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WELLS FARGO SECURITIES

Economics Group

Special Commentary

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Information: Past Imperfect, Present Incomplete, Future Uncertain

Capt. Bart Mancuso: How did you know that his next turn would be to starboard?

Jack Ryan: I didn't. I had a 50/50 chance. I needed a break. Sorry.

Capt. Bart Mancuso: That's all right, Mr. Ryan. My Morse is so rusty, I could be sending him dimensions on Playmate of the Month.

This simple exchange from the movie "Red October" illustrates the need to make decisions without complete, perfect information and the need to communicate what we think is the correct message under uncertainty.

The reality of the world we live in is that there are many possible outcomes with less-than-perfect information in decision making. This is the focus of this essay.[1] Three regularities in decision theory add to the richness, or some would say complications, to economic decision making. First, decision makers tend to focus more on losses than gains. Second, persons focus more on changes in their utility-states than they focus on absolute utilities. Finally, the estimation of subjective probabilities is severely biased by anchoring, recency and other thinking patterns.

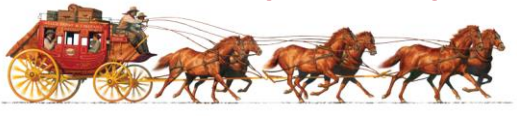
The reality of the world we live in is that there are many possible outcomes with less-than-perfect information in decision making.

To illustrate the importance of information, especially bad information, in decision making one can simply turn to the events of the first business day this month and the release of the Institute for Supply Management (ISM) manufacturing survey. At 10 a.m. on June 2, the organization reported that their factory index fell to 53.2 in May from 54.9 in the prior month. This was clearly weaker than the consensus has expected and, in economics and financial markets, the difference between expectations and actuals are what drives markets and the economy.

The 10-year Treasury yield declined immediately declined following the weaker-than-expected read on the manufacturing sector, as the index indicated to investors a weaker economy ahead. The yield declined from 2.51 percent to a touch below 2.49 percent (see Figure 1). Yet shortly after the release there were questions about the headline number. By 11:15 a.m., a *Bloomberg* story appeared quoting the research firm Stone & McCarthy that their calculations suggested a stronger number due to the use of what they considered a correct set of seasonal adjustment factors. By 11:32 a.m., the ISM had corrected its initial report to read 56.0 from 53.2 and, in response, the 10-year yield rose to 2.54 percent at around 11:45 a.m.

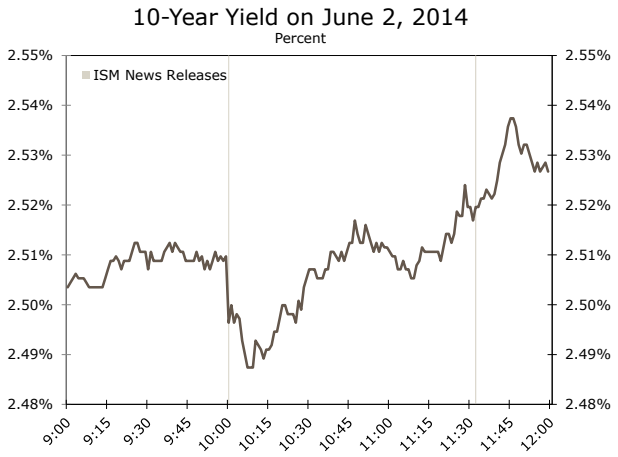
Yet, the story continues. Suspicions in the marketplace persisted that the second release was not quite correct either and that the second release number, at 56, was too high. By 12:09 p.m., *Bloomberg* reported that a second correction was to be released within the hour. At 12:32 p.m.

[1] **Leach, Patrick, "*Why Can't You Just Give Me the Number? An Executive's Guide to Using Probabilistic Thinking to Manage Risk and to Make Better Decisions*" 2006. and Howard, Raiffa, "*Decision Analysis: Introductory Lectures on Choices Under Uncertainty*." 2007.**



the second correction was issued and the final number came in at 55.4—above the original release and yet below the second release. The markets had been whipsawed on both the long and short side of the release. This episode highlights the importance of accurate information in setting market actions.

Figure 1



Source: Institute for Supply Management, Bloomberg LP and Wells Fargo Securities, LLC

1. The Underlying, Implicit Assumptions in Economic Decision Making

How do consumers and firms face the limits of information in their decision making process?

Economic models begin with the assumption of an ideal decision maker, fully informed, fully rational and able to compute with perfect accuracy. This decision maker acts how people ought to make decisions. But given the reality of actual decision making, how do consumers and firms face the limits of information in their decision making process? What is the positive, actual, aspect of decision making—not the normative, idealistic, aspect of decision making. What do people actually face in their decision making in a world without all the relevant information and no perfect model on how the world works? Unlike playing the game of chess or tic-tac-toe, all rules are not obvious and all prior moves are not known.

Under assumptions of perfect competition, all agents are rational and have perfect information. This allows precise mathematical derivation of desirable results. In addition, the assumptions underlying economic models dictate that each economic agent possesses knowledge about other market participants, and that knowledge is available to all participants. Each participant knows the playoffs and strategies available to other players. But we must ask what happens when these pristine assumptions are not in place. When examining the economy in action, it is unrealistic to expect perfect desired results.

2. The Limits of Public Policy in Society[2]

Given the limits of information in any society, we immediately recognize the restraints of public policy in the face of imperfect information. Central planning cannot match the efficiency of the open market because any individual knows only a small fraction of all that is known collectively.

Decentralized decision making in an economy thus complements the dispersed nature of information spread throughout society. This principle of dispersed information, that no single agent has information as to all the factors which influence prices and production throughout the economic system, intimates that markets search for an equilibrium of buyers and sellers and

[2] **Hayek, Friedrich A., "*The Use of Knowledge in Society.*" 1945. Library of Economics and Liberty. 10 June 2014. <http://www.econlib.org/library/Essays/hykKnw1.html>.**

therefore this gives a dynamic to economic activity that influences the pattern of behavior in product, labor and credit markets.

3. Decision Theory: The Importance of Imperfect, Incomplete and Dynamically Incorrect Information

Unlike in tic-tac-toe, in poker each player's cards are hidden from other players—an example of incomplete information. The challenge for each player is to identify available information, uncertainties with respect to that information and other issues relevant in a given decision. This is in contrast to the idealized decision maker, who is fully informed and able to compute with perfect accuracy the possible outcomes and is fully rational in each decision.

Instead, we face choices under conditions of imperfect information along with all the computational problems and personal biases in our decision making. The result is that we calculate, either heuristically or with some simple model, the expected value of possible outcomes by identifying outcomes, determining their values and associated probabilities.

4. Limited Information Limits Results: Why Perfect Models Fall Short

At first glance we often model the behavior of economic variables over time with an assumption of perfect competition and flexible prices (wages, commodity prices, interest rates and exchange rates). However, once we take these models into the real world and examine actual data, we find that the patterns of the data do not represent smooth adjustments from one equilibrium point to another. Because of imperfections in the information available to decision makers, we do not get the same behavior in the economy as if information were perfect. In cases where information is imperfect, the results differ from the predictions of simple, perfect competition models. Therefore, we should expect a different result from that predicted from many policy initiatives that are hatched in perfect model incubators. Instead, we face a wider range of outcomes and lower probability of any individual given outcome than models predict.

The patterns of real-world data do not represent smooth adjustments from one equilibrium point to another.

Moreover, as time passes, we get new information that leads to new price/output or wage/employment combinations that were unanticipated when initial policy actions were implemented. Fiscal stimulus in 2009 did not give us the rapid economic and employment growth that was predicted by Keynesian models. Rapid growth in the Fed's balance sheet did not generate the inflation feared by those who use monetarist models.

Figure 2

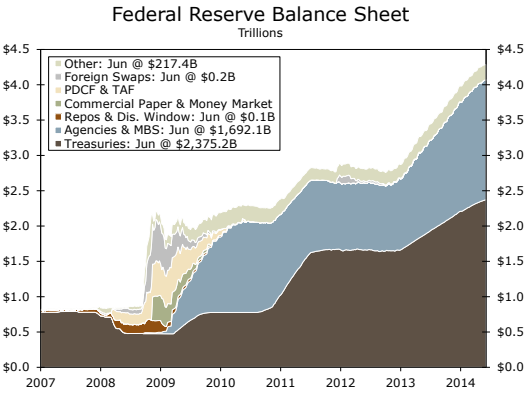
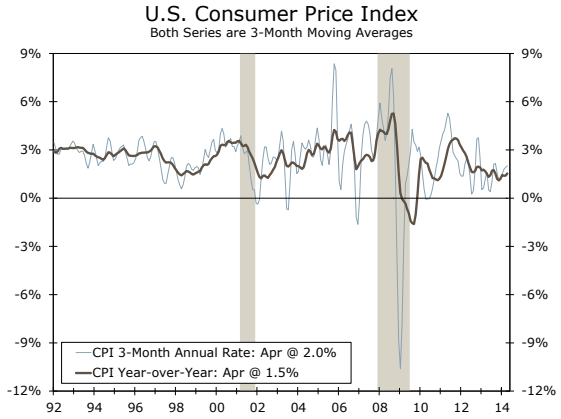


Figure 3



Source: Federal Reserve Board, U.S. Department of Labor and Wells Fargo Securities, LLC

Credit markets often do not adjust smoothly to changes or even discussion of possible changes of policy actions as illustrated by the jump in market interest rates and credit availability following the hint of Fed tapering beginning in May 2013. In addition, wholly unanticipated was the sharp reaction to this same hint of policy change in the exchange rate markets for emerging market countries.

In economic forecasts and in many models, the pattern forecasted for the data is smooth. Yet, in the reality of markets, movements can be very sharp and often unexpected. Moreover, these movements can lead to further changes that are not anticipated and provide new information and therefore lead to further economic developments that were not expected.

Further, imperfect information, such as inherent sampling problems with many economic statistical gathering processes may also lead economic agents to make decisions that have not been made in an atmosphere of perfect information. Samples for retail sales, employment and durable goods orders, series critical to making effective decisions, are all subject to large revisions as more complete information is developed.

In addition, GDP can be influenced by weather, as we saw in the first quarter of this year, which can give a misleading impression of the pace of economic growth. Current estimates of first quarter GDP are now negative and this information is clearly not representative of the underlying pace of growth, but the initial estimates of GDP has led some analysts to conclude the economy is weak and making decisions under that assumption.

5. Three Barriers to an Effective Idealized Economic Model in the Real World

Three types of real world information problems interfere with our perfect models of economic information. First, there is the issue of incomplete information—economic agents do not know all the facts and therefore economic agents may delay decisions or make different decisions than would have been made if all information was available. This incomplete information is apparent when the President and Congress are moving ahead with major legislation and yet the details of such information is not yet available or legislation has been passed, but federal agencies have not yet put in place the rules implementing that legislation.

Incomplete Information

The problem of incomplete information emphasizes the observation that in the real world, in contrast to perfectly competitive model assumption, no agent has full information as to other agents' budgets, preferences, resources or technologies, not to mention their plans for the future and numerous other factors which affect prices in those markets.

Investment is one area where incomplete information is most obvious. A firm may find that it needs to adjust its capital stock to achieve a level of capital consistent with a new (higher or lower) level of expected output. Since the costs of a full adjustment and cost of making a mistake produce too much/too little may be very high, a firm will pursue a policy of partial adjustments. In our analysis, this may give rise to a distributed lag process in a series such as capital investment. Incomplete information also leads to a bias in thinking called the hindsight bias. Sometimes called the "I-knew-it-all-along" effect, the tendency to see past events as being predictable at the time those events happened.

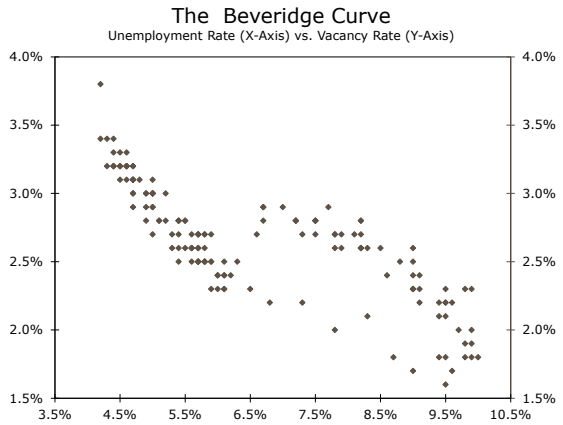
Incomplete information is a problem when decision makers attempt to assess the state of the economy.

Currently, there are two other fields where incomplete information is having a significant impact on current economic activity. First, in labor markets both potential workers and potential employers face incomplete information barriers on job opportunities and the skilled workers to fill those jobs. Both potential employers and employees engage in significant search costs to find a match.[3] Incomplete information is also a problem when decision makers attempt to assess the state of the economy and the behavior of other economic agents in response to economic events. For example, we note the sometimes surprising reactions of financial markets to an economic data release that would appear very positive, but the market reaction is negative. One has only to experience a few releases of the Employment Situation report and the subsequent market reaction to appreciate the problem.

[3] For an original exposition on search costs see Mortenson, Dale T., "*Job Search, the Duration of Unemployment, and the Phillips Curve*." American Economic Review 60 (December 1970): 846-862.

Figure 4

Figure 5



Source: U.S. Department of Labor and Wells Fargo Securities, LLC

Incomplete Information: Dealing with Missing Variables in Our Empirical Work

When forecasting economic series, interest rates for example, there are frequently pieces of data we would like to have but do not. In this example, we utilize the Fed funds rate, unemployment rate and PCE deflator series to show the missing variable (incomplete information) case. The unemployment and inflation rates are two potential determinants of the Fed funds rate. We run three different regressions or models; (1) the Fed funds rate and unemployment rate (inflation is missing); (2) Fed funds rate and PCE deflator (unemployment rate is missing) and (3) the Fed funds rate, unemployment rate and PCE deflator (complete model).

Two measures of a model's fit are root mean square error (RMSE) and Schwarz Bayesian Criterion (SBC), and we want these values to be small. That is, the model with a smaller RMSE/SBC value is better (and contains more useful information) among competitors. The third model, which includes the fed funds rate, the unemployment rate and PCE deflator, produces the smallest values for the both RMSE and SBC.[4] Note, by including a relevant variable, we increase the usefulness of our estimates. In other words, if we use model-1 or model-2 to explain movements in the Fed funds rates, then the error in estimation is larger than the model-3 error. In the present case, the larger error is because of a relevant variable is missing from the model. Therefore, a missing relevant variable in the model or incomplete information can lead to a larger error. On the other hand, by including a relevant variable in the model or with more information we can improve the decision making process.

Imperfect Information

Second, the case of imperfect information—information that does not precisely reflect reality—is often the actuality facing decision makers. The challenge is faced all the time because so much economic information comes via initial surveys of activity that are frequently revised, sometimes significantly, as further information is gathered. Initial estimates of retail sales, GDP, employment, capital goods orders are more often than not revised from their initial released number.

Much economic information comes via initial surveys of activity that are frequently revised, as further information is gathered.

For many, house hunting is daunting because of the uncertainty on pricing. In fact, many of us will sometimes ask—why is this house so cheap? In credit, there are the issues of adverse selection and moral hazard as well as questions on the quality of bank capital in the United States, Europe and especially China. Finally, there are always questions on the quality of corporate profits and analysts are always asking for more detail suggesting that there is still that bit of information out there that remains to be found that would improve the quality of earnings estimates.

[4] The SBC and RMSE values for Model-1 are 1858.26 and 2.82, for Model-2 values are 1677.8 and 2.23 and the Model-3 values are 1637.6 and 2.1.

Economic variables that we model are presumed to influence or at least represent the actual economy. However, we often receive new information (note the revision of GDP estimates we are currently witnessing for the first quarter of GDP) such that the initial information imperfectly represents the real economic situation. Robert Lucas has made the case that imperfect information on prices, whether a relative price change compared to other competitors or an absolute change for all competitors. If a firm perceives that the price change is relative (greater demand for its products), then that firm may alter its production schedules. Although a firm may actually be misreading the data, the firm will pursue a departure from previous output schedules. For any decision maker the critical question becomes: how much of our macro data reflect actual activity as opposed to our perceptions of what we believe activity to be happening?

In policymaking, the problem of imperfect information arises in two distinct paths.

In policymaking, the problem of imperfect information arises in two distinct paths. First, while there is one monetary policy, we often hear from several different members of the Federal Open Market Committee (FOMC) that create different impressions of the direction of policy. Second, currently the FOMC is following a broad set of labor market indicators to determine the direction of policy. Although this may make good policy, the information problem is that to the private-sector investor, a central bank that follows multiple labor market indicators sends a confusing signal. As the adage goes, a man with one clock will know what time it is, but a man who has two clocks is never sure. This policy making problem is further complicated by the initial unemployment rate guidepost of 6.5 percent being replaced by the emphasis of a wider range of labor market indicators. This problem is also present when several different inflation guidelines shift between core and overall inflation, CPI and PCE inflation—once again, too many clocks.

Imperfect information—Dealing with the Problem of Measurement Error

Here we can examine the problem of imperfect information by comparing the S&P 500 index and nonfarm payrolls. A common measurement error is that an analyst may utilize the level form of the variables in regression/correlation analysis. Most time series variables are non-stationary at their level form. The common estimation method utilized by analysts is the ordinary least square (OLS) model, which assumes the underlying dataset is stationary. If the data are non-stationary at the level form, then using OLS on that dataset would produce spurious results, i.e., it would tend to suggest a very strong relationship (denoted by a very high R-squared value) even though there is no meaningful relationship between the variables. In our example, both the S&P 500 index and nonfarm payrolls are non-stationary at level form and using that form of the variables we obtain a very high R-squared value , R-squared=0.89. The difference form (month over month percent change in this case) of a series, however, is usually stationary and therefore is better suited for a regression analysis. Using the difference form of the S&P 500 index and nonfarm payrolls, we obtained a lower, but reliable R-squared (0.01). Therefore, a measurement error can lead to a completely wrong conclusion.

Figure 6

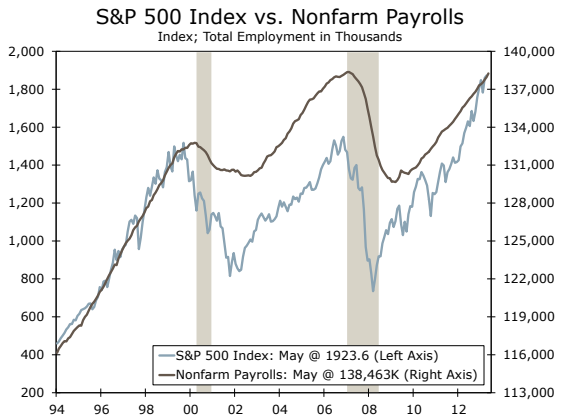
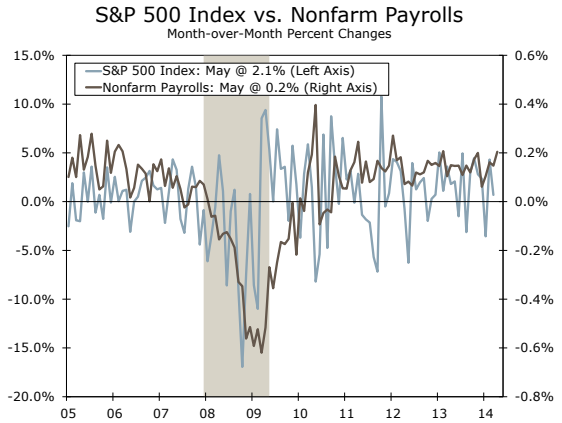


Figure 7



Source: Bloomberg LP, U.S. Department of Labor and Wells Fargo Securities, LLC

Third, information is also dynamic over the business cycle and over time itself. For example, information on the pace of economic growth and jobs changes over time and this changed perspective leads to alternative decisions or decisions that are regretted and would have been different if economic agents did indeed have perfect foresight. In war it is said that battle plans change after the first shot. In business, the introduction of New Coke was met with immediate negative reaction that marketing executives completely failed to anticipate. Many times government rules can change on land use or flood plains after a developer or home owner has bought a piece of real estate and then finds out property cannot be improved in the way she envisioned.

Credit decisions can be turned on their head by court decisions on municipal bankruptcies, rule of law in corporate bankruptcies and federal dictates, or simply a rewriting of federal/state laws that upset the previously understood relationship between creditor and debtor. Finally, recent years have witnessed significant shifts in sovereign government commitments to exchange rate regimes and trading agreements as one political party assumes leadership in a given nation.

Information Dynamics—Information Can Change in the Future—Out- of-Sample Forecast Error

Out-of-sample forecasts for the unemployment rate using the fed funds rate and PCE deflator as predictors will tend to produce larger errors as time moves forward. In other words, the forecast errors increase with the forecast horizon.

To complicate matters, the objective function of other players may change over time, thereby complicating economic decisions. European governments can quickly shift to tighter fiscal policy. Foreign governments can quickly shift exchange rate policy. Domestically, regulators can alter the direction of policy and rules over time. This problem is compounded with changes in political party leadership. At the state/local level, changes in land use policy after property has been bought for development, affects that development of land and therefore limited economic development in many local areas. As a result, in contrast to the model that assumes that the objective functions of economic agents do not change over time, the reality is that change is constant on the part of decision makers and the rules they promote. New information and rules alter the payoffs and the expected rates of return on investment in equipment and workers. This uncertainty on future policy changes will tend to reduce long-term investment in equipment and the hiring of workers. The time horizon for all economic decisions is shortened given the risk/uncertainty of future political/policy change.

Processing Bad Information Poorly

The quality of information influences the effectiveness of economic modeling and forecasting efforts.

The quality of information influences the effectiveness of economic modeling and forecasting efforts. However, there are additional problems that further complicate the ability to estimate the impact of economic activity and policy changes. Information is often processed in inefficient ways that further drives economic results away for the idealized results of forecasts. Market prices are the result of price discovery—from both the supply and demand sides—from the gathering, processing and distribution of information. This price discovery faces numerous challenges. Here we highlight seven issues: analysis paralysis, bounded rationality, information asymmetry, cognitive bias, rational ignorance, heuristics and prospect theory.

Analysis Paralysis

Too much information can be a problem. For both public and private decision makers, too many guidelines and economic indicators can actually stifle the economy. The perceived cost of making a decision exceeds the benefits that could be gained by enacting some decision. This is a problem today in several areas. First, in monetary policy, as we have cited before, there are several economic guidelines (multiple measures of labor slack, inflation-core or total, CPI or PCE) such that so much information may stymie any future decision. Financial institutions face numerous regulators each with their own set of priorities such that rather than moving forward by putting excess reserves to use, many financial institutions simply sit on the reserves waiting for further information. In a similar way, private non-financial firms face similar problems with the multiple information guideposts on taxes and regulations. In each case the magnitude of the quantity of

information/analysis overwhelms the decision-making process and thereby prevents an economic agent from making a decision.

Bounded Rationality

Herbert A. Simon commented that the rationality of individuals is limited by the information they have, the cognitive limitations of their minds, and the finite amount of time they have to make a decision.[5] This is the reality of making decisions on production, hiring and allocating credit in real time. This leads many decision makers to be satisficers—not optimizers with complex mathematical models. Households apply their rationality only after having greatly simplified the choices available. Households, firms and even public policy makers lack the ability and resources to arrive at the optimal solution.

Decision makers pick a stopping point—they do not seek all the information that might be available. However, the particular stopping point differs among individuals. As a result, the perfectly rational decisions assumed in economic models are often not feasible in practice because of the finite computational resources and time available for making them.

Our evaluation of economic activity and the impact of public or private sector actions must begin with the recognition that the costs of gathering, processing and disseminating information provides an incentive that many decision makers will limit the time spent in these efforts. In fact, the complexity of the situation may in fact limit rather than expand the information process. In real time, actions must be taken despite the complexity, as in Capt. Mancuso's need to send a message without gathering information and checking his Morse code. Decision makers simply are unable to process and compute the expected utility of every alternative action. Deliberation costs might be high and there are often concurrent with economic activities also requiring attention so decision makers have limits on time and the ability to process information.

Information Asymmetry

Imbalance of power in transactions can sometimes cause bargaining and does not match the optimization assumed by a perfectly competitive model.

Frequently, there is an imbalance of power in transactions which can sometimes cause bargaining and does not match the optimization assumed by a perfectly competitive model. The model assumes a willing buyer and a willing seller reach an agreement on price and terms. However, we are familiar with many agreements where the seller may be very desperate to sell (the housing bust in recent years) and cases where the buyer acts defensively to protect an established position.

Here we focus on decisions in transactions where one party has more, or better, information than the other. There are three situations that produce results that are contrary to the idealized results of the perfectly competitive market model: adverse selection, moral hazards and the principal-agent problem.[6]

Adverse selection arises when one party to the agreement lacks critical information while negotiating an agreed contract to the transaction. This problem arises in financial services when a loan is being made and complete information about the credit history and certainly the motivations of the borrower are unknown. Other situations of adverse selection include used-cars and home purchases for example.[7]

Moral hazard arises when one party lacks critical information about performance of the agreed-upon transaction or lacks the ability to retaliate for a breach of the agreement. Households/firms may behave more recklessly after becoming insured, but the insurer cannot effectively retaliate against the insured in the short run during the term of the current contract. Only in the long-run can the insurer deny to renew—but even here that ability is sometimes proscribed. Further, people with high risk are more likely to buy insurance and insurance companies often cannot discriminate due to the force of law. We can see this in the market for health insurance where

[5] Simon, Herbert, "*Models of Man*," Wiley, 1957.
[6] Rosen, Sherwin, "*Prices and Incentives in Elimination Tournaments*", 1986, AER 76(4) p. 701-715.
[7] Akerlof, George A., "*The Market for Lemons: Quality Uncertainty and the Market Mechanism*." 1970, QJE 84 (3): 488-500.

younger, healthier people are less likely to buy medical insurance compared to older, less healthy people.[8]

In the case of the principal agent problem, there is an information asymmetry where agents have more information and the principal cannot directly ensure that the agent is always acting in the principal's best interests. In the most common situation, corporate management acts as agent and shareholders are the principal.[9] In another case, politicians are the agent and voters are the principal. The information asymmetry therefore has significant private sector implications with respect to the incentives for corporate management, where maximizing shareholder value may not be the driving principle for management and therefore it is difficult to determine if management is truly maximizing profits—a basic tenet of microeconomic theory. In public policy, do politicians construct policy actions, such as fiscal policy, to actually maximize economic growth or are decisions on policy, such as a fiscal stimulus, directed more toward insuring their own reelection rather than public benefit?

Cognitive Bias

Even with the proper information, the decision maker has biases that will not produce an economically optimum solution. The decision maker employs his or her own subjective social reality, not the objective input of relevant information that would lead most other people to pursue a different decision path. Judgments deviate from the optimum so it becomes increasingly difficult to judge the range of outcomes and their possibilities. This situation often arises when investors seek to evaluate the strategy of corporate leadership and that strategy of new products/prices or acquisitions appear confused and without a clear path forward. These cognitive biases include the confirmation bias, framing and the sunk cost bias.[10]

Even with the proper information, the decision maker has biases that will not produce an economically optimum solution.

Rational Ignorance

Rational ignorance occurs when the cost of educating oneself on an issue exceeds the potential benefit of that education.[11] In this case, the decision maker comes to a rational decision that the cost of educating oneself on an issue outweighs any potential benefits; therefore, it is irrational for a decision maker to waste time pursuing additional information. For example, consumers have limited time, so visiting another store to possibly find a better price may not be worth the time. Now of course, consumers will use the internet to search for better prices or product information to overcome the time constraint/drive time problem.

Heuristics

In this case, households and firms employ experience-based techniques for problem solving, learning, and discovery that gives a solution which is not guaranteed to be optimal. Here, exhaustive search/processing of information is impractical. Heuristic methods are employed to speed up the process of finding a satisfactory solution via mental shortcuts to ease the cognitive load of making a decision. In other contexts we can refer to rules of thumb, educated guesses, intuition, working backward or trial and error.

Prospect Theory

Under prospect theory, households make decisions based on the potential value of losses and gains rather than the final outcome, and that people evaluate their prospects (these losses and gains) using certain heuristics rather than precise economic models.[12] Our focus here is the way people choose between probabilistic alternatives that involve risk, where the probabilities of outcomes are known. This involves a two-step process. First, households order outcomes and

[8] Arrow, Kenneth, "*Uncertainty and the Welfare Economics of Medical Care*," AER 1963 (Vol 53) 941-973.
[9] Bebchuk, Lucian and Fried, Jesse, "*Pay Without Performance*," Harvard University Press, 2004.
[10] Silvia, John E., "*Dynamic Economic Decision Making*," Wiley, 2011.
[11] Downs, Anthony, "*An Economic Theory of Democracy*," Harper & Brothers, NY, 1957, p.244-246, 266-271.
[12] Kahneman, Daniel and Tversky, Amos, "*Prospect Theory: An Analysis of Decision Under Risk*," 1979, Econometrica XLVII p. 263-291.

match outcomes that are perceived to be equivalent. Then households set a reference point and then consider lesser outcomes as losses and greater ones as gains.

Conclusion

Recent experience with the ISM release and now the GDP revision due to heath care revisions to earlier government assumptions reinforce the basic message that decision makers do not make critical decisions in an environment of perfect information. Critical to our decision making is that we often must treat the data will an element of caution.

Because of the uncertainty surrounding the quality of information we have today we also realize that public and private decision makers face a wide range of possible outcomes for any decision despite the precision that we attribute to the sophisticated models an simulations we run. We must recognize that we do not have complete information in making a decision—notice the current significant revisions that are applied to then initial first quarter 2014 GDP estimates. Second, information is often imperfect and does not perfectly reflect the current state of the economy. Once again, the recent experience of the ISM report and its two subsequent revisions emphasize this point. Finally, the information we have today may not be reflective of information in the future about the economy. Unfortunately, many economic projections assume a smooth path of growth or straight line projections of recent behavior (recency bias). As a result, decision makers often rely on heuristic tools to make decisions within the universe of significant amounts of information—even as the information is less than we often assume in our models.

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