

Provided for non-commercial research and education use.
Not for reproduction, distribution or commercial use.



This article appeared in a journal published by Elsevier. The attached copy is furnished to the author for internal non-commercial research and education use, including for instruction at the authors institution and sharing with colleagues.

Other uses, including reproduction and distribution, or selling or licensing copies, or posting to personal, institutional or third party websites are prohibited.

In most cases authors are permitted to post their version of the article (e.g. in Word or Tex form) to their personal website or institutional repository. Authors requiring further information regarding Elsevier's archiving and manuscript policies are encouraged to visit:

<http://www.elsevier.com/copyright>



Contents lists available at ScienceDirect

Socio-Economic Planning Sciences

journal homepage: www.elsevier.com/locate/seps

Predicting a recovery date from the economic crisis of 2008

Iwan J. Azis

Graduate Studies, Regional Science program. Adjunct Professor of Economics, Johnson Graduate School of Management, Cornell University, Ithaca, NY 14853, USA

ARTICLE INFO

Article history:

Available online 16 March 2010

Keywords:

Crisis and recession

Recovery

Animal spirits

Credit crunch

Financial and housing market

Pairwise comparisons

ABSTRACT

Predicting a recovery from a crisis is always difficult, but it is particularly so with the 2008 crisis in the United States. How could a small segment of the financial markets known as subprime credit bring down the world's largest economy into the worst recession since WWII? The resulting conflicts in policy responses are so severe that the short-term objective (recovery) clashes with the longer-term and more structural goals (governance, regulations, technology). This and the enormous uncertainties caused by it add to the difficulties to predict the pace of recovery. While the economic turnaround depends on consumers' decision to spend and business' decision to invest and hire, in an uncertain situation such decisions can only be taken as a result of market players' perceptions of opportunity that depend on their emotional state and confidence. When the latter produces spontaneous urge to action ('animal spirits'), the recovery process accelerates. Thus, the appropriate model to predict recovery should be able to incorporate such perceptions factors. By identifying and prioritizing economic and policy factors, it is shown how such a model, the Analytic Network Process (ANP), can be used to make the prediction of the recovery time of the US economy. The forecast was made during Spring 2009 by the author working with participants in a seminar of "Economics of Financial Crisis" at Cornell University. We used an expert judgment approach within the framework of a decision theory model, based on the ANP structure that captures the interplay between financial market, housing sector, and market confidence, all of which are influenced by a range of policies. It is estimated that a real sustainable recovery will begin around late July or early August 2010. While a quicker recovery is possible given the enormous size of fiscal stimulus, monetary injection and unprecedented measures of qualitative easing, it is our conjecture that the temporary nature of all these measures will make such a quick turn-around unsustainable (a double-dip recession). When sensitivity analysis was performed, it was found that altering the priorities of the policies, and their interactions with the aggregate demand components, would not significantly change the estimated time to recovery. This stability of the prediction is due to the overriding importance of restoring *confidence*, making the other factors less important.

© 2010 Elsevier Ltd. All rights reserved.

1. Introduction

Easy money and massive capital inflows from abroad fuelled a borrowing spree in the U.S, and this, in turn, created the now well-known 'housing market bubble.' With the growth of financial innovations and instruments that helped fulfill the "American Dream" of citizens to own a house, subprime lending thrived, beginning in the late 1990s. Believing that housing prices would always increase, such lending was attractive to mortgage companies, banks, homebuyers, and investors alike. Rating agencies assigned good ratings to many of those debts, so banks were able to sell the mortgages that underpinned the loans to investors, and, apparently, no one was concerned about the risk. Risk was assumed to be shared and insured against by companies that issued credit

default swaps (CDS), which essentially covered investors against losses from a default [1].

When homeowners began to find it difficult to pay their mortgages, the buyers of the original mortgages were then not getting paid, and the complex web of trades started to disintegrate, creating multiple losses and logistical headaches, if not nightmares, for many parties. The runs on the so-called Asset Backed Commercial Paper (ABCP) played a pivotal role in the crisis that soon became increasingly severe [2].

Since banks were also involved in mortgage debts, financial contagion spread to them. The entire financial market subsequently suffered from huge losses. The resulting liquidity crisis then began to affect consumption and investment credits, causing a major slowdown in the real side of the economy. As many firms filed for bankruptcy, or disappeared, insolvency problems set in. Only by the fall of 2008, had policy makers begun to realize that the U.S financial sector's deepest problem was basic solvency [3].

E-mail address: ija1@cornell.edu

As in most crises and recessions, it is of interest to understand what the key factors are, what significant policy measures have been taken, and how they may play a role in the recovery process. The Federal Reserve, supported by the U.S Administration, has aggressively acted to intervene by taking policy actions that fit the conventional textbook definitions of monetary policy of quantitative easing (cut the discount rate, raise loan terms, and lower the federal funds rate), as well as those that do not (reduce the premium on primary lending, raise the term of lending from overnight to 90 days, create the Term Auction Facility or TAF, authorize lending to support inter-institutional purchase such as the JPMorgan Chase purchase of Bear Stearns, and purchase mortgage securities); see [4] and [5] for detailed discussions on the U.S.' early policy responses to the crisis. The purchase of private securities by the Fed, known as the qualitative easing, is unprecedented and has expanded the size of the Fed's balance sheet significantly. On the fiscal front, the size of the stimulus package is also huge. When signing the \$787 billion package into law in February 2009, President Obama made it clear that even such a large amount is just the 'first step towards economic recovery'.¹ The second round of the fiscal stimulus may involve at least a similar amount as in the first.

Any economy receiving such massive injection and supports will surely feel the effect, including the possibility of a quick turnaround. But whether the turnaround sustainable or not, that is a different matter altogether. By using the Analytic Network Process (ANP) that captures the perception factors regarding the strategic variables causing the crisis and the predicted recovery, we argue that it is not. Our conjecture is that, the real recovery will take place later than what most analysts and the Administration have predicted. Otherwise, a double-dip recession is likely.

In the ANP structure we model the key macroeconomic and policy factors, and their interactions, and subsequently prioritize their effect(s) on the time to recovery.²

2. Pre-crisis development

Two main factors contributed to the declining world's inflation rate: production shift to low-cost countries (e.g., "Chindia" factor: cheap imports of consumer goods from China, and outsourcing of services to India.), and smaller fiscal deficit due to fiscal consolidation and economic reforms, especially in the traditionally large deficit countries (e.g., Latin America). This allowed many countries to lower their interest rates. In the U.S, the low rate was first prompted by the fear of a deflationary pressure following the 1997 Asian Financial Crisis. Subsequently, the Fed adopted a more accommodative policy to forestall looming problems created by the bursting stock, high-tech, and telecommunication bubbles that came along with the recession in 2001. This enabled the U.S economy to avert a deeper and longer-lasting recession.

But as the recovery began, the environment of easy money also produced record levels of home equity borrowing and home sales, funded among others by "creative" financial companies operated like hedge funds. This led to borrowing-fueled speculative spree especially in the housing market, similar to the internet-stock mania in the 1990s. The rules and regulations governing these financial companies were generally less restrictive than those for banks, mutual funds, and other financial institutions.

Since the LTCM debacle in 1998, and despite pressures on the U.S financial authorities to put tougher controls on hedge fund operations, there were practically no major improvements in the

financial regulation.³ This explains why "creative" financial activities multiplied in number during the last few years. One of such activities involved the asset-backed securities (ABS) or commercial paper used to finance mortgage firms, credit card companies, auto lenders, etc. At the beginning, many of the issuers of such commercial paper were real estate-related financial companies. They expanded the assets on the balance sheet by lending mortgages to future homeowners and sold these assets to investors by issuing the commercial paper (the essence of ABS is to sell commercial paper backed by such assets). As mortgage loans increased sharply since the mid 1990s, so did the ABS.

What distinguished the operation of these paper issuers from the traditional way of lending was that, they packaged the loans into securities pools before selling it to investors. In so doing, they collected monthly principal and interest payments from borrowers and disbursed them to investors who held the commercial paper. They received fees for performing such services. Thus, paper issuers received the trust of investors by consistently paying them on a regular basis with incomes received from homeowners. As long as the flow of these incomes could be secured, and investors continued to receive the payment, everybody was happy. Investors were also "blinded" by the bundling of the loans, because good and bad loans were put together such that buyers could not see the bad ones. This type of operation was clearly different from a traditional lending as loans were financed directly by investors rather than indirectly by bank depositors. Yet, it was seen as a "healthy" operation because the risks involved were shared with others.

With more mortgages sold and more securities issued, mortgage firms received more incomes. This put them in a position to buy more risky assets and to attract more investors by paying them with earnings from those assets. As more new investors arrived, more investment money flowed in, allowing the firms to use the money to pay the existing investors: that is, one group of investors paid another group of investors. All these were initiated by securitizing mortgage lenders and passing the rights to the mortgage payments and related credit/default risk to third-party investors via mortgage-backed securities (MBS) and collateralized debt obligations (CDO). Mortgage firms did it, hedge fund did it, and so too other financial firms like the one managed by Bernard L. Madoff.

But what really transformed the financial sector was when investment banks also jumped into this "financial innovation." This decision marked the beginning of the problem that eventually brought the U.S economy into its knees. These investment banks operated beyond just performing as the underwriter for mortgage companies. Once they managed to attract home buyers to get the mortgages, the next and most important step was to sell securities backed by such mortgages (MBS). Many of the buyers of the securities were wealthy and reputable individuals, as well as institutions including schools, local governments, charitable organizations, and banks.

As if the risks were not low enough, many investment banks also insured the MBSs and CDOs they issued through a financial

¹ President Obama's first speech to a joint session of Congress on February 24, 2009.

² For detailed explanations of the ANP, see [6] and [7].

³ LTCM (*Long Term Capital Management*) is a hedge fund founded in 1994 with \$1.3 billion investment at inception. It made huge profits during a few years of operation. By early 1998, the fund had a leverage factor of roughly thirty to one, i.e., holding \$5 billion equity and over \$125 billion borrowing. The key reason investors were attracted to its strategy was the belief that the long and short positions were highly correlated so that the net risk was small (this is based on the complex computer models that LTCM used). Long story short, in September 1998 the LTCM lost substantial amounts of investors' equity capital, and was on the brink of default. To avoid the threat of a systemic crisis, the Federal Reserve orchestrated a \$3.5 billion rescue package from leading U.S. investment and commercial banks, in exchange for 90% LTCM's equity.

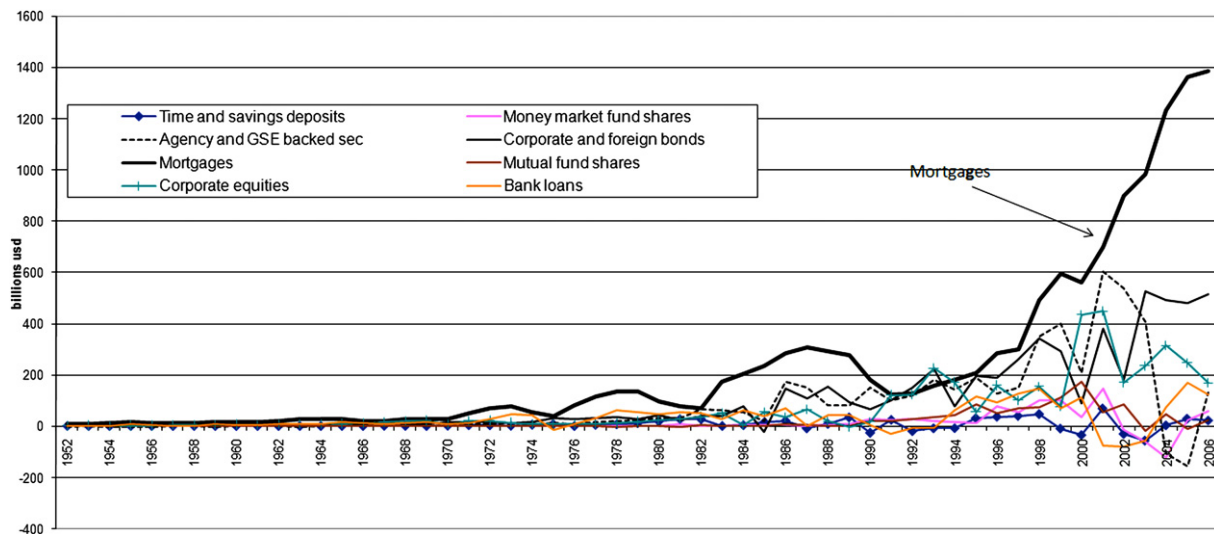


Fig. 1. US Financial Sector's Investment in Financial Assets. Source: Author' calculation based on a series of U.S Flows-of-Fund.

derivative known as *credit default swap* (CDS).⁴ Practically non-existent until late 1990s, CDS market grew very rapidly, reaching a staggering \$62 trillion in 2008, more than 4 times the U.S GDP!

An important motivation for investors to buy MBS was the strong perception that housing prices would always go north. As the number of interested investor increased, it made easier for banks to finance the scheme. It also opened up more opportunities for other players such as brokers and realtors. Everybody did not want to miss out the opportunities. The combination of wanting to fulfill the "American dream," taking advantage of the lucrative interest rate, and expecting that housing prices would continue to rise, allowed hundreds of thousands of Americans to buy homes they never believed they could afford. It also offered an opportunity and handsome profits for homeowners-to-be and lenders, respectively.⁵ As a result, the number of risky portfolio holder surged. The investment banks conducted the operation on a large scale, before long only a few handfuls of banks that had not been part of these risky investments.⁶ This means more loans and more mortgages. As shown in Fig. 1, mortgage lending clearly shot up since the mid-1990s, dominating the U.S financial sector's investment.

3. The crisis

Pandemonium set in when homeowners began to have difficulties with payments. Some struggled to get loans for subprime

refinance deals. A wave of foreclosure or hangover from a heady time suddenly hit the housing market. Investment banks had to force margin calls to protect themselves from the collapsing loan value, and mortgage companies and hedge funds were being forced to sell assets to meet these margin calls. As the value of the underlying mortgage assets declined, corporate, individual and institutional investors holding MBSs and CDOs faced significant losses. Many investors tried to withdraw. The problem was, many of them lived on credits granted by the same investment banks who tried to force the margin calls (e.g., *Lehman Brothers*, *Merryl Lynch*, or large companies' financial branches like *General Motors*). Other major financial companies such as *Bear Stearns* and *Bank of America* had also faced a sudden wave of withdrawals by investors.⁷

No one worried about risk spreading because banks had sold off the underlying mortgages to investors, and the mortgages were insured through CDS. Rating agencies also gave a nod to these mortgages. Many investors jumped in because they could get high returns through leverage, e.g., making \$100 million bets with only \$1 million of their own money and \$99 million in debt. If the value of investment rose, they could easily multiply their money. Also, the mortgage loans allowed interest rates to be reset from low teaser to high rates, thereby promising a larger cash flow than prime loans that carried lower fixed rates. Hedge funds, wealthy individuals, and other reputable institutions also had confidence in the arrangement because even if the loan or credit went bad, they perceived that securities backed by bad credit could still be safe. After all, most of the securities had received good ratings from agencies like *Moody*, *Fitch* and *Standard & Poor*. Even international investors piled into this debt market.

The idea that the risks were shared collectively with other parties, i.e., issuers, underwriters, borrowers, and insurance firms, was appealing. But these features meant very little when the delinquency rate surged. Worse, while the complex and synergic relationships might have created a favorable system, any shock in

⁴ In CDS, the buyer of the insurance contract agreed to pay a fixed spread to the seller of the contract. In exchange, given the approved term (usually five years) the seller agreed to buy the securities from the buyer at par in the event of a default. In this way, investment banks as the buyer received protection, insurance company as the seller (e.g., *American International Group*, *AIG*) collected a lot of premium income.

⁵ The 1997 tax break proposed by the then President Clinton and approved by Congress in 1997 also played role in the creation of a housing bubble. Under the law, people do not pay tax on most of the profit obtained from selling a house. In essence, it allowed home sales to become tax-free windfalls. A study by the Federal Reserve suggested that the number of homes sold was almost 17% higher over the decade before than it would have been without the law.

⁶ The good time spread out across the Atlantic. In Europe, asset-backed bonds (a.k.a. "covered bonds") are the most well-known. The key difference from the U.S mortgage-backed securities is that, in Europe banks that make loans and package them keep those loans on their books. This means that when a company with mortgage assets on its books issue the covered bond, its balance sheet grows.

⁷ When the U.S second-biggest home lender *American Home Mortgage Investment Corp* filed for bankruptcy in early August 2007, the market of commercial paper felt the shockwaves. As other lenders fell into a similar situation, many of them took the option of delaying payment for the money they borrowed from investors (there was a clause allowing such a practice in the unlikely event lenders could not refinance). All of sudden, the 30-day notes you bought became, say, 240-day notes. Who would not shun such commercial paper?

the market could create a “domino effect” that would raise the risk of a system-wide failure. Since some of the lending carried prohibitive prepayment penalties, effectively made refinancing impossible, investors could be on the hook for bad mortgages. Before late (some were already too late), they tried to quit. With less money available in the market, liquidity crunch was exacerbated.⁸

The liquidity problem was evident as many commercial banks found liquid assets or very short-term loans and longer-term liabilities were no longer available in the market. The spread between 3-month LIBOR and the expected overnight rates widened as liquidity concerns had been priced into terms rates.⁹ To avert a full-blown catastrophic credit squeeze, a series of massive liquidity injections were conducted by the Fed, the European Central Bank (ECB), Bank of Japan (BOJ), and other central banks.

The solvency problem, on the other hand, was not immediately realized by the authority. Two hedge funds operated by *The Bear Stearns Co Inc* (one of the biggest players in securities industry) slipped to the brink of collapse because of their exposure to sub-prime mortgages. Nearly a third of its revenue came from fixed-income trading.¹⁰ The probability of their default increased sharply, and the spreads on its CDS soared to 1000 basis points (it costs \$1 million to insure against a default of \$10 million face value of bonds). Had *Bear Stern* defaulted, the market would have had to try to unravel the complex web of trades that could create a logistical headache for bankers, because a CDS contract in effect pledged to protect an investor against loss from a default. Being counterparty on so many trades, which theoretically means *Bear Stern* needed to get hold of bonds to pay back many investors, the complexity would have been unprecedented. This was the reason why the Fed arranged a guarantee for a forced marriage of *Bear Stearns* to rival *JPMorgan Chase and Co* (the acquiring cost was \$2 per share, way below \$80 in the weeks before).¹¹

But a more serious problem was just about to emerge. When the government seized *Fannie Mae* and *Freddie Mac*, default in the CDS market became an option, raising questions about how dealers would unwind billions of dollars worth of contracts. With so many CDS attached to CDOs, holders of all securities including good CDOs faced a high risk of their securities being priced unfavorably by the market, because speculators were short selling the CDS index that was tied to CDOs, i.e., proxy of CDO price when no one knows exactly the real price. They argued that no one will buy it because of the unknown price (due to the complexity and uncertainty of mortgage-duration, foreclosure events, etc). The entire security market eventually got hit. The turning point was the day when Lehman Brothers announced its bankruptcy on September 15, 2008.

What started as a crisis in the subprime and mortgage market had now reached the entire credit markets; the spread between

high quality bond yield (e.g., corporate bonds rated BBB and AAA) and Treasury notes widened. What does this mean for the economy? The incentive to invest weakened because cost of money was higher as reflected in the widening spread. Added by increased uncertainty, this caused total investment to stagnate. Although the day-to-day performance of the stock market fluctuated, the general trend clearly went south. Tobin's q , the ratio of market value of an asset to its replacement cost, suggests that this will pull investment downward. In response, the Fed cut the interest rates rate aggressively. But even that failed to end market upheaval, because unlike in the LTCM debacle and 2001 recession, this time the liquidity problems were compounded with insolvency. As a result, investors' confidence and spontaneous urge to invest remained low. The outlook of consumption was equally gloomy. Yet, consumption holds the key to the problem as it constitutes more than 70% of the U.S GDP, and its fluctuations are influenced by what happens with assets prices including housing prices (“wealth-effect”).¹² As long as consumers' emotional state and confidence to act (spend) are weak, any signs of recovery are temporary.

4. The importance of market players' perceptions

From the discussions above, it is clear that one of the key characteristics of the 2008 crisis is the vigorous presence of a vicious cycle among the financial sector, housing market, and consumers' confidence, where the precise nature and intensity of the effects of the cycle depend heavily on the perceptions of various economic agents.¹³

One of the reasons why the policy response to the crisis of this proportion must be bold and large is to influence public perceptions and confidence. Like in the case of government spending, there is also the element of multiplier of confidence, the higher of which the faster the recovery process will be. Thus, the challenge is not only how to alter perceptions, but how to do it in such a way that will generate a high multiplier of confidence. The problem is, perceptions are closely related with human behavior, and they are both difficult to measure. Human behavior, especially in the market place, is hardly under detailed guidance of careful hedonic calculations. More likely it is the product of an unstable and non-rational complex of reflex actions, impulses, instincts, habits, customs, fashions, and perhaps also mob hysteria. All these factors are difficult to quantify. It is not that economists are unaware of the importance of those factors, but they deterred from incorporating them into economics due to its perceived complexity, as well as problem of measuring them directly.

When it comes to predicting a recovery from the 2008 financial crisis, things are even more difficult to make. Given secondary data, almost no standard financial and macro economic models can predict with a degree of certainty as in normal (non-crisis) situation. The behaviors of consumers and other economic agents are more uncertain than ever before given the almost big-bang nature of the shock to the economy. Yet, consumers' decision to spend and investors' decision to expand are so critical in shaping the nature and intensity of the

⁸ One by one major financial institutions disclosed their problems associated with the subprime lending and mortgage-backed assets. Deutsche Bank had to write down its losses (at the time estimated at \$3.1 billion). Citigroup and UBS had to do the same thing. BNP Paribas and Société Générale, two big French institutions, and Barclays of Britain were next on the line. Even in Japan, where banks typically do not sell high-risk mortgage products such as subprime loans, they could not escape losses. In early October, its largest bank, Mitsubishi UFJ, reported ¥5 billion losses on sub-prime loan linked investments. The list got longer, not counting many smaller banks and other financial institutions.

⁹ When LIBOR-OIS Spread increases, it indicates that banks think that other banks they are lending to have a higher risk of defaulting on the loans. Consequently, they charge a higher interest rate to offset this risk. This usually happens when credit markets are not functioning as smoothly as they could be, as the mid 2007 case has shown.

¹⁰ Using US\$30 billion credit line provided by the U.S Federal Reserve Bank, JP Morgan took those MBSs at a fraction of their market value.

¹¹ A similar ‘bail out’ scheme also took place in August when *Bank of America* acquired a \$2 billion equity stake in *Countrywide* in a bid to bolster the confidence of creditors and investors in the failing mortgage lender.

¹² During the last few years, housing related effects of low interest rates accounted for at least one quarter of growth in personal consumption expenditures; it was responsible for the robust economic recovery after the 2001 recession (Greenspan, 2003) [11].

¹³ In “Animal Spirits” [9] Nobel prize winner George Akerlof and co-author Robert Shiller argued that no matter how big is the stimulus package, it may not be enough to stabilize the economy if it fails to take into account the downward spiral of animal spirits that is underway and may continue to worsen. When animal spirits is on ebb, consumers do not spend, businesses do not invest or hire people. They stressed the importance of swings in confidence and perceptions which are not always logical.

recovery. It is what they perceived as challenges or opportunities coming out of the crisis that critically influence the process. They will consider to act (consume or invest) only when they see some opportunities, and they will act accordingly when they see it feasible. Thus, what matters are their perceptions of desirability and perceptions of feasibility (Krueger and Brazeal, 1994) [15].

While the set of perceived opportunities can be considered as the intersection of the set of desirable behaviors and the set of feasible behaviors, it is not always the case that a perceived opportunity always gets acted upon.¹⁴ For example, even with the opportunity provided by the Federal Reserve to revive the financial market through its financial support to banks and other financial institutions, the latter remain reluctant to lend, prolonging the problem of credit crunch. Here, the concept of animal spirits becomes important to use. In a highly uncertain situation, the decision to do something positive – consumers to spend and businesses to invest and hire is likely taken only as a result of animal spirits (spontaneous urge to action rather than inaction), not as the outcome of the weighted average of quantitative benefits multiplied by quantitative probabilities. Such actions may be seen irrational and misguided, but they are real and reflect the confidence or emotional state of investors and consumers. It is their perceptions of opportunity that depend closely on the perceptions that a situation is positive and controllable that drives the economy and the recovery.

Given the pivotal role of perceptions, therefore, we use a perception-based Analytic Network Process (ANP) to predict the timing of recovery by structuring the model according to what can be synthesized from the preceding sections in terms of the key factor that holds a pivotal role in the recovery, that is, the interdependent link between financial market and housing market. Without the stability of either one, the process of recovery will be slow. Given the enormous size of housing-related negative assets on the balance sheets of many financial institutions, it can only be when the housing market is restored that the financial sector will be stabilized. As long as the liquidity provided by the financial sector remains disrupted, the housing market is unlikely to stabilize. Here is where consumer confidence can break the vicious cycle. Such confidence is influenced by the extent to which the excess supply of housing, caused primarily by the rising number of foreclosures, continues to dampen prices and, hence, households' net worth and consumption [13]. The prospect of recovery will likely be determined by the dynamics of this interdependence [8]. In constructing prediction model, the ANP is appropriate to use since it is capable of quantifying interdependent factors, tangible and intangible, such as consumers' and investors' confidence and market perceptions towards the value of US dollar. In doing so, it allows for assessing factors' influences and priorities alongside well-known and relevant measurements and statistics. Further, it allows one to synthesize this diversity of data into a mathematically valid metric whose stability can be determined through sensitivity analyses.

5. ANP structures

The analysis of how the crisis evolved described above is used as the framework of discussions in the "Economics of Financial Crisis" seminar we conducted during the Spring 2009 at Cornell University. The 61 participants with knowledge of macroeconomics and

finance (some of whom are ex-Wall Street players) were the primary respondents in the ANP survey. The structure of the factors, clusters of factors, and the relations among both factors and clusters shown in Fig. 2 is built based on such a framework. During the 14 meetings, we discussed and debated about various aspects of the crisis using primary and secondary data, as well as reports from various media. The author also travelled to some countries to evaluate the perceptions of market players and policy makers there toward the US economy and policies, particularly with respect to the dollar perception. This is particularly needed to determine the priority of factors in the 'External Factors' cluster shown in Fig. 2.

Let us now describe in details the ANP structure we used in the survey. As seen in Fig. 2, the three main components (clusters) in the network are 'Aggregate Demand,' 'Aggregate Supply,' and 'External Factors.' While most elements in the 'Aggregate Supply' component are long-term in nature – that is, they cannot be altered in the short-run – those under the 'External Factors' have a more direct and immediate impact on the US economic turnaround. Without rising demand from abroad, the output of export products is unlikely to pick up. The recovery will surely need to rely on demand from other countries. In this regard, if the world economy continues weak, and major countries still suffer from the on-going balance sheet recessions, critical external financing, which we would expect to soften the impact of liquidity crunch in the US, will be hard to find. Foreign investors' perception and confidence in the US dollar also matter.¹⁵ As the fiscal and current account deficit widens due to the stimulus policy, foreign investors holding US assets begin to consider diversifying their investment to include assets denominated in other currencies. This can pose a significant challenge to the dollar's long-standing position in world markets (Goldberg, 2010) [14], and present a risk that foreign investors (notably, China) will cut back on their purchases of US assets. When that happens, the interest rates move upward, threatening the recovery process. Indeed, increasing signs of concerns toward the declining value of US dollar has been openly and repeatedly expressed by Chinese officials and analysts.¹⁶

In terms of predicting the recovery, the 'Aggregate Demand' component plays a far more determining role than do the other two components because the main source of the economic contraction is the non-functioning of the financial sector that led to a credit crunch and liquidity crisis, combined with a deteriorating confidence. The sub-components of 'Aggregate Demand' are decomposed into 'Financial,' 'Housing' and 'Confidence' sub-components.

As mortgage loans increased sharply after the mid 1990s, so did ABS. Given their critical role in the financial sector, and the fact that the security market, in general, is the largest source of financing for

¹⁵ Foreign countries holding dollar based American securities that deteriorate in value is exposed to a crisis through a *financial channel*, and those exports to the United States is exposed to a downturn through a *real or trade channel*.

¹⁶ For example, referring to the US policy during the crisis China's Banking Regulatory Commission deputy head, Luo Ping made comments in early 2009 with his colloquial English: "We hate you guys. Once you start issuing \$1 trillion-\$2 trillion ... we know the dollar is going to depreciate, so we hate you guys..." He further remarked, as paraphrased by the China News Service: "... if the US government issues a large amount of Treasury bonds amid efforts to deal with the economic crisis, all investors who hold US Treasuries will suffer losses." In February 18, 2009, Chinese Academy of Social Sciences' economist, Yu Zuyao, also made a similar comment: "To rescue the ailing US economy by increasing government borrowing will create a record-high federal deficit... This can further lead to catastrophic consequences such as serious inflation and US dollar depreciation...- China faced high depreciation risk to its foreign exchange reserves, US Treasury bonds and other US dollar-denominated assets."

¹⁴ The way the market players see the possibility and the perception of possibility depend upon the perceived constraints imposed by the announced policies, "stories" (what other people say and what the media publish), as well as other external environments.

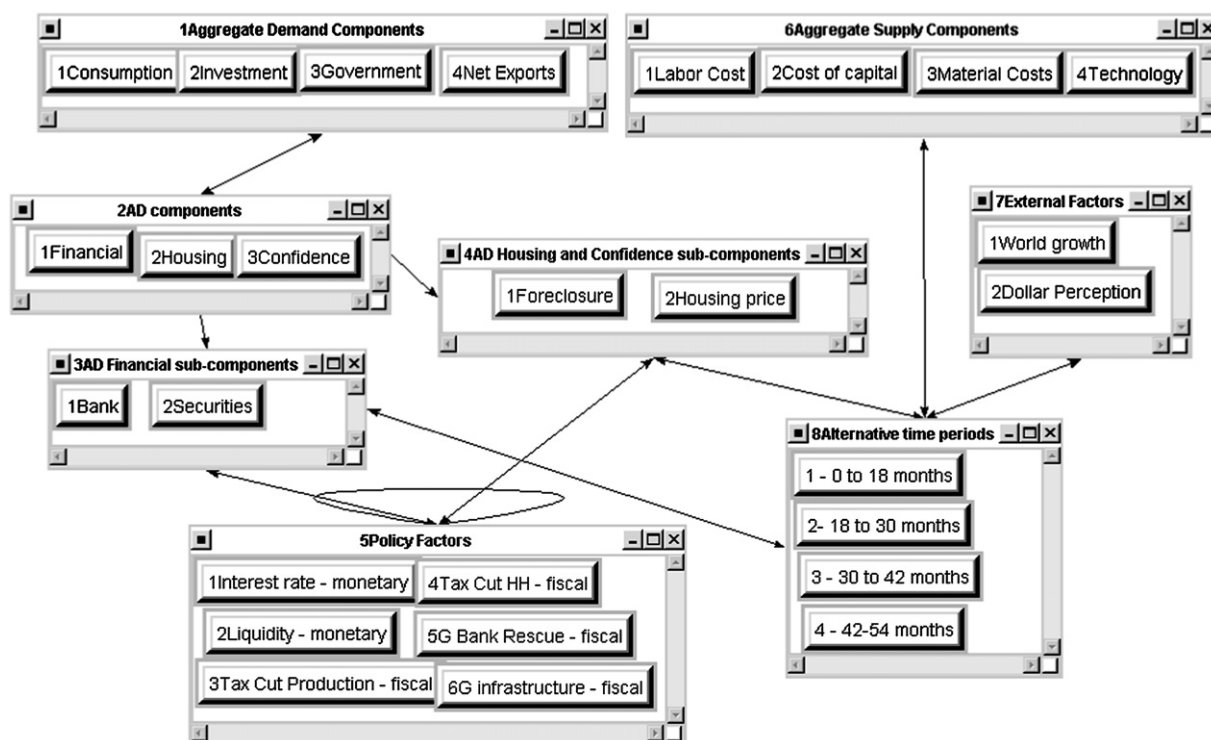


Fig. 2. ANP structure showing the dependence and feedback among aggregate demand factors.

US firms,¹⁷ the prospect of economic recovery is influenced by what occurs in the securities market; hence, the node 'Securities' in the 'Financial sub-component' in Fig. 2

As the crisis began, many mortgages went into default, and banks suffered losses. Thus, together with the 'Securities' market, 'Banks' appear as another critical node in the 'Financial sub-component' cluster. Without improvement in these factors, the recession would be prolonged.

In the 'Housing and Confidence sub-components' cluster, two nodes are identified: 'Foreclosure' and 'Housing Price.' All the previously discussed sub-components can be influenced by 'Policy Factors.' Along with 'Aggregate Supply' and 'External Factors,' 'Policy Factors' influence the time to recovery by altering the priorities of the aggregate demand sub-components. The specific policy factors of interest are in a separate cluster from the components and subcomponents of 'Aggregate Demand.' Importantly, the clusters in Fig. 2 are linked through what are considered important necessary conditions for recovery: i.e., the resumption of financial intermediation (the 'Financial' factor), the end of the housing crisis (the 'Housing' factor), and the restoration of market confidence (the 'Confidence' factor).¹⁸

As shown in Fig. 2, the important policy measures are: monetary (lowering interest rates), liquidity injection (Fed's purchase of private securities), lowering taxes on both production and household income, rescuing some financial institutions (e.g., Bear Sterns, Freddie Mac & Freddie Mae), and increasing the spending for infrastructure through fiscal stimulus.¹⁹ These policy measures may or may not have helped slow the downturn. Even if they did, it is hard to judge the relative effectiveness of those programs since any economy in recession will eventually recover. It is true that something had to be done as the effect of doing nothing would have been worse. In this regard, trade-offs that exist in virtually all policy measures used to revive an economy should be open to consideration. The ANP approach used in the current analysis takes into account precisely the nature and intensity of such trade-offs.

6. Predictions and the analysis of recovery

We established a time line in months starting with December 2007 as the 0 point and ending 54 months later. Note that this start date has been officially declared by the National Bureau of Economic Research (see [10]) as the time when the recession officially began. We divided the time line into four intervals during which the turnaround might occur: 0–18 months, 18–30 months, 30–42 months, and 42–54 months.

Priorities for the alternative time periods were derived by pairwise comparing elements in the model using the judgment of the seminar participants as to which is dominant, and how dominant (using one of the terms: Importance, likelihood or preference, as appropriate) in the ANP structure. The priorities were then combined or synthesized throughout the entire model to derive the priority or likelihood of the turnaround occurring for each time

¹⁷ As remarked by Group Vice President and Deputy Financial Institutions and Supervision, Federal Reserve Bank of San Francisco, Teresa Curran, in her presentation during the Conference "Global Crisis Response: Financial Policy Cases and Lessons from Advanced Economies", in Seoul, Korea, 30 September–1 October, 2009, debt-securitization markets are the major source (approx. 60%) of all credit in the United States. These markets collapsed during the crisis. Some continue to operate because the Government and the Federal Reserve are propping them up through a massive purchase of government-guaranteed mortgage securities, and attractive financing for private investors who buy the securities (through the Term Asset-Backed Securities Loan Facility or TALF).

¹⁸ The importance of 'Confidence' in causing a crisis and influencing the pace of recovery is well discussed in [9].

¹⁹ For more discussion about the policy response, see [8].

Table 1
Time periods considered in the prediction model.

Time period intervals	Definition of time period intervals	Midpoints of time period intervals in months from beginning	Likelihood of turnaround during time period
0–18 months	From 0 to 18 months	9 months	0.099901
18–30 months	From more than 18 months to 30 months	24 months	0.276769
30–42 months	From more than 30 months to 42 months	36 month	0.490007
42–54 months	From more than 42 months to 54 months	48 months	0.133323

period. The alternatives, and the priorities derived for them, are shown in Table 1.

The priorities obtained for the studied time periods are shown in the “Normals” column of Table 2. The priority for a time period may be interpreted as the likelihood that the economy would turn around during that interval. The expected number of months until recovery begins is obtained through the well-known computation for expected value in which the likelihood of each time period is multiplied by its midpoint and the results summed. Table 3 presents the expected value computations for our data, resulting in a prediction of 31.6 months until recovery begins. Since the starting point of the recession was December 2007, the recovery is expected to take place around July or August 2010.

In what follows is the analysis as to why we predict it will take a longer time for the US economy to fully recover, that is, longer than what some analysts and the Administration suggest. The typical recession during the post-WWII period lasted approximately one year, but the current decline is certainly more severe. The Federal Reserve, the Administration and Congress responded quickly and aggressively, to repair the damage to credit markets. With massive amount of fiscal stimulus, combined with the quantitative and qualitative monetary easing, a turnaround in any depressed economy will certainly occur, no matter what. Indeed, the US unprecedented policies prevented the bad recession from becoming much worse.

During the Fall of 2009, market players and the media were occupied with talk of an impending recovery based on signs of improvement in the stock market, improvement in production (e.g., in automotive, partly due to the short-lived “cash-for-clinkers” program), and the slower pace of GDP decline. The Federal Reserve declared that the US economy has begun to “level out” amid growing confidence in US markets that the country is heading for recovery. During his talk at the Brookings Institution in mid-September 2009, Fed Chairman Ben Bernanke declared that the recession has ended. He remarked that “From a technical perspective, the recession is very likely over at this point.” The Conference Board also reported that its index of leading economic indicators started to rise. The question is, will the turnaround sustainable? The ANP results shown earlier imply that it will not.

True, that liquidity has increased, but loans remain scarce. Certain parts of the securitization market (especially those that are TALF-related) have begun to percolate, but that happens only to those borrowers with “stellar” credit. While severe economic downturns are generally followed by powerful expansions, in a deep recession of

Table 2
Likelihoods or priorities of time periods derived from the ANP Model.

Time period intervals	Priorities
1. 0–18 months	0.100
2. 18–30 months	0.277
3. 30–42 months	0.490
4. 42–54 months	0.133

Table 3
Expected number of months until the turnaround.

Time period intervals	Priority	Interval midpoints	Priority × Midpoint
1 Eighteen months (0–18)	0.100	9	0.900
2 Thirty months (18–30)	0.277	24	6.643
3 Forty two months (30–42)	0.490	36	17.640
4 Fifty four months (42–54)	0.133	48	6.398
Sum: Number of months to turnaround	31.581		

this kind aggressive hiring is unlikely to resume soon (jobless recovery). It is also important to note that not all signs of turnaround are caused by the policies; market has played its role as well. A self-correcting market has been evidenced by falling oil prices (which affected spending), moderating wage increases (which influenced hiring), and a rising stock market (which improved household balance sheets, consumer confidence and spending).

But a far more important reason underlying our prediction is the fact that the aggressive stimulus policies involving enormous amount of money cannot and will not last forever. An exit strategy has to be implemented before domestic and foreign markets begin to worry about the US economic fundamentals (ballooning fiscal deficit, widening current account deficit, rising debt, nationalized financial institutions). When implemented, the exit strategy will unequivocally hold back whatever recovery trend generated by the stimulus policies. In some sectors, the trend may even be reversed as the stimulus funds withdrawn. When this occurs, the possibility of a double-dip recession becomes high. If the Federal Reserve and the Administration use their maximum efforts to prevent this scenario from happening, a double-dip pattern may be avoided, but the recession can be prolonged. This is the reason why the resulting analysis using the ANP shows that the predicted recovery will begin later than what some analysts and the Administration have predicted.

7. Conclusions

It is always risky to predict financial crises, recessions, and recoveries, let alone to comprehend how a small segment of a financial market, i.e., subprime credit, could cripple the world's largest economy into the worst recession since WWII. Even more difficult is to analyze and capture the perceptions of market players (consumers and investors) that play a significant role in the recovery process through their ‘animal spirits,’ that is, their spontaneous urge to spend and invest.

Based on our analysis using the ANP structure, from the US recession that officially began in December 2007 the estimated time of real recovery is late July to early August 2010. This implies that the recession will last longer than what some analysts and the Administration have predicted. One of the primary reasons is the estimated exit strategy that may hold back—or even reverse, the recovery trend produced by the unprecedented stimulus policies. It can also be argued that some of the conditions that made the crisis possible remain unchanged even after various measures have been taken. The role of the financial sector is so vital to this recovery that the very first policy measure taken by the Administration was directed towards restoring this sector. Yet, some rules and regulations in this sector have not changed significantly.

It is also our conjecture that the problems in the US financial and housing markets are sufficiently severe and interrelated that the adverse effect on the economy worked not only directly through a traditional credit crunch that caused consumption and investment to fall, but also, indirectly, through the non-functioning of the securities market. The latter has been the most important source of financing for the US business sector. The deteriorating values of

bank assets damaged the balance sheets of many financial institutions, such that even with the qualitative easing (aggressive purchases of private securities by the Federal Reserve) it will take time to restore the securities markets.

The ANP structure used in the analysis confirmed that the interplay between financial markets, housing sector, and market confidence was useful in estimating the time to recovery, which would have been difficult to model otherwise. Indeed, it is this interplay that characterizes the study's ANP structure and distinguishes it from the paper by Blair et al. [12], in this same journal volume.

Such interplay is influenced by a range of policies ('Policy Factors' cluster). The bank rescue program is among the most important measures since it helps determine the effectiveness of other policies. However, as long as confidence is not fully restored, and problems in the financial and housing sector remain, almost any measures will prove less than effective. Given such conditions, it is important to note that our prediction result was stable, as indicated by the study's sensitivity analyses. Altering the priorities of each policy, and their interactions with the model's aggregate demand components did not change the priorities of recovery in the various time intervals.

References

- [1] Diamond DW, Rajan R. The credit crisis: conjectures about causes and remedies. In: NBER Working Paper Series, No. 14739. Cambridge, MA: NBER; 2009 February.
- [2] Covitz DM, Liang N, Suarez GS. The evolution of a financial crisis: panic in the asset-backed commercial paper market. Working paper in finance and economics discussion series (FEDS). Washington D.C.: Federal Reserve Board; August 2009.
- [3] Bordo MD. An historical perspective on the crisis of 2007–2008. Working paper in NBER working paper series No. 14569. Cambridge, MA: NBER; December 2008.
- [4] Cecchetti SG. Crisis and responses: the Federal Reserve in the early stages of the financial crisis. *J Econ Perspect* 2009;23(No. 1):51–75.
- [5] Global financial stability report: navigating the financial challenges ahead. Washington D.C.: International Monetary Fund (IMF); October 2009.
- [6] Saaty TL. Fundamentals of decision making and priority theory with the Analytic Hierarchy Process. Pittsburgh, Pennsylvania: RWS Publications; 1996.
- [7] Saaty TL. Decision making with dependence and feedback. The Analytic Network Process. Pittsburgh, Pennsylvania: RWS Publications; 2001.
- [8] Azis IJ. Crisis, complexity and conflict. Bingley, UK: Emerald Group Publishing Limited; 2009.
- [9] Akerlof G, Shiller R. Animal spirits: how human psychology drives the economy, and why it matters for global capitalism. Princeton: Princeton University Press; 2009.
- [10] Determination of the December 2007 peak in economic activity. The National Bureau of Economic Research, <http://www.nber.org/cycles/dec2008.html>; 2008.
- [11] Greenspan A. Remarks at the annual convention of the Independent Community Bankers of America; March 4, 2003. Orlando, Florida (via satellite);.
- [12] Blair AR, Mandelker GN, Saaty TL, Whitaker R. Forecasting the resurgence of the U.S. economy in 2010: an expert judgment approach. *Socio-Econ Plann Sci* 2010;44(3):114–21.
- [13] Roubini N, Menegatti C. The US housing recession is still far from bottoming out. *RGE Monitor*; March 2007:1–22.
- [14] Goldberg Linda S. Is the international role of the dollar changing? *Curr Issues Econ Finan Fed Reserve Bank NY* January 2010;16(Number 1).
- [15] Krueger N, Brazeal D. Entrepreneurial potential & potential entrepreneurs. *Entrepreneur Theory Pract* 1994;18(3):91–104.

Iwan Azis is Professor and Director of Graduate Studies of the Regional Science Program, and Adjunct Professor of Economics, Johnson Graduate School of Management (JGSM), Cornell University, Ithaca, NY. He earned his MSc and PhD from Cornell University. Before joining Cornell University in 1992, he was Chairman of the Department of Economics, University of Indonesia, and Director of the World Bank-funded Inter-University Center. His research interest is on the economy-wide dimension of macro-financial economics, and regional economic modeling and institutions. He has conducted research and consulting work for various international organizations, governments and universities. His articles appeared in, among others, *International Journal of Trade and Global Markets*, *Review of Urban and Regional Development Studies*, *Asian Economic Papers*, *ASEAN Economic Bulletin*, *Journal of Economic Literature*, *The Annals of Regional Science*, and *The Developing Economies*. His articles also appeared in various books published among others by MIT Press, Oxford University Press, and Cambridge University Press. He serves as an editor in several scholarly journals, e.g., *Review of Urban and Regional Development Studies*; *Peace Economics, Peace Science and Public Policy*; *Bulletin of Monetary Economic and Banking*; *Bulletin of Indonesian Economic Studies*. His latest book, *Crisis, Complexity and Conflict* (Emerald), unveils critical elements of policy conflicts, including those surrounding the 2008 financial crisis. In early 1998, he spoke before the Joint Economic Committee of the US Congress on the Asian Crisis. He received the "Distinguished Scholar in Regional Science, Financial Economics, and Economic Modeling" award in 2006 in Lisbon, Portugal.