and finance see Thaler (2015).

in Russell, 1998). Also interesting is Keynes rejection of wild irrationality, "We should not assume that everything depends on waves of irrational psychology."[6]

It is easy to understand why behavioral finance initially attracted considerable resistance from mainstream finance experts. (It still does from some.) Efficient market theory provides a powerful approach to the behavior of financial markets and has made many important contributions to financial analysis, for example, emphasizing that markets are typically forward looking rather than responding only to current or past developments as was commonly assumed in much Keynesian analysis at one time. It provides the important insight that markets are likely to behave differently to news that is anticipated than to news that is unanticipated. Efficient market theory has contributed to the reconceptualization of the foreign exchange markets as having important elements of financial markets not just goods markets, and undermined the idea of a static Phillips Curve and replaced it with the expectations augmented Phillis Curve which made an important improvement to standard Keynesian macroeconomic theory. It would be foolish to abandon the important insights that efficient market theory has provided.

Besides the important aspects of behavior that it helps to explain, it provides an intellectually satisfying unified framework for analysis. One suspects that this intellectual attraction was one of the important reasons why many economists were quite hesitant to give it up. This hesitancy was reinforced by those behavioral economists who tended to put the debate in either-or terms and viewed their work as a wholesale attack on the rationality assumption. To those who believed that the rationality assumption was the fundamental keystone to all of economics, this was an attack to be strongly resisted. However, with hindsight we can see that this was a false characterization of the issue. The real question is when to use efficient market assumptions and when to make other ones.

Modern behavioral finance began with efforts to explain financial behavior which was not consistent with standard efficient market theory. For example, stock markets were found to display much more volatility than could be explained by variability in earnings and there were numerous ways to follow statistical rules that would make above average returns, a fact inconsistent with the view that markets made use of all available information.[7] While such facts became clear their interpretation was not. They clearly falsified some aspects of

[6] Unfortunately, this aspect of Keynes was left out of the famous ISLM version of Keynesian economics that became standard. Since the Global Financial Crisis this aspect of Keynes has begun to attract more attention, as has the work of Hyman Minsky (1975) and (1986) with his argument that stability generates instability. For an insightful analysis of the distinction between Keynesian economics and the economics of Keynes see Leijonfufhyud (1968).

[7] Of course, one could almost always hunt long enough to find rules that would have made profits. The key question is whether there are rules that will earn profits in future periods, i.e. out of sample.

simple efficient market theory based on risk neutrality, but such findings might still with consistent with risk averse efficient markets with risk premia For example, in the early studies of the behavior of foreign exchange markets after the breakdown of the Bretton Woods pegged exchange rate regime a number of us found that statistical rules could provide above average returns, but while some of us interpreted these as showing that in its early days the foreign exchange markets were not fully efficient, others who were committed to the EMH interpreted the evidence as showing that there had been time varying risk premia.

While many of the applications of behavioral finance have been quite *ad hoc* there has been a substantial maturing of analysis in recent years. One of the standard defenses of efficient markets theory used to be that there are almost an infinite number of ways to be irrational so that the recognition that people may sometimes be irrational cannot give a useful guide to supplementing the EMH. A major strength of recent behavioral analysis is that it draws on cognitive and neuroscience to consider particular ways in which human biases and cognitive limitations in decision making may lead at times to inefficient behavior. This narrows down substantially the number of hypotheses which should be major candidates to include in financial analysis. This process is still in a relatively early stage so there is much analysis to be done to discover which of the different biases are most important under various circumstances. And, of course, some biases may reinforce each other, for example, in generating follow the leader behavior. Such analysis presents an exciting agenda for research.

Two different versions of the EMH should be distinguished. One is that markets set roughly the "right", i.e. fundamental equilibrium, price and is a very strong conclusion. The second interpretation is that it is impossible for agents, or more reasonably very difficult, for agents to consistently beat the market. While the first conclusion implies the second, the second conclusion does not imply the first. Thus, as Malkiel (2023) has emphasized, the second interpretation of the EMH is consistent with the existence of bubbles in asset markets.

Some argue that a serious weakness of behavioral finance is that it lacks the sort of a unified theoretical framework provided by efficient market theory. This is quite understandable from an esthetic point of view but from the point of view of positive analysis it can be viewed as a major strength. We should remember that mainstream economics itself contains many different models, for example, monetarist versus Keynesian versus new classical macro models and a variety of models of exchange rate determination and formation of expectations in the foreign exchange market. Indeed, a key aspect of good-applied analysis is to know which models to apply to different situations. For example, monetarist models have a comparative analysis for longer run analysis while Keynesian models work much better for short term than long term analysis. James Tobin has referred to this as regime shifts.

Despite its advances a critic might describe behavioral finance as concluding that anything can happen, not a very useful conclusion. This has a certain

degree of truth. For example, there are behavioral hypotheses that conclude that markets will under react to news and others that they will overreact. This is not helpful for predictions, but it does have an important negative type of value in terms of arguing that we should not assume that markets will always respond optimally to news.

It is often as important to know what you don't know as what you do know. Thinking that you have knowledge which is false can lead to major disasters.[8] Indeed, this was one of the major causes of the Global Financial Crisis where many decision markets had excessive faith in the precision of financial engineering to give precise estimates of risk, whereas Kay and King (2020) have convincingly argued there was considerable uncertainty.[9] As a result, many financial institutions and investors took on much more risk than they realized and suffered huge losses as well as inflicting enormous pain on the rest of the economy.

As will be discussed below many of the behavioral hypotheses reinforce rather than contradict each other in terms of their predictions. We can most usefully think of behavioral finance and behavioral economics in general as providing a set of plausible hypotheses about various types of influences that may lead to nonoptimal behavior. A huge number of possible biases have been identified.

Different papers have identified small numbers of biases as being among the most important, but these lists often do not agree. A sample of some of the possible biases most frequently mentioned include Ambiguity aversion, Anchoring, Availability, Cognitive dissonance, Confirmation, Familiarity, Framing, FOMO (fear of missing out), Herd mentality, Hindsight, Hubris, Loss aversion, Mental accounting, Myopia, Overconfidence, Prospect Theory. Regret Theory, Short time horizons and Wishful thinking. Thus, an important task for researchers is to try to identify which types are most important when analysing different issues.

A list of the many potential biases can make one extremely pessimistic about human beings. However, this need not be the case. A number of these traits were evolutionarily efficient in previous settings but are not so in many modern circumstances. In terms of standard evolutionary models these new environments have not been around long enough for some of these counterproductive traits to have been bred away. Such unhelpful traits can often be

[8] Ed Tower called my attention to the quote from Mark Twain "It ain't what you don't know that gets ylo into trouble. It's what you know for sure that just ain't so."

[9] For a discussion some of the false mental models or views that contributed to the US subprime and global financial crises such as the belief that housing prices never fall in aggregate see Willett (2012). Other important causes include the failure to recognize sufficiently systemic risks and how interconnected the financial system had become. Many of the risk management techniques adopted were quite efficient in spreading the risks of shocks to particular institutions but not for system wide shocks.

overcome, however. Many of our inefficient biases come from instincts from the parts of our brains that evolved early on, what are sometimes called our lizard brains. More recent biological evolution in our brains has given us the power to often override these instincts or gut reactions. This is emphasized in Kahneman's bestseller*, Thinking fast and slow* (2011). Our rational thinking can often override our initial irrational (or less than fully rational) instincts and they can be trained to do this more effectively. Our brains have evolved to a point that we have the capacity to learn at a speed that far exceeds the operation of biological evolution. Andrew Lo uses this concept as the subtitle of his recent book, *Adaptive markets: Financial evolution at the speed of thought* (2019). Of course, some humans learn faster than others. And some may not learn at all. It is not clear to what extent behavioral analysis in its current stage allows agents to systematically beat the market but it is clear that counteracting some of these tendencies can be a substantial help in not losing so much relative to the market, for example, by reducing overtrading and making more use of index funds.

What will make behavioral finance most useful for practical purposes is when it can go beyond a checklist of possibilities and develop contingent analysis of the types of circumstances under which different behavioral hypotheses are more likely to be important. Progress is already being made in this task, but we have much further to go. Such contingent analysis can give rise to predictions that can be confirmed or falsified with empirical evidence, the hallmark of science. As will be discussed in Section 3 the international monetary area presents a number of cases where there is empirical support for some of the important predictions that can be derived from behavioral finance hypotheses.

2. Some of the important hypotheses from behavioral analysis for applications to international monetary analysis

As noted above there are many, many hypotheses that have been developed from behavioral science. Here I will briefly review a few of the ones that I have found particularly important for my work on international. monetary issues. Let us begin with a discussion of important preconditions for contingent behavioral finance.

Behavioral biases and limitations tend to be following to most prevalent in circumstances of considerable complexity and uncertainty. Thus, I view behavioral finance and the uncertainty analysis present by Kay and King as

complements rather than competitive approaches.[10] Biases often tend to be much less important in stable environments where there have been many repetitions of events and quick feed-backs, and thus opportunities to lean from experience. This is a key component of Andrew Lo's (2019) adaptive market hypothesis where markets converge toward efficiency[11] over time in stable environments and is consistent with concepts of evolutionary efficiency that occur over long time periods. Lo suggests that it would be useful if economics was based more on biology that physics.[12]

An important aspect of the extent of learning is whether there is fairly quick and unambiguous feedback on the consequences of actions. Where the consequences occur only well into the future, and it is difficult to see whether-or-not they were based on correct information and models or narratives, little learning may take place. Likewise with complex outcomes such as crises there are typically a number of interacting causes. While there may be agreement on the checklist, there is often considerable disagreement on the interpretations of which are most important. Thus, quite different lessons may be taken from a particular crisis. This problem is compounded by the behavioral tendency for people to conflate their objective views of developments with their normative views of what they would like to see. A complementary tendency (confirmation bias) is to count heavily evidence that is consistent with prior views while ignoring or heavily discounting evidence that conflicts. Such tendencies can lead to ignoring warning signs of impending crises and the lessons that should be taken away from developments. There is also the tendency to learn much less from the mistakes of others than from our own. For example, the Asian crisis offered important lessons that were largely ignored in the advanced economies, e.g., that low inflation is not always sufficient to avoid bubbles in asset markets.

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[10] In places Kay and King give the impression that they see their uncertainty analysis as an alternative to behavioral economics and finance. Several other authors have done the same with their contributions relative to their descriptions of behavioral finance. They often present cogent critiques of particular examples of behavioral economics and finance, but I do not see these as reasons to abandon the broad approach. Generalizing these critiques may reflect an understandable tendency for those presenting new approaches to emphasize the differences rather than complementarities with other approaches. However, Bookstaber (2017) surely goes too far however when in his book advocating an agent-based modeling approach that mainstream economics has nothing useful to say about crises.

[11] See also Gennaioli and Shleifer's (2018) hypothesis of diagnostic expectations.

[12] Economics is sometimes charged with suffering from physics envy, meaning that more value is placed on mathematical models than on empirical studies even if the models don't fit the data. Some economists seem to have the idea that studies are more scientific if they are based on mathematical models, but the true hallmarks of science are the discovery and explanation of empirical facts. In this process mathematical models can be extremely useful, but they are not always necessary, and in some cases, can be seriously misleading.

One problem that can make efficient learning more difficult is that environments can sometimes shift swiftly. There is an important adage which holds that disequilibria can go on for much longer than one would think and then can collapse much faster than one would think.

Other behavioral hypothesis can interact with those just mentioned. One is the tendency to have excessively high rates of time preference, i.e. short time horizons, that result in ignoring or discounting heavily effects that will occur well into the future. This reinforces the rational incentives such as concerns with reelection where the public has short time horizons These can generate time inconsistency problems where there are important differences between the time patterns of the costs and benefits of actions. This results in tendencies to adopt policies with quick payoffs and defer ones where the costs tend to come first. The political business cycle with its tendency to adopt expansionary policies before elections with the good effects of expanding growth and employment coming predominantly before the election and most of the costs in terms of rising inflation coming after is one of the most well-known examples. Another is the tendency for governments to delay needed balance of payments adjustments promptly enough to avoid currency crises.[13]

A complementary type of behavior is myopia, the tendency to forget or too heavily discount the effects of events that occurred in the past. Memories can be short. Previous crises are often forgotten fairly rapidly by investors and financial institutions. Failure to sufficiently heed the lessons of past crises are often important contributors to future crises. This is especially true when there are long periods of stability between crises. This gives rise to the adage that crises breed in the benign periods that precede them as a result of short memories and complacency setting in. This is a major theme of Minsky (1986). In the short run the feedback to excessive speculation and loose lending standards can be positive, leading in some cases to credit boom and asset bubbles.[14] This has been termed "recency" by Bernstein (2023).

Such considerations made an important contribution to the Global Financial Crisis where the weights put into many of the risk models were based only on fairly short time periods dominated by the benign environments of the previous decade or two (the great moderation). This type of problems is particularly likely for institutions where there is fairly rapid turnover of personnel. Younger individuals typically often have little sense of history. This applies not only to

[13] See Bird and Willett (2008).

[14] Excessive rates of credit creation typically encourage more risky borrowing and investing which make losses and the outbreak of a crisis more likely. It also contributes to high leverage which can make the effects of a crisis much worse once it breaks out. For example, a major reason that the effects of the bursting of the dot.com bubble in the US were much milder than the bursting of the housing bubble was that leverage from the baking system was much greater in the second case.

teenagers but also to many professionals. There also seems to be a tendency to learn much more from one's own mistakes than from those of others.

And as noted above even in the longer run the lessons taken away from crises may differ a great deal to different agents. For example, while there is fairly general agreement about the causes of the global financial crisis there is still considerable disagreement about the relative importance of different contributing factors. Many on the left put heavy weight on financial deregulation while on the right emphasis is often placed on government programs to expand home ownership for lower income individuals.[15] These considerations suggest that the speeds and extents of learning many differ greatly from one area to another, and also of course from one agent to another depending in part on to what extent the agents are open minded.[16]

While rules of thumb and narratives can be efficient in situations of limited information and considerable uncertainty, this is not the case with all of them. Information gathering is often costly and there is no clear way to judge if agents have invested an efficient amount of effort in learning.[17] However, there are clearly cases where most people would judge that people have adopted narratives and mental models that are clearly wrong. Rather than spending time trying to judge whether the adoption of such narratives reflects irrationality or ex ante efficient decisions that turn to be wrong ex post some economists have made what I believe is a very useful suggestion to not try to solve this issue and focus instead on whether the narratives are useful or not in achieving one's objectives. This is a more operational question. Even here, however, it is important in judging the usefulness of particular assumptions in models to try to distinguish between cases of narratives that are fundamentally wrong and those that are merely incomplete.

From the standpoint of positive analysis in many cases it is important to try to discover what mental models are motivating various important actors.[18] The traditional assumptions of much of older economic analysis as well as many versions of the more recent new classical macroeconomics that assumes that everyone knows the correct model is clearly a serious limitation for many types of questions. For example, this is likely to be useful in understanding

[15] For analysis of the crisis see, e.g., Davies (2010) who identifies over 20 causes of the crisis that have been suggested in the literature. A valuable review of a number of books on the crisis is given in Lo (2012).

[16] Of course, most of us are more minded on some things than on others.

[17] Like rationality there are many cases which are clear cut and many which are not. Given the limitations of human brains ignorance with respect to particular issues is often quite rational. The concept of rational ignorance, e.g., plays an important role in public choice analysis, helping to explain the extent of trade protectionism and why voters often do not catch on to political business cycles.

[18] I use mental models, narratives and stories interchangeably. For recent discussion of the importance of narratives and mental models see Shiller (2019) and Willett (2012).

different policy positions and attempting to judge whether substantial asset price increases are bubbles. For the latter evaluating the correctness of popular views may be quite helpful.[19]

Another important bias is the tendency of people to believe what they would like to believe, i.e. to conflate normative with positive analysis. Learning that one's views are incorrect is usually not pleasant. This helps contribute to the problem of confirmation bias, the tendency to pay more attention to evidence that is consistent with prior beliefs than to ones that contradict them. Hubris and the tendencies of a majority of people to believe that they are above average in a wide variety of skills can also lead individuals to discount the views of those who disagree with them.[20] Such factors lead to a tendency toward wishful thinking that things are as we would like them to be. Some of this tendency can be explained by what the psychologists call efforts to avoid the cognitive dissonance generated when events occur that are different than agents would like them to be such as situations where the situation actually requires tradeoffs to be made between objectives. Such disutility is avoided by ignoring inconvenient evidence.

A major example of this involves the tendency of many conservatives to embrace extreme forms of supply side economics.[21] Conservatives generally prefer low taxes and fiscal prudence. Standard economics argues that under most circumstances if one wishes to reduce fiscal deficits, cutting government expenditure and/or raising taxes is necessary. While many conservatives in this situation would typically prefer is to cut expenditures but this may not be politically feasible. In such cases the conservatives would be faced with making a choice among competing objectives, a situation that generates disutility. How to make this conflict disappear? The answer is to assume that cutting taxes will increase rather than reduce government revenues because the

[19] Of course, there may be a number of different views which fall within a range of plausibility so there are limits to what can be done with this type of analysis. We should try to guard against the problem that we may think that our preferred view is the only plausible one. Still reasonable people may agree that some views are outside plausibility, especially when they are based on assumptions that are clearly factually incorrect such as the belief that Donald Trump actually won the last US presidential election.

[20] In behavioral economic and finance the focus is on biases which many but generally not all people tend to have, i.e. they are propositions which may hold on average. We all know people who underestimate their abilities, but numerous studies have found that over estimation generally dominates. Identification of such possible biases may still be useful even if they don't consistently dominate outcomes since they can point to possibilities to look for. Knowledge of such biases can also help individuals try to reduce them. For example, it is not yet clear how useful behavioral finance is in allowing investors to beat the market, but it can definitely help individuals try to correct habits such as overtrading which tend to yield below market returns.

[21] All mainstream economists believe that supply side behavior is important although such considerations did not play an important role in traditional Keynesian economics.

reduction in disincentives to work will generate so much increase in output that the tax cuts can more than pay for themselves. As is shown by the Laffer curve analysis this is a theoretical possibility that can occur in cases of very high tax rates. However, almost all the empirical evidence suggested that income tax rates in the US at that time were not that high and the Reagan tax cuts failed to pay for themselves.

However, this has not kept later conservatives from repeating these arguments, with former President Donald Trump a prime example.[22] The effort to pursue such Laffer curve type fiscal policy led to a major financial and currency crisis in the United Kingdom in 2022. The newly elected government of Prime Minister Liz Truss proposed tax cuts in the face of large fiscal deficits. The market did not share the view that these tax cuts would reduce the deficit and major financial and currency crise quickly followed. Indeed, the opposition generated by this proposal was so strong that the Prime Minister felt forced to resign after less than two months in office.[23]

Another important type of potential bias is the human tendency to follow the herd. In earlier eras this was likely very adaptive behavior. In primitive times when others in your group began to run it was wise to follow suit even if you had not seen a danger, it was likely that some of your group had. And the cost of running unnecessarily was low relative to not running when there was a lion in the bush. The result could be fatal.

As noted above, one of the implications of evolutionary analysis is that modern financial markets provide a quite different environment from those that faced humankind over most of its history. Thus, some behavior that was evolutionary adaptive for a long time may have become maladaptive in the current environment and has contributed to a tendency for financial markets to display herd behavior which pushes price movements too far.[24] Recent analysis has emphasized that herding can also apply to the narratives adopted by market participants.

The result of such tendencies is for financial markets to sometimes suffer from the types of herding behavior which generate excessive price movements such as in bubbles and crashes. Such behaviors are reinforced by two other important factors. One is the tendency to assume that the developments of the recent past will always continue into the future. Despite the

[22] See, e.g., Bird (2018).

[23] Another example of the adoption of faulty mental models leading to crises was the belief by Turkish President Recep Erdoğan's that against all evidence high interest rates cause increased inflation. His insistence that the central bank keep interest rates well below the rates of inflation over a period of years led to capital flight and repeated currency crises and inflation rates that eventually rose above 70 %. Finally in 2023 after his reelection Erdoğan finally relented and allowed the central bank to raise interest rates substantially.

[24] Of course, herding can be quite rational in terms of following the actions of those who you believe have better information than you.

warnings by financial companies that past returns are not a guarantee of future behavior it is well documented that for many investors past behavior is often projected into future expectations. In cases of limited information such behavior can be rational, but behavioral finance suggests that it often goes beyond what is rational.

Such behavior can be reinforced by the 'kernel-of-truth" phenomena. Most bubbles begin with developments that justify substantial increases in prices or in capital flows. The problem is that such initially rational behavior can begin to feed on itself for the reasons just discussed and this can lead to excessive price movements and surges in capital flows that end in disruptions.[25] With respect to capital flow surges the initiating event is often the election of a new government that is committed to more orthodox economic policies.

Such excessive movements are consistent with the classic argument against efficient markets, that people tend to swing between mania and depression. This is certainly true for those with the misfortune of being bipolar and there are examples of bubbles and crashes that have been characterized as resulting from the madness of crowds However, with respect to financial behavior such episodes are fairly rare events.[26] More common is the widespread acceptance of false narratives such as 'This time it's different', which have been called the four most dangerous words in investing.

There is also the tendency of people to react to good news by becoming more optimistic and to bad news by being more pessimistic. A major additional contributor to crashes and contagion is when developments force market participants to finally recognize that the narratives that had motivated their recent behavior were false. Such broken mental models and recognition by agents that they had not really understood the situation will typically lead to major increases in risk aversion that are not necessarily irrational. Such tendencies can of course contribute to stronger swings in asset prices and capital flows.[27] As will be discussed in the following section such reactions are often a major cause of contagion.

A focus on narratives and mental models points to the likelihood that these will differ across different agents. While there has been some mainstream eco-

[25] For an application of behavioral finance to help explain capital flow surges and reversals see Efremidze, Rutledge et al. (2016). For empirical analysis of the patterns of surges and reversals and sudden stops see Efremidze, Kim et al. (2017) and references cited there. For further analysis of these issues see Bird (2018).

[26] See the analysis and references in Bernstein (2021) and Menschell (2002). There is of course also the wisdom of crowds. One of the important factors that distinguishes these are whether decisions are being made largely independently opposed to being swept up in crowd psychology.

[27] I should note that some of the empirical proxies for market sentiments are sometimes treated as if they reflect just swings in psychological optimism and pessimism, but they are in fact generally measures of outlooks which can combine elements of both rational expectations and behavioral factors.

nomic analysis based on heterogeneous expectations, most macroeconomic and currency crisis models are based on unified actor models where differences in expectations are not considered. This assumption is typically needed for mathematical tractability and does not keep them from being useful, but if only these models were followed some important phenomena would be missed. For example, in the standard currency crises models a switch on expectations from optimistic to pessimistic occurs at a particular point in time resulting in calm in the foreign exchange markets turning into a sudden crisis. This does sometimes occur such as the example of the UK in 2022 mentioned above[28]. But frequently speculative pressures build up more gradually over time. This can be explained by different agents having different expectations about future shocks, their effects, and what policies governments will adopt. Over time more and more market participants may switch to seeing higher probabilities of a crisis and so capital outflows may continue to mount for a considerable period of time.

We know from the analysis of complex systems and far from equilibrium behavior that at times small events can have important non-linear effects with huge consequences. An example is that in a tightly coupled system such as a rocket the failure of a small component can bring destructive system failure.[29] This was the case with the crash of the *Challenger* mission in 1986 where the malfunction of a small connector component led to an explosion of the rocket and resulted in the death of all those abroad.

When such systems, which can include financial sectors, enter far from equilibrium states a small adverse development can sometimes lead to a system crash that is vastly disproportionate to the magnitude of the event. Where systems are close to equilibrium, the effects of shocks tend to be linear, as is predicted from standard efficient market theory. However, when systems enter critical stages tipping points may be reached. An initial example given of this property is when adding one more grain of sand leads to a land slide. In asset bubbles markets may become so overvalued that a small spark can lead to a sudden collapse.[30]

An important example from international monetary analysis can be illustrated by the popular currency crisis models. In the first-generation models there is a fundamental disequilibrium, often assumed to be due to large fiscal deficits that the government does not have the political strength to correct. In such cases a currency crisis in inevitable and the only question is when it

[28] Another example of a quick swift in expectations was the market reaction to the Russian legislature's failure to pass the fiscal legislation that had been agree by the government with the IMF as a condition for a large IMF loan.

[29] Bookstaber (2007, 2017) gives nice treatments of this issue.

[30] Of course, not all bubbles end in crashes. Some deflate slowly. This is another example of how markets can behave differently in different situations, one of the most important conclusions from behavioral analysis.

will occur. In such models, fundamentals are either good or bad. The second-generation models add a third state where the fundamentals or neither so bad that a crisis is inevitable or so good that there is no risk of one. In this third, intermediate state, a country is in a vulnerable zone where a crisis is not inevitable and with good luck will not occur but with bad luck some adverse event, not necessarily a huge one, can set off a self-fulfilling speculative attack. In such cases officials often argue that this type of nonlinear response is evidence that the attack is caused by destabilizing speculation. And this would be true if the balance of payments was close to equilibrium, but could reflect quit rational expectations when the country was in a vulnerable zone.

The factors discussed above have focused on various behavioral biases. It is important to remember that the other key aspect of behavioral finance is that there are limits to arbitrage that can keep stabilizing speculation from fully offsetting the effects of destabilizing speculators on prices. It seems likely that these failures will be even stronger in the case of capital flows since there is less of a mechanism for stabilizing capital flows to offset the effects of destabilizing flows. For international monetary analysis these considerations have the important implications that capital mobility may often not be perfect, i.e. there are limits to international arbitrage.

3. Some implications for capital flows and international monetary analysis

As noted in the introduction some of the most important implications of behavioral finance for international monetary analysis concern the nature and behavior of international capital flows. One is based on limits to arbitrage and helps to explain why, even in the absence of capital controls, international capital mobility is often much lower than the perfect capital mobility that is assumed in many of the currently most popular open economy macro models. Therefore, uncovered interest rate parity does not always hold.[31]

As has been famously analysed in Mundell-Fleming models of open economies the degree of capital mobility will affect the strengths of monetary and fiscal policies under fixed and flexible exchange rates. Another implication is that expectations in the foreign exchange market can deviate from both the static expectations assumed in the initial Mundell-Fleming models and the rational expectations assumed in many of the recent models.

[31] Another possible reason is due to risk premia although there has been limited success in finding useful empirical proxies for such risk premia. There would be no risk premia even in the face of considerable uncertainty if market actors were risk neutral.

A key point is that expectations formation may be quite different under different circumstances. This applies also to the degree of capital mobility and the thickness of financial markets. As a result, sterilized exchange market intervention may be effective under some circumstances and not others. Under conditions of a great deal of uncertainty foreign exchange markets may become quite thin. In such cases the possibility of mispriced exchange rates may come in the form of capital outflows combined with of an insufficiency of stabilizing speculative, not only from destabilizing speculation. In such cases the short run equilibrium price in the foreign exchange market could fall well below the long run equilibrium price. While this would offer scope for speculative profits great uncertainty might lead rational speculators to not take advantage of this opportunity This may have been part of the explanation for the large exchange rate depreciations which followed the abandonments of pegged exchange rates during the Asia crisis in 1997–1998. In such cases of thin markets official intervention can be effective although effectiveness is likely to depend on the credibility of the government and central bank.

On the other hand, when governments are trying to maintain a pegged exchange rate which is clearly substantially overvalued the supply of funds economic agents wish to move out of the country is likely to be quite elastic. In such cases efforts to use sterilized intervention to maintain the peg are unlikely to be successful. This implies that the traditional debate about whether sterilized intervention is effective or not is seriously mis-specified. The issue should be reframed as under what conditions can sterilized intervention be effective and under what conditions will it not.

The fact that capital mobility will often be far from perfect, even if high, has important implications for the international monetary trilemma which states that at any one time a country cannot have all three of a fixed exchange rate, no controls, and an independent monetary policy. It is often not recognized that this trilemma need hold in the short run only under conditions of close to perfect capital mobility. With a lower degree of capital mobility sterilized intervention can allow a country to operate outside of the trilemma constraint set in the short run and have some degree of monetary independence even with a credibly fixed exchange rate and no capital controls.[32] There is some evidence that this situation may hold even for a small open economy with well-developed financial markets such as Hong Kong (see Xue & Willett, 2024).

While such ability offers the benefit of being able to operate outside of the trilemma constraints in the short run it also carries a potential danger. Officials seeing what they would like to see and engaging in wishful thinking may be too optimistic that current payments deficits are temporary and thus do not require undertaking costly adjustment polices to correct the deficit when in fact they face a fundamental disequilibrium. The desire to delay ad-

[32] For further analysis see Willett and Bird (forthcoming).

justments is increased under uncertainty where officials may see the choice as being between the certain costs of adjustment in the present versus the uncertain benefits of possibly avoiding a crisis in the future. In Kahneman and Tversky's terminology this could be explained as a framing effect where officials become risk takers when facing certain short-term costs versus a smaller chance of facing huge costs in the future.

Political economy incentives such as those which can generate political business cycles can reinforce this tendency to delay needed adjustments for too long. Such tendencies to delay need adjustments is one of the primary causes of currency crises.[33]

Two further areas of important applications of behavioral finance concern the discipline effects of financial markets and contagion generated by crises. There is a popular view, which I once held, that financial markets provide strong discipline over national monetary and fiscal policies. However, this requires two conditions to be met—that financial markets quickly signal increasingly dangerous policies and that policy officials respond to these signals. With rational expectations the first condition should generally hold. However, we have observed many cases where such early warning signals have not been provided by financial markets. Important examples include the Asian crisis of 1997–1998, the Argentine crisis of 2000–2001, and the recent Greek crisis.

In a Mundell-Fleming model with static expectations high capital mobility can help finance fiscal deficits and thus reduce their impacts on interest rates. As a result, the Mundell-Fleming models imply that while the adoption of fixed exchange rates would provide discipline over monetary it would do the opposite for fiscal policy. Argentina in the late 1990s provides an example. These models also imply that with high capital mobility and a fixed exchange rate a fiscal expansion can undermine the effects of an independent central bank. The resulting capital inflows would generate corresponding monetary expansion despite any efforts by the central bank at monetary tightening.[34]

Why do markets often fail to give strong signals until it is too late? One standard explanation is moral hazard coming from being too big or connected to fail or being geopolitically important.

But that is not the only factor. While it has been argued that the bailouts of Mexico in its 1995 crisis were a cause of the excessive capital flows into Asia and the failure of governments to follow appropriate policies this seems doubtful given the economic pain that was still generated in Mexico despite the bailouts and the large losses suffered by many investors.

There are other important types of moral hazard, however. In the case of the Asian crisis, one was the connected lending which took place in a number

[33] For further discussions of the tendencies to delay needed adjustments see Amri and Willett (2017), Bird and Willett (2008) and Walter and Willett (2012).

[34] For further analysis of such discipline issues see Willett, Chiu et al. (2014).

of the countries where it was often assumed that there was an implicit government guarantee of the politically important financial institutions. The second was the widespread belief that while small depreciations of the currencies might take place, several of the countries had adopted de facto crawling pegs, governments would not allow large depreciations. This led many institutions to fail to cover their international borrowings. These unhedged positions led to a massive rush to cover after the large depreciation of the Thai currency.

Faulty narratives or mental models often also play an important role. In the case of the Asian crisis many investors focused mainly on the countries strong domestic economic fundamentals and failed to consider sufficiently their weak international economic positions and the problems in their financial sectors.

It is a common view that with respect to contagion from crises that it is during the contagion stage that markets deviate the most from efficiency, being dominated by excessive fear and pessimism. The Asian crisis is a prominent example. However, I have argued that the most important market failure occurred before the crisis where excessive capital surges helped set up the preconditions for the crisis. By generating risky financial positions, the previous capital inflows magnified the rational incentives to reduce or hedge such positions once the crisis began. Willett, Nitithanprapas et al. (2005). These actions resulted in large capital outflows. Undoubtedly some of the contagion was due to excessive swings in mood toward excessive pessimism. But much of the panic was quite rational. Agents discovered that reality was quite different from what they had thought it was and that they had taken on much more risk than they had expected. Indeed, it seems likely that contagion will generally contain both rational and irrational behavior.[35]

The outbreak of the Thai crisis served as what is often referred to as a wake-up call resulting from the discovery that agents had been operating on the basis of faulty narratives or mental models.[36] The Thai crisis led investors and borrowers in other Asian countries to quite rationally reevaluate their financial positions and in a number of the countries there were enough similarities to the Thai case to generate rational panics. In many cases closer examinations led to discoveries that financial positions were much riskier than they had appeared from less thorough investigations. The Greek crisis led to a similar wake-up call within the eurozone with much, but likely not all, of the resulting contagion being quite rational.[37] The criticisms that the contagion was unjustified in the Asian case were often based on the same types of narratives which focused on the strong macroeconomic fundamentals. They paid

[35] In the case of the Greek crisis see Bird et al. (2017).

[36] Faulty mental models such as that in aggregate house prices never fall and that the complex products generated by financial engineering were quite safe also played a major role in the generation of the global financial crisis. See, e.g., Willett (2012).

[37] See the analysis and references in Bird, Du et al. (2017).

insufficient attention to the financial sectors which had become substantially overextended both domestically and internationally.

These crises in Asia and Greece, like the earlier Mexican crisis, are classic cases of capital flow surges and sudden stops or reversals.[38] As is typical with asset bubbles, the initial capital flows were quite rational responses to improved conditions in these countries. In the cases of Mexico and Asia this was caused by important economic policy reforms and for Greece it was entry into the euro zone. As with asset bubbles the problem was that the capital inflows were carried too far. There can be little question that the excessive inflows were not based purely on the judgments of many investors independently arrived at. Herding behavior was undoubtedly a major cause. It is important to recognize that this herding was not due just to following what others were doing. The spread of common narratives, which proved to be ultimately faulty, was a major factor.

Conclusions

Behavioral finance is an exciting new area of research. While some experts have viewed this enterprise as a wholesale attack on efficient market theory this is not a helpful way to conceive of it. It should be viewed as a complement rather that substitute for efficient market theory. It is also not a single theory but a range of hypotheses all of which are wrong in terms of explaining everything, but which often can be quite useful in explaining some things. This applies as well to the broader range of analysis that goes beyond simple optimization models and consider factors such as the roles of uncertainty, narratives, and complexity economics.

While to date most of the applications of behavioral finance have been to domestic financial markets it is also important for the behavior of international capital flows and the behavior of international financial markets including the foreign exchange markets. As illustrated in this paper these in turn can have important implications for countries monetary and fiscal as well as exchange rate policies.

While the focus in this paper has been on the behavior of economic agents the behavioral approach also has important implications for the political economy analysis of policymaking. And again, it should be seen as a complement

[38] For recent treatments of capital flow surges and reversals see the analysis and references in Efremidze, Rutledge et al. (2016) and Efremidze, Kim et al. (2017). For a discussion of the similarities between the causes of asset bubbles and crashes and capital flow surges and reversals see Efremidze, Rutledge et al. (2016).

rather than a substitute for efficiency analysis. Great gains have been made in applying economic analysis to political questions. This was the prime objective of public choice theory, and it has been extremely successful. There are many areas however where such simple optimizing analysis can be usefully supplemented by behavioral analysis. For example, time inconsistency analysis provides an important explanation for why governments often delay adjustments for too long with the result that crises breakout. It seems very likely that this problem is much worse under conditions of greater uncertainty and that wishful thinking also often contributes, to delaying needed but costly adjustments as does confirmation bias which results in ignoring or heavily discounting information that conflicts with one's preferred narratives or mental models.

Some economists have been distressed by behavioral finance because it leads to a range of theories or hypotheses rather than a single elegant theory. But in truth markets do not always behave in the same manner. Thus, in my view the lack of a single unifying theory in behavioral finance as there is in efficient market theory is actually a strength reflecting the fact that the financial world is in practice much more complex that assumed by efficient market theory.

Of course, this is in one way distressing but in another it is exciting. Behavioral finance is in its infancy and we have much to learn about which hypotheses, including efficient market theory, have more explanatory power under what conditions. This gives us a rich agenda for research.

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