

The Subprime Crisis

A Primer*

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Money
&
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Abstract

In light of the nature of developments in the US mortgage and housing markets during the period 1995-2007, the paper provides a critical appraisal of three popular explanations of the crisis: (a) imprudent lending; (b) lax monetary policy; and (c) the home price bubble originating in socio-psychological factors. This paves the way for examination of the roots of the crisis and its contagion in terms of interaction between the real and the financial factors operating in the US economy. The intertwining of the factors helps to resolve the three major puzzles characterising the crisis, viz., the disproportionately large losses and write-downs of financial entities in relation to the quantum of subprime default; the relative ineffectiveness of monetary policy; and the failure of widely used risk management and credit rating models.

Socrates: "If contracts for a loan were, in general, made by law at the lender's risk, there would be a good deal less shameless money-making and a good deal less of the evils I have been describing."

Plato, *The Republic*

I. Introduction

The year 2007 witnessed one of the worst turmoils in the global financial system. The crisis originated in the US subprime mortgage market in the latter part of 2006 and by August 2007 engulfed not only the entire financial sector of the United States, but also that of other mature market economies like Germany, Great Britain, Japan and Switzerland. The most important impact of the crisis¹ has been on home losses suffered by a large number of people belonging to weaker income groups in general and the Afro-Americans and the Hispanics in particular. About 320,000 foreclosures (of which more than half related to subprime lending) were initiated in both the first and the second quarter of 2007, as against an average of 225,000

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¹ At least from a humanitarian viewpoint.

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during 2001-06 (Bernanke, 2007b). According to the Joint Economic Committee (2007), in the absence of effective steps for resolving the crisis, “subprime foreclosures alone will total approximately 2 million” over the three-year period 2007-09. This along with the drying up of funds in the mortgage market cannot but effect a significant slowdown if not an absolute decline in the growth of owner-occupied dwellings.

What hogged the media limelight however was the magnitude of financial meltdown characterising the crisis. Apart from a string of bankruptcies in the US and elsewhere of lenders specialising in the mortgage market, huge losses have been posted by a whole host of other financial intermediaries including multinational commercial and investment banks like the Citigroup, HSBC, Morgan Stanley, Merrill Lynch, Deutsche Bank and UBS. The loss estimates vary widely, but are expected to be “several times the \$50 billion or so write-downs that have been announced by big financial institutions” (Summers, 2007). While the IMF put the estimated loss² at \$200 billion in September, 2007 (IMF, 2007a), two months later analysts at Deutsche Bank expected the loss to be of the order of \$400 billion. Indeed, as early as late August 2007 the Chairman of the Federal Reserve Board already noted, “Global financial losses far exceeded even the most pessimistic projections of credit losses on those [subprime] loans” (Bernanke, 2007a).

From the viewpoint of the health of the financial and real sectors, of much greater concern have been the increasing impediments to flow of funds hindering business operations and worsening of investment prospects in both construction and other lines of activities. As the crisis had unfolded and delinquencies in mortgage payments grown,³ credit rating agencies started downgrading an ever increasing number of mortgage-backed securities (MBSs) and collateralised debt obligations (CDOs) based on them.⁴ This along with the heightened uncertainty concerning (a) the magnitude of direct-cum-indirect exposure of financial intermediaries to subprime loans and (b) the prospective depth or duration of the crisis, not only led to a sharp rise in the interest

² Due primarily to rating downgrades.

³ In June 2007, the delinquency rate of subprime mortgages rose to 13.5 per cent, more than double the rate in mid-2005; for Alt-A mortgages (which lie between the prime and the subprime categories) the corresponding figures for delinquencies were 3 per cent and 1 per cent respectively (Bernanke, 2007a).

⁴ As of December 28, 2007 Standard & Poor’s downgraded \$97 billion-worth of US MBSs and put an additional \$18.5 billion on Credit Watch negative out of \$2.55 trillion in original issuance of the Q₁,2005 through Q₃,2007 vintages of these securities. The lowering constituted 27 per cent for the Investment Grade and 44 per cent for the Speculative Grade (Standard & Poor’s, 2008). During the third quarter of 2007 Moody’s downgraded 1495 Asset Backed Securities (ABSs) worth \$30.2 billion, the highest number of quarterly downgrades since the inception of the ABS market. With its modified rating model, the agency on December 17, 2007 further put on Credit Watch negative 1133 securities worth \$22.0 billion out of the ABS reviewed on or before July 13 during 2007.

spread on both mortgage-related and other private bonds, but also caused a serious liquidity shortage in the short term, especially the inter-bank, money markets.

The growing threat of the subprime problem turning into a major systemic crisis prompted practically all major central banks to mount a series of rescue operations from early August 2007. In response to a jump in the overnight rate by 60 basis points (to 4.6 per cent) on 8 August, 2007, the European Central Bank (ECB) injected the very next day a massive 95 billion (\$131 billion) into the money market in order to facilitate business transactions and restore investors' confidence.⁵ The Federal Reserve for its part cut the discount rate by 50 basis points (to 5.75 per cent) on 17 August, 2007 and extended the period of lending to as much as 30 days.⁶ This was followed by further monetary easing, with cuts in both the discount and the federal funds rates so that over August 2007-January 2008, the former came down from 6.25 to 3.5 per cent, and the latter from 5.25 to 3.0 per cent (*Table A.1*). The Bank of England was initially chary of providing relief to the beleaguered banks in view of its perceived moral hazard consequences, but forced by deteriorating credit-market logjam to announce on 19 September, 2007 a plan of injecting up to £10 billion (\$20 billion) funds into the system.⁷

The rate cuts were supplemented by other measures⁸ for tackling the global financial turmoil, characterised by a liquidity shortage and a flight from private to public securities. In this context the world's major central banks deemed it prudent to initiate a joint programme to restore investors' confidence and ward off the recessionary trends resulting from subprime woes. On 12 December, 2007 the Federal Reserve announced the establishment of Term-Auction Facility (TAF) in collaboration with the Bank of Canada, the Bank of England, the European Central Bank and the Swiss National Bank—a plan that also elicited support from the Bank of Japan and the Reserve Bank of Australia. Under TAF the Federal Reserve auctioned on 17 and

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⁵ The amount was in fact larger than the injection following the 9/11 attack on the twin towers in 2001.

⁶ Instead of the customary practice of providing one-day loans through the discount window.

⁷ An important factor behind the Bank of England's policy reversal was the run on Northern Rock, Britain's first bank run since 1866. The run stopped only after the government announced full guarantee of all depositors' money with the bank.

⁸ As in the case of the 1958 Long-Term Capital Management (LTCM) crisis, the US Treasury also tried to rope in leading (private) financial institutions in instituting a bail-out programme. For this purpose in mid-October 2007 a Master Liquidity Enhancement Conduit (M-LEC) with a pool of about \$100 billion from Citigroup, Bank of America, JP Morgan Chase and a few other banks was sought to be set up. M-LEC was to be used for easing pressure in the credit market through purchase of risky mortgage and other securities. However, the private bankers ultimately went their separate ways and M-LEC proved to be a non-starter.

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20 December, 2007 a total of \$40 billion loans of one-month duration,⁹ and followed it up with further auctioning on 14 and 28 January, 2008, each amounting to \$30 billion. The Bank of England pumped in £10 billion (\$19.5 billion) one-month money on 18 December, 2007 as well as on 15 January, 2008. The biggest injection came from the European Central Bank which on 18 December, 2007 lent a massive 350 billion (\$500 billion) for a period of two weeks.

The easy money policy followed in unison by the world's leading central banks seems to have had only a marginal impact on the darkening economic scenario. As of end-January, 2008 the prospects of an early resolution of the crisis appear dim. Write-downs by banks, big and small, are on the rise; so are job losses,¹⁰ especially in construction and finance, and housing starts. The Fed Chairman himself shares the apprehension of most economists concerning the growing threat of an economic downturn and proposes to conduct biweekly loan auctions "for as long as necessary to address the elevated pressure in short-term funding markets" (*Business Line*, 6 January, 2008) and cut "interest rates aggressively to avoid a recession" (*New York Times*, 11 January, 2008). In fact the Fed did exactly that when even without waiting for its scheduled meeting at the end of January—a most unusual move—on 22 January, 2008 it cut the federal funds rate by as much as 75 basis points to 3.5 per cent "in view of a weakening of the economic outlook and increasing downside risks to growth" (*Business Line*, 23 January, 2008). "The federal government also proposed to inject a massive \$160 billion by way of corporate investment incentives and personal tax rebates in order to counter the growing recessionary tendencies" (Bloomberg, 19 January, 2008). Till now these measures and proposals have failed to uplift the market sentiment.

Subprime Puzzles and Issues

The troubles in the US mortgage market, their transformation into a major economic crisis, and the ineffectiveness of central bank measures to arrest the financial meltdown and the accompanying real sector slide have brought to the fore a number of important issues and puzzles whose resolution is by no means simple or straightforward. As a prelude to our discussion in the rest of the paper let us identify the main questions and issues that need to be addressed in this connection.

The first relates to the constellation of factors triggering off the

⁹ All banks eligible for the Fed's discounting facility could bid for the funds.

¹⁰ The combined write-downs for the fourth quarter of 2007 by only three finance companies totalled more than \$40 billion. According to the US Bureau of Labor Statistics while job losses in mortgage banking during February-December, 2007 amounted to 79,000, the fall in employment in construction between September 2006 (when the subprime problem surfaced) and end-2007 was as much as 2.36 lakh. The overall unemployment situation has also worsened sharply, with the jobless rate jumping from 4.7 to 5.0 per cent and private employment declining by 13,000 in December, 2007.

subprime problem. What is surprising however is the magnitude of the meltdown it has caused¹¹ and the extent of the output-cum-employment loss effected: both are already disproportionately large in relation to the incidence of default in the mortgage market. *Direct* subprime losses, estimated at around \$34 billion (up to November 2007), are not insignificant; but the sum pales into insignificance when put against the \$57 trillion US financial system, not to speak of the size of the global money and capital market.¹² It is for this reason that the virulence of the subprime contagion caught everybody by surprise. Though the signs of the trouble had been palpable from the second half of 2006, as late as July 2007, most analysts (including the IMF), expected the subprime defaults to leave the rest of the financial system and the real sector relatively unscathed.¹³

The second (and a related) issue concerns the failure of highly sophisticated risk-management techniques (as well as the credit rating models) developed by banks and other financial institutions. In particular, securitization of loans and collateralised debt obligations (CDOs) were specifically designed to reduce risk and improve the shock absorptive capacity of the banking system through dispersal of risk on a wide scale. How could these immunising innovations then turn out to be “financial weapons of mass destruction”, to quote Warren Buffett?

Third, the subprime problem surfaced when the US economy appeared to be in the pink of health. Indeed, with a robust GDP growth and a declining rate of unemployment, the central bank was expected to raise the federal funds rate some time in August 2007 in order to ward off the threat of inflation due to overheating. It is in this context that the sharp slide in the economy in so short a while cannot but appear puzzling and is hard to explain in terms of the conventional chain of economic causation, remembering that an annual loss of \$34 billion on subprime mortgages constitutes only about a 0.25 per cent cut of the US gross domestic product.

Finally, unlike in 2001-02, when the Fed’s easy policy proved a resounding success in arresting the recessionary trend following the bursting of dotcom bubble, in the present instance the sharp cutbacks in the federal funds rate—from 5.25 to 3.0 per cent between September 18, 2007 and 30 January, 2008—coupled with massive injection of (one-month) liquidity have failed so far to arrest the economic slide and growing joblessness (*Table A.2*).¹⁴ The puzzle in this regard lies in the

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¹² Which has been so severely buffeted by the crisis. As per Morgan Stanley, world’s *traded* securities total \$165 trillion.

¹³ In its April 2007 Report, the IMF observed that the subprime problem “is not likely to pose a serious systemic threat” (IMF, 2007). This optimism was also voiced in its July 2007 Update of the *Global Financial Stability Report*.

¹⁴ Though it is too early to judge the efficacy of the measures, remembering that, out of the 2.25 percentage point cut in the federal funds rate since mid-September 2007, a reduction amounting to 1.25 percentage point was effected in two steps during the last week of January 2008, on the 22nd and the 30th (*Table A.1*).

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fact that compared with the *primary* shock (by way of the rise in default) arising from the subprime market, the magnitude of the monetary stimulus provided by the Fed has been significantly large.

The rest of the paper is devoted towards a resolution of these issues and organised as follows. Since the eye of the currently raging storm is in the subprime section of the US mortgage market, Section II discusses the factors behind the rapid growth of subprime lending and the major features characterising these loans. Section III examines the adequacy of the main theses advanced so far for explaining the emergence of the subprime crisis. In view of the close connection between the housing and mortgage markets on the one hand and the behaviour of the macroeconomy and the financial sector on the other, in Section IV we seek to put forth an alternative explanation of the crisis in terms of the interaction between the real and financial factors in the US economy during the period under investigation. In light of this discussion the final section attempts at a resolution of the issues and puzzles highlighted in the introductory section.

II. Growth of the Subprime Market

Subprime lending¹⁵ consists of loans extended to borrowers with weak credit characteristics, signifying a relatively high probability of default. These characteristics include low FICO scores;¹⁶ two 30-day delinquencies in the last 12 months or one 60-day delinquency over the last 24 months; bankruptcy in the last 5 years; and a debt service-to-income ratio of 50 per cent or more. Given these characteristics, it is not very difficult to appreciate why subprime lending had not been very significant in the US mortgage market for a long while and required for its rapid growth conditions of a somewhat exceptional nature. As *Table 1* illustrates, subprime mortgages started gaining in importance only from the mid-1990s; but within 12 years their share in total mortgage origination jumped from 4.5 per cent in 1994 to more than 20 per cent¹⁷ in 2006. For an appreciation of the roots of the subprime

¹⁵ As distinguished from prime lending where the borrower is highly creditworthy. In the mortgage market, between the prime and the subprime loans lie Alt-A mortgages.

¹⁶ These are credit scores of individuals, based on their credit report data over the preceding 6 months and generated from the software developed by Fair Isaac and Company (FICO). The FICO scores are widely used by the US banks and other lenders for assessing the creditworthiness of prospective borrowers: a borrower with a higher FICO score is *ceteris paribus* considered more creditworthy. Though other credit risk characteristics are also taken into account, a FICO score of 660 or less generally condemns one as a subprime borrower.

¹⁷ There was a break in this upward trend during the recessionary years, 2001-02, (following the bursting of the dotcom bubble) when the house price (Case-Shiller) inflation showed some deceleration (*Table A.2*); but the 4-year period 2003-06 was characterized by exceptionally high growth in subprime lending as also in its share in total mortgage originations.

problems surfacing in late 2006, it is instructive to examine the factors behind the rapid growth of subprime mortgages during the period under consideration. These factors may be grouped under three heads, viz., enabling legislations; technological-cum-financial innovations; and macroeconomic trends including policy initiatives.

TABLE 1
Mortgage Origination Statistics

1	2	3	4	5	6	7
Year	Total Mortgage Originations (USD Billions)	Subprime Originations (USD Billions)	Prime and Alt-A Originations (USD Billions)	Subprime Share in Total Originations (percent of dollar value)	Subprime Mortgage Backed Securities (Billions)	Subprime Originations Securitized (percent of dollar value)
1994	773.1	35	738.1	4.5	NA	NA
1995	635.8	65	570.8	10.2	NA	NA
1996	785.3	96.5	688.8	12.3	NA	NA
1997	859.1	125	734.1	14.5	NA	NA
1998	1,430	150	1280	10.5	NA	NA
1999	1,275	160	1115	12.5	NA	NA
2000	1,048	138	910	13.2	NA	NA
2001	2,215	190	2025	8.6	95	50.4
2002	2,885	231	2654	8	121	52.7
2003	3,945	335	3610	8.5	202	60.5
2004	2,920	540	2380	18.5	401	74.3
2005	3,120	625	2495	20	507	81.2
2006	2,980	600	2380	20.1	483	80.5

Source: 1) Gramlich, Edward M. (2004);
2) Joint Economic Committee (2007).

Enabling Legislations

The most important legal initiatives that paved the way for an accelerated rise in subprime originations were:

- (a) Depository Institutions Deregulatory and Monetary Control Act, 1980;
- (b) Alternative Mortgage Transactions Parity Act, 1982; and
- (c) Tax Reforms Act, 1986.

The first two acts removed some important constraints on lenders under the earlier legal regime—constraints that tended to seriously limit the commercial viability of subprime mortgages. The main provisions of the two acts having an important bearing on subprime lending consisted of the following:

- (i) phasing out of “Regulation Q” during the 1980s under which deposit rates offered by financial entities were strictly regulated by the Fed;
- (ii) removal of ceilings on mortgage rates through abolition of State Usury Laws;

The removal of ceilings on deposit and lending rates along with abolition of geographical restrictions opened up opportunities for extension of loans to subprime borrowers with proper pricing of risks and created favourable conditions for effective management of these risks.

- (iii) abolition of the geographical boundary¹⁸ within which the operation of an individual mortgage lending agency had to be confined; and
- (iv) liberalisation in respect of the types of mortgages that could be offered.

Since the lending rate needs to be positively related to the risk of default,¹⁹ it is necessary for subprime mortgage rates to be higher than those set for prime (or Alt-A) borrowers. The State Usury Laws were thus a major factor inhibiting the supply of credit in the subprime market. Again, unless the depositors were offered higher interest rates commensurate with the greater risk undertaken by mortgage originators, they would be unable to garner funds for lending to less creditworthy borrowers. Thus what the 1980 and the 1982 Acts did was to create conditions under which subprime mortgages would be driven by market forces, with the deposit and the lending rates governed by the extent of risk aversion of savers on the one hand and the borrowers' risk of default on the other.

It is also not very difficult to see that, when forced to operate within a small geographical location, mortgage lenders ran high risk since (a) with limited funds at their disposal they could not exploit the considerable scale economies (including those connected with risk management) characteristic of financial intermediation; and (b) they were unable to guard against region-specific shocks in the absence of distribution of their loan-portfolio over a wide area, having a diverse set of economic activities.

The implication of the foregoing is that the removal of ceilings on deposit and lending rates along with abolition of geographical restrictions opened up opportunities for extension of loans to subprime borrowers with proper pricing of risks and created favourable conditions for effective management of these risks. Flow of funds to the not-so-creditworthy borrowers was also facilitated by provision (iv), under which lenders could offer mortgages tailored to the borrower's needs. The result was that over the last 12-13 years there has occurred a proliferation of adjustable rate mortgages (ARMs) with low (teaser) rates for the first 2-3 years and higher rates thereafter.²⁰ The relatively long period of repayment (30 years) and the high loan-to-value ratio (generally 80 per cent) also made these mortgages highly attractive to borrowers in the subprime category.

Finally, the Tax Reforms Act, 1986 turned out to be an important factor making subprime loans highly attractive to both borrowers

¹⁸ Usually within a radius of 50 miles.

¹⁹ Assuming that with an adequate credit history of the borrower, the problem of adverse selection (Stiglitz and Weiss, 1981) can be taken care of.

²⁰ Often with balloon payments at the end of the loan period.

and lenders. Under this Act though interest payments on consumer loans remained non-deductible for income tax purposes, interest deductions were allowed on mortgages for a primary residence and one additional house. This tax break reduced considerably the effective cost of and hence the demand for mortgage debt. Subprime mortgage loans also became more attractive in view of the fact that for households requiring consumption finance borrowing against or withdrawal of house equity rather than taking consumption loans now became a cheaper alternative. Moreover, the favourable tax treatment of interest costs of mortgages implied an improvement in the creditworthiness of subprime borrowers.²¹ Both these factors—the rise in demand and reduction in risk (at any given mortgage rate)—boosted the flow of funds in the subprime market.

Institutional and Financial Innovations

Apart from the legislative initiatives in the 1980s, the government sponsored enterprises (GSEs) also played an important role in rapid development of the US mortgage market. In the 1970s GSEs like Ginnie Mae, Fannie Mae and Freddie Mac, supported by a federally backed insurance system, started securitizing conventional (or conforming) mortgages and issuing from their pools mortgage backed securities (MBSs). This was a momentous step since while formerly mortgage loans were highly illiquid and financed mostly from deposits garnered by thrift institutions, creation of a secondary market for these loans and standardisation of mortgage products (through MBSs) transformed them into liquid assets and provided a channel through which funds from banks and other financial intermediaries and investors could readily flow to the mortgage market. The significance of such flows is indicated by the fact that between 1980 and mid-2007 the outstanding GSE MBSs recorded a 20-fold rise, from \$200 billion to \$4 trillion.

The GSEs provided a boost primarily to the conventional or prime mortgages;²² but their model was closely followed by private entrepreneurs in exploiting the investment potential in the non-conforming mortgage (i.e., Alt-A, jumbo²³ and subprime) market. The 1990s witnessed the establishment of private mortgage insurers and private mortgage pools. The latter bundled non-conforming, mostly subprime, loans not eligible for securitization by GSEs. As *Table 1* shows, these private label securities backed by subprime mortgages made enormous strides within a short while and by 2007 accounted for around \$2 trillion of the residential mortgage debt.

²¹ With a fall in the effective burden of mortgage debt, given the mortgage rate of interest.

²² i.e., those that conformed to the (relatively stringent) standards set by the federally backed insurers and GSEs.

²³ GSEs are not permitted to securitize mortgage loans exceeding a certain ceiling, even if the borrower is prime.

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Under the private initiative financial innovations leading to large-scale expansion of the subprime market went far beyond securitization and standardisation of mortgage products. These innovations were driven by two sets of factors: (a) the sharp fall in the costs of computation, data processing and monitoring the relevant (data-based) indicators;²⁴ and (b) development of highly sophisticated models of risk assessment for a wide variety of borrowers. The softwares based on these models and the quantum jump in computational facilities enabled the lenders to handle an enormous number of loan applications and churn out speedily at a negligible cost (i) the FICO scores and other credit characteristics of the applicants; and (ii) the interest rate, the duration and the loan-to-asset ratio appropriate to the risk profile of a prospective borrower.²⁵ The result was that under the new system a large number of borrowers who would have been ineligible earlier were now extended house building loans on a massive scale. Indeed, thanks to the development of the subprime market, there was a significant rise in homeownership among the ethnic and poorer families and for the USA as a whole the proportion of households having their own houses jumped from 64 per cent in 1994 to 69.3 per cent in Q₄, 2004.

The financial engineering driving the growth of subprime loans was not simply confined to developing mortgages appropriate to the borrower's credit characteristics and securitizing them. There was also a relentless effort to reduce the cost of finance as also the risk related to subprime lending. It was in this context that financial innovation was directed towards solving an age-old dilemma. A significant reduction in costs required that funds needed to be secured through short-term debt instruments or from commercial and investment banks having substantial access to cheap finance. However, a pre-requisite for this was ready marketability of mortgage based financial assets as well as their high credit rating—something which simple (vanilla) securitization would fail to accomplish: sans government guarantee²⁶ straightforward private label securities backed by subprime loans would still be conferred low credit rating and hence be high cost to financial institutions required to observe capital adequacy and other norms.²⁷

The twin problems of reducing the costs of subprime lending and raising the credit-rating of subprime-mortgage-backed securities (SMBSs) were tackled in two ways. First, commercial and investment banks set up structured investment vehicles (SIVs) or conduits as off-

²⁴ e.g., FICO scores over time.

²⁵ Unless the profile is too bad to make him eligible—something which also would immediately be known, once the relevant data are fed into the computer.

²⁶ Which is implicit in GSE MBSSs.

²⁷ This is apart from the fact that pension funds and life insurance companies are often barred from investing in lowly rated instruments. Note also that non-bank financial intermediaries holding such assets would fail to secure cheap funds in the short-term money market through issue of commercial paper or other means.

balance-sheet entities for purposes of issuing SMBs. Second and much more momentous was the creation of structured securities or collateralised debt obligations (CDOs) out of a pool of subprime loans bought from mortgage originators. The structured products were derivative instruments, with their returns related to the cash flows from the underlying subprime loans. However the risk profiles for different categories of the structured products varied significantly. For one thing, their duration or maturity period was not the same. Again, the various tranches differed in respect of the seniority of their claims on the cash flows. Thus the first claim on the (actual) cash receipts from the mortgage pool was of the holders of senior-most tranches; it was only after meeting their dues that the (remaining) cash flows could be used for meeting the claims of investors holding the next category of tranches; and so on. The implication is that, though all mortgages in the pool are subprime, the default risks and hence credit rating vary enormously between the senior-most and the junior-most (called equity or toxic) tranches: the former were invariably awarded a triple-A rating, while the latter were condemned to the junk category.

There were several routes through which the financial innovations noted above boosted the flow of funds in the subprime market. The structured products with wide differences in their duration, default risks and returns enlarged the size of the market by catering to investors with varying risk appetite. What was more important, construction of highly rated instruments out of a subprime pool made them attractive to banks and other financial entities as investment outlets with low (capital) costs and (relatively) high returns.²⁸ The quantitative significance of this arose from the fact that (a) as much as 90 per cent of a pool of subprime mortgages, when bundled and tranced into CDOs, often earned an A or higher rating and found ready takers among a whole host of investors; and (b) thanks to close integration of the global capital market, CDOs proved a potent means of drawing large funds in the US subprime market from all over the world, especially from commercial and investment banks in Europe, Japan, Australia and Canada. Finally, investment in A or A-plus rated SMBs could be highly leveraged through issue of asset-backed commercial papers²⁹ (ABCPs) or short-term loans from banks.

Macroeconomic Environment, Policy Regime and House Price Inflation

An analysis of factors behind the phenomenal growth of the subprime market over 1994-2006 would remain seriously incomplete unless we take into account the behaviour of the macroeconomy as well

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²⁸ Compared with that on similarly rated company bonds or other financial assets.

²⁹ As conduits, SIVs and many a lender specialising in mortgage loans took recourse to such modes of financing.

The large gap between the home price inflation and the borrowing rate along with a loan-to-value ratio of around 80% led to a sharp rise in demand for mortgage financed houses.

as of the relative prices driving investment in residential construction during this period. Not only was the annual average GDP growth (at 3.2 per cent) during the 12-year reference period significantly above the rate attained over the previous two decades, but the higher growth was also accompanied with a perceptibly lower amplitude of cycles³⁰ and a decline in the average CPI and core inflation rates. While the transition to the higher growth trajectory was attributed to the IT revolution and the consequent rise in total factor productivity, it was the policy makers in general and the central in particular that were credited with the taming of inflation and cycles. Such a benign macroeconomic environment could not but provide a boost to long-term investment, especially that in housing.

Of particular significance in this regard were steeply rising home prices, the wide gap between the house price and CPI inflation rates, a low interest rate regime and large loan-to-value ratios—a heady combination that made mortgage financed investment in housing an irresistible investment opportunity. The loan-to-value ratio in subprime ARMs was generally 80 per cent or more. Between January 2001 and June 2003 the federal funds rate was brought down by as much as 550 basis points, from 6.5 to 1.0 per cent; only at end June, was the rate revised to 1.25 per cent (*Table A.1*). Even while the rates were being raised, the Fed's policy statements led investors to believe that the upward revisions in the funds rate if any would be slow, in "measured" steps. The temporal behaviour of the yield on US Treasury Bills, which often constituted the benchmark for subprime ARM lending, closely mimicked that of the federal funds rate (*Table A.2*). At the same time, between Q₁, 2001 through Q₁, 2006 the house price (Case-Shiller) inflation rate was persistently double digit and averaged 14.3 per cent, but the average CPI and core inflation rates were no more than 2.6 and 2.1 per cent respectively.

The constellation of factors noted above played a crucial role in rapid expansion of the subprime market between 2001 and 2006. The large gap between the home price inflation and the borrowing rate along with a loan-to-value ratio of around 80 per cent led to a sharp rise in demand for mortgage financed houses, which in its turn contributed towards sustaining the upward trend in house prices and gave rise to the phenomenon of self-fulfilling expectations. No less if not more important was the impact of supply shift in the subprime market. Apart from the enabling legislations and the technological-cum-financial innovations considered earlier, the significant fall in the default rate of subprime mortgages constituted an important reason behind this shift. With the double-digit inflation remaining considerably above the tax-

³⁰ The recession following the bursting of the dotcom bubble in 2001 was in fact one of the mildest in the US economic history and the GDP growth recorded during this phase was not significantly lower than the growth in most mature economies.

deductible mortgage rate, the delinquency in both prime and subprime mortgages plummeted during the reference period: in times of financial stress, instead of defaulting it became worthwhile for a borrower to sell the house outright or refinance the mortgage taking advantage of the accumulated home equity and the cheap interest rate. The decline in the default rate raised the credit scores of prospective subprime borrowers, making a larger fraction of them eligible for mortgage loans; raised the flow of funds in the subprime market; and brought down the interest spread on subprime loans—something which further raised demand in the housing market. Hence the mutually reinforcing mechanism of house price inflation and the increasing flow of subprime credit.

III. Origins and Manifestation of the Crisis: Some Alternative Hypotheses

The foregoing analysis suggests that for an adequate appreciation of the roots of the crisis and its rapid contagion we need to consider interactions among factors operating in (a) the mortgage market, (b) the housing sector and (c) the economy as a whole. While the close connection between mortgage lending and home price inflation between 1995 and 2005 is quite palpable, given the importance of housing in the US economy, the behaviour of the housing sector and that of the macroeconomy could not but also be inextricably linked. However, though all analysts acknowledge the interdependence among the three sectors, they tend to differ in their identification of the roots of, or the major factor responsible for, the boom and bust in the US mortgage and housing markets. Before putting forth our own explanation of the phenomenon, it seems useful to consider the three main theses that have been advanced in this connection.

The most popular explanation of the subprime crisis, especially among financial analysts, focuses on the sharp deterioration of lending standards, reflected in incomplete documentation; widespread use of ARMs with teaser rates the implications of which were incomprehensible to most borrowers; and outright fraud on the part of some originators whose earnings (fees) were related to the magnitude of origination. The problem was compounded by the high credit rating accorded to the structured securities constructed out of these loans and large exposure of banks and other financial institutions either directly or indirectly through their SIVs and clients to the CDO market. Attention is drawn to the fact that many of the subprime mortgages contracted in late 2005 and in 2006 became delinquent soon after their origination. The sharp

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³¹ Loans extended to borrowers with no income, no job, no asset. According to Credit Suisse estimates, about 80 per cent of subprime loans extended in 2006 included low teaser rates; a similar fraction of Alt-A loans were nothing but “liar loans” with very little or no documentation (*Economist*, March 22, 2007).

The third thesis seeks to explain the house price bubble in terms of the widespread belief that the US economy, thanks to a leap in the rate of technological innovation, had entered a higher growth trajectory in which home prices would tend to rise indefinitely.

rise in such imprudent or NINJA loans³¹ during this period, it is suggested, lay at the root of subprime troubles and their subsequent spread to the rest of the economy through financial and other forms of contagion.

An influential group of economists³² traces the roots of the subprime crisis to the Federal Reserve policy during 2001-06. Thus Taylor's explanation of the crisis (Taylor, 2007) runs almost entirely in terms of overly loose monetary policy for too long (2001-04) [in violation of the Taylor rule (Taylor, 1993)], followed by significant increases in the funds rate between mid-2004 and mid-2006 (*Table A.1*). While the exceptionally cheap loans produced a home price bubble and a boom in residential investment, the 425 basis point rise in the federal funds rate between June 2004 and June 2006 negatively impacted, with a lag, housing construction and the mortgage market: from the second half of 2006 the delinquency rate, especially in subprime ARMs, started rising significantly; house prices came crashing; and so did residential investment. The strong correlation among the interest rate cycle, the mortgage lending cycle and the housing cycle seems to make the case against the Fed quite open and shut.

The third thesis, due to Shiller (2007), draws attention to the unprecedented home price inflation between 1996 and 2005 and seeks to explain the house price bubble in terms of the widespread belief that the US economy, thanks to a leap in the rate of technological innovation, had entered a higher growth trajectory in which home prices would tend to rise indefinitely. According to Shiller, as in all booms and busts, operation of social-psychological factors³³ tended to make these beliefs infectious, with more and more investors basing their future home price expectations on current market trends rather than long-term economic fundamentals. Needless to say, such "irrational exuberance" cannot but end up in a crash and despondency sooner or later.

In all the three theses summarised above the core phenomenon, it is important to recognise, is the formation and bursting of the home price bubble: the explanations differ primarily in their identification of the main factor(s) driving the housing cycle. For an evaluation of the strengths and weaknesses of these explanations and providing a backdrop to our own, it appears important to consider the main features of the bubble and the related phenomena during the reference period.

³² *Economist* has long been the most influential advocate of the thesis among the laity. Taylor (2007) quotes with approval *Economist's* view in this regard.

³³ The psychological principles behind the operation of these factors, according to Shiller, "... include psychological framing; representativeness heuristic; social learning; collective consciousness; attention anomalies; gambling anomalies such as myopic loss aversion, emotional contagion, and sensation seeking" (Shiller, 2007).

House Price Bubble and Bust: Some Features and Indicators

There are several characteristics of the behaviour of house prices over the period 1996-2006 that indicate large departures from what may be called their warranted level,³⁴ i.e., the level consistent with the economic fundamentals in the housing market. Not only was there an uninterrupted home price inflation during this period³⁵ (*Table A.2*), but as Shiller (2007) highlights, with a persistently wide gap between the house price and CPI (consumer price index) inflation rates, *real* house prices rose by 86 per cent between Q₄, 1996 and Q₁, 2006. A house price boom of such magnitude over so long a period was unprecedented in the US history. However, a steep rise in real house prices need not necessarily imply a bubble; for its identification we need to have some idea of the fundamental determinants of these prices.³⁶

The current price of a house in real terms should ideally be governed by the expected stream of real rent during the life-time of the residence and interest rates expected to prevail in the long run.³⁷ In the US housing market, between Q₄, 1996 and Q₁, 2006 real rent remained practically unchanged, rising by only 4 per cent during the entire period, compared with the 86 per cent rise in real house prices (Shiller, 2007). The entire period 1996-2006 was not, it seems, characterised by a bubble. The home price increases during the second half of the 1990s were in fact consistent with the long-term relationship between real rent and real house prices.³⁸ However, from 2001 there was an increasing divergence between the movements of the two variables (*Chart 1*) and by 2006 the national real home price index shot up to a level that was 70 per cent above the equivalent real rent (Feldstein, 2007). The development of a gap of this order strongly suggests the prevalence of a house price bubble over Q₁, 2001–Q₁, 2006.

A prolonged and sharp rise in real house prices over the equivalent real rent³⁹ can be consistent with economic fundamentals only if there are strong grounds for believing that real rent will increase over time and/or the long-term real interest rates are expected to fall significantly. But during 2001-05 there was nothing to lend substance to these expectations: compared with the previous quinquennium the average GDP growth during this period was nearly 50 per cent less and the unemployment rate 80 basis points more (*Table 2*). Under these conditions it was not reasonable to expect the long-term macro per-

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³⁴ Following Harrod (1939).

³⁵ From March 1996, to be more accurate.

³⁶ In the absence of a speculative bubble.

³⁷ Since a house lasts for 50 years or more.

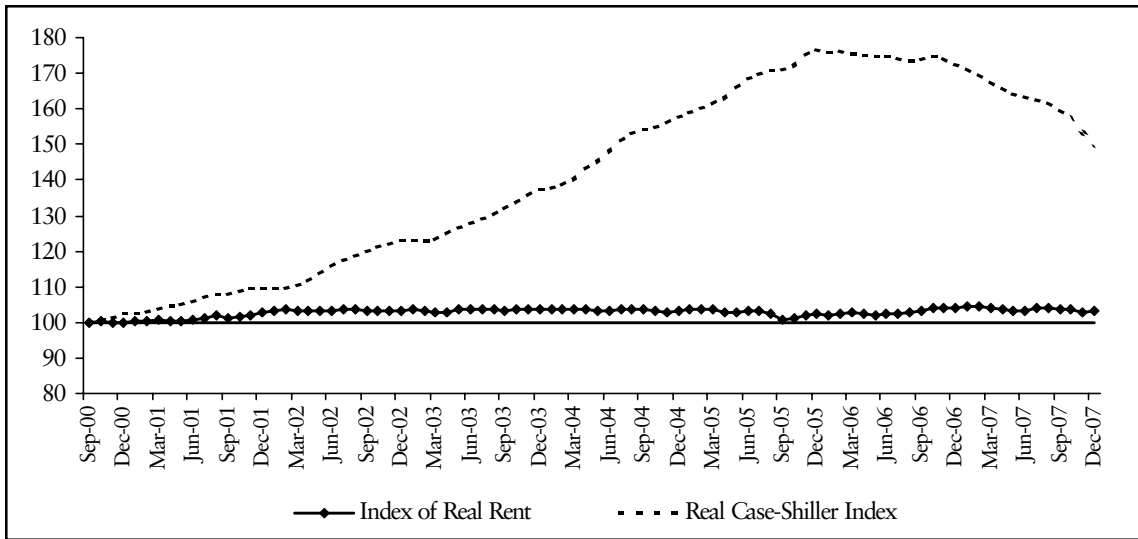
³⁸ In the period 1991-95, the housing market was depressed and the ratio of home prices to rent dipped below its long-term magnitude.

³⁹ As given by the historical relationship.

formance of the economy raising real rent in the foreseeable future.⁴⁰ Nor was there any development to suggest that the real rate of interest would tend to go down in the long run.

The hallmark of a bubble, let us recall, is the widespread belief that the expected increase in prices closely corresponds to the current price increases, irrespective of other economic trends. On the basis of this criterion, the Case-Shiller annual surveys of home buyers, conducted between 2003 and 2007, provide clinching evidence of a bubble psychology⁴¹: "... times and places with high home price increases show

CHART 1
Real Rent and Real Case-Shiller Index



1	2	3	4
	1991-95	1996-2000	2001-05
2 GDP Growth Rate	2.47	4.1	2.32
3 Unemployment Rate(%)	6.59	4.61	5.43
4 Case-Shiller Inflation	-1.14	6.98	14.31
5 CPI Inflation	3.13	2.48	2.55
6 Row 4 - Row 5	-4.27	4.5	11.76

Note: Growth rates are year-on-year.
Source: Estimated from Table A.2.

⁴⁰ Remembering that except for a temporary decline during the Second World War, housing as a ratio of personal consumption remained stable at around 15 per cent between 1919 and 2007 (Shiller, 2007).

⁴¹ After the housing market had slumped in 2007, the mean expected one-year price increase became negative.

high expectations, and when the rate of price increases changes, so too do expectations of future price increases, in the same direction” (Shiller, 2007). Such expectations, despite the stagnation of real rent and absence of any indicator of enhanced macro performance in the future, clearly suggest the unsustainability of the housing boom during this period.

Alternative Explanations of the Crisis: An Evaluation

In the context of the behaviour of the housing market during 1996-2006, let us examine how far the three alternative hypotheses noted at the beginning of the present section can adequately account for this behaviour. Consider first the role of imprudent subprime mortgages, characterised by (a) ARMs with teaser rates cum large loan-to-value ratios; and (b) not only incomplete documentation, but often outright fraud in respect of the borrowers’ credit characteristics—something which has made these mortgages earn the sobriquet “liar” or NINJA loans. The strong evidence adduced in support of this hypothesis is that there was a proliferation of such imprudent mortgages during 2005-06 and it was the delinquency of many of them soon after their origination that triggered off the subprime crash.⁴²

Subprime originations and ARMs did register a jump in 2005-06 (*Table 1*); there was to be sure also a rise in the default rate from Q₃, 2006 (*Table 3*). As of Q₃, 2007 though subprime ARMs accounted for no more than 6.8 per cent of aggregate mortgage loans outstanding, the foreclosure starts in the former were as much as 43 per cent of total starts (*Table 4*). Indeed, in Q₃, 2007 while the rates of foreclosure starts for prime fixed and prime ARMs were 0.47 and 2.18 per cent respectively, the corresponding rates for subprime fixed and subprime ARMs were 3.22 and 10.69 respectively.

However, though the burgeoning subprime ARM including NINJA mortgages undoubtedly triggered off the crash, they did not it seems constitute a basic source of the housing trouble. Note first that the home price inflation in both nominal and real terms reached their peaks around Q₃, 2004 and by Q₁, 2005 the inflation was already decelerating⁴³ (*Table A.2*). Second and more significant as per our earlier analysis, over 2000-04 the gap between the real house price appreciation and the increase in real rent had already become yawning, with the former averaging 10.7 per cent per annum compared with a minuscule 0.7 per cent clocked by the latter. Thus the deterioration of lending standards during 2005-06 did not play much of a part in

However, though the burgeoning subprime ARM including NINJA mortgages undoubtedly triggered off the crash, they did not it seems constitute a basic source of the housing trouble.

⁴² Thus according to Cole, Director, Banking Supervision, Federal Reserve, “Borrower performance deterioration in the subprime market has been concentrated in loans made very recently, and problems in these loans started to become apparent in the data during the latter half of 2006” (Cole, 2007).

⁴³ As Bernanke (2007a) notes, the downturn in the house market surfaced in the summer of 2005 and since then sales of both new and existing homes have been on the decline (due to demand deficiency).

TABLE 3
Foreclosure and Default Rates in US Mortgages

1 year	2 Foreclosure rate (% of all loans outstanding)	3 Default rate (% of all moer- gage loans)*	4 Default rate (% of subprime ARM**)	5 Default rate (% of all sub- prime loans)
1 2005(Q2)	1	NA	NA	NA
2 2005(Q4)	NA	4.7	NA	12.39
3 2006(Q3)	1.05	4.67	13.22	12.56
4 2006(Q4)	1.19	4.95	14.44	13.33
5 2007(Q2)	1.4	5.12	NA	15
6 2007(Q3)	1.69	5.59	NA	NA

* Default rate for mortgage loans on one-to-four-unit residential properties.
** Default rate for subprime adjustable rate mortgages(ARM).
Source: 1) Mortgage Bankers Association (2007);
2) www.finfacts.com;
3) Bloomberg Report (5th Nov. 2007).

TABLE 4
Statistics on Distribution and Foreclosure of Different
Types of Loan as in 2007-Q3

1	2 Amount of Loans Outstanding* (in Billion)	3 No. of Foreclisure Starts**	4 Percent of outstanding loans	5 Percent of foreclosure started
1 Total Prime	8055.0	63.68	77.60%	36.30%
1(a) Prime fixed	6549.9	30.88	63.10%	17.60%
1(b) Prime ARM	1505.1	32.81	14.50%	18.70%
2 Total subprime	1359.8	96.49	13.10%	55.00%
2(a) Subprime fixed	654.0	21.05	6.30%	12.00%
2(b) Subprime ARM	705.9	75.43	6.80%	43.00%
3 FHA & VA	965.4	15.26	9.30%	8.70%
4 Total	10380.2	175.43		

*Values are estimated from data given in source 2 and column 4 of this table.
** The numbers are estimated from column 2-row 6 of Table 3 and column 2-row 4 and column 5 of this table.
Source: 1) Mortgage Bankers Association (2007);
2) Federal Reserve Statistical Release (<http://www.federalreserve.gov/releases/h15/data.htm>).

creating the basic supply-demand imbalance in the housing market. Finally, a look at *Table 1* suggests that the house market bubble and bust were related more to aggregate or prime loans than to subprime mortgages. Apart from the fact that even at their height in 2005-06 subprime originations were no more than one-fifth of the total, it needs to be noted that it was the significant increase in prime lending between 2000 and 2003 and its subsequent slowdown and decline over 2004-06

that closely corresponded to the accelerating and the decelerating phases of the Case-Shiller inflation—something which cannot be said of the temporal behaviour of subprime mortgages. Indeed, it is much more reasonable to argue that the jump in subprime originations during 2004-05 was driven by the steep fall in the delinquency rate among borrowers due to burgeoning house prices in the earlier period—a fall that made an increasing number of low income borrowers eligible for mortgage loans. This is however not to deny that subprime mortgages had a non-negligible role in the timing of the housing bust and its contagion.⁴⁴

So far as the Fed's role in the formation and bursting of the bubble is concerned, during 2001-06 there was indeed, as we have already seen, a close correspondence between the boom and decline in housing investment on the one hand and the cutbacks and hikes in the federal funds rate on the other. The successive cutbacks in the rate after 2000 are deemed to have provided a boost to residential construction. The downturn in the housing market is also attributed to the Fed policy: as the funds rate was being raised from mid-2004, there occurred after a lag of a couple of years a decline in housing investment (Taylor, 2007) along with a crash in home prices (*Tables A.1, A.2 and A.3*).

As Shiller (2007) points out, the (lagged) relationship between the federal funds rate and residential investment—the main plank of the Taylor thesis—had never been observed before during the entire period since 1950. What is no less important to note, the relation was characterised by a major asymmetry that is somewhat at variance with economic logic. Between November 1998 and January 2001 the federal funds rate was raised from 4.75 to 6.0 per cent; but there was a significant step-up in housing investment as also a steeply upward trend in the ratio of residential to total investment from Q₁, 2001 to Q₁, 2005—a period which saw sharp cuts in the funds rate followed by its upward revision in successive steps. If residential investment is indeed driven by the federal funds rate, the lag if any should be more important for hikes than for cuts in the rate: both denial of loans and postponement of (new) residential construction are easier than implementing plans for an increase in mortgage financed investment in housing.

There are other and more fundamental reasons for believing that the Fed policy (at least on its own) was not primarily responsible for the formation and bursting of the housing bubble. First, with the growing link of the mortgage market with the domestic and international capital market, the impact of the federal funds rate on home finance had been reduced considerably.⁴⁵ Second, for a durable, fixed

The successive cutbacks in the rate after 2000 are deemed to have provided a boost to residential construction. The downturn in the housing market is also attributed to the Fed policy.

⁴⁴ As we shall presently discuss.

⁴⁵ According to Bernanke (2007a), "... in the absence of Reg(ulation) Q ceiling on deposit rates and a much reduced role for deposits as a source of housing finance, the availability of mortgage credit today is generally less dependent on conditions in short-term money market, where the central bank operates most directly."

The *proximate* reasons for the phenomenon should thus be sought in factors operating in the housing sector, not in the short-term money market where the Federal Reserve operates.

investment like housing, rational economic agents may be expected to focus on long-term fundamentals, not on anti-cyclical monetary (or fiscal) policies. Third, both the buyers in the housing market and mortgage lenders ignored, as already observed, the growing divergence between real home prices and real rent—a crucial factor not related⁴⁶ to the Fed policy. Fourth, the imbalances in the housing market were closely linked to a sharp fall in the interest spread on mortgage loans. This reflected a major change in banks' assessment of riskiness of housing finance and/or in their risk-management capability—a change that would constitute a better explanation⁴⁷ of the subprime crisis than the loose monetary policy followed by the Fed.

Last and perhaps the most important, the impact of a cheap or dear money policy if any should, one may reasonably expect, be roughly the same on most categories of investment. During 2001-05 there was no trend in total investment as a ratio of GDP. In sharp contrast, residential investments displayed a steeply upward trend, rising (as percentages of total and fixed investment) from 20 and 25 per cent to 30 and 36 per cent respectively between Q₁, 2001 and Q₂, 2004, and further to 31 and 38 per cent respectively in Q₄, 2005. The rise in only one type of long-term investment⁴⁸ in response to an overall (macroeconomic) anti-cyclical measure—a response which was never observed before—is extremely difficult to rationalise in terms of economic principles or motivations. The *proximate* reasons for the phenomenon should thus be sought (as a first approximation) in factors operating in the housing sector, not in the short-term money market where the Federal Reserve operates.

In Shiller's explanation of the crisis the core element consists of the socio-psychological factors and cascading forces arising therefrom, rather than mundane or mainstream economic motivations. The formation of the home price bubble in this approach is traced to “a feedback mechanism operating through public observations of price increases and public expectations of future price increases” (Shiller, 2007). In the context of the subprime crisis, Shiller identifies “new era stories” of capitalism—concerning the prospects of phenomenal economic growth along with unrelenting home price increases everywhere—highlighted in the media and “spread through word of mouth”—as the driver of emotional speculative interest in the housing market, the feedback and the contagion. “But the feedback ... cannot go on forever, and when prices stop increasing, the public interest in the investment may drop sharply: the bubble bursts” (Shiller, 2007).

⁴⁶ At least directly.

⁴⁷ In the sense that it implies a fall in the market rate of interest relevant for investors, even if the long-term factors driving the macroeconomy remain unchanged.

⁴⁸ While other categories of investment were stagnant or declining for the most part.

Shiller's analysis, as we have seen earlier, provides convincing evidence of a housing bubble during the reference period. However, his explanation of the formation and bursting of the bubble purely in terms of social-psychological factors appears inadequate. One problem with the Shiller-type theory is its lack of predictive power: while the story may sound plausible, it does not help distinguishing situations when price increases due to operation of normal economic forces will end up in a bubble or not. In fact, even when a boom is in full swing, it is difficult to be sure whether there is a bubble or the expectations driving the price increase have some sound economic foundations.

Second and more important, psychological factors are undoubtedly important or even crucial in the formation of a bubble, but the economic environment in which they operate are often equally if not more important: Shiller's view in this context that not only did the Fed policy have very little to do with the bubble, but the proliferation of new mortgage institutions and financial innovations were the consequence rather than the cause of the housing boom, does not, our analysis in the second section suggests, appear well founded.

Finally, the central agent in the Shiller thesis is the home buyer. It is his susceptibility to media stories irrespective of their economic rationale that, according to the thesis, lay at the root of the subprime problem. Such susceptibility is not unknown even among investors who are otherwise exceptionally rational.⁴⁹ However, in the run-up to the subprime crisis it was not only the buyers who proved to be the most credulous or gullible; if anything, they were much more sensible than the proverbially cool and hard-headed financiers who went in for big bets on a continuation of home price inflation. With enhanced liquidity in the housing market, buying a house can be sensible short-term investment even if the buyer himself does not expect prices to go up in the medium or the long run: the return would be fairly high if the *average* investor expects the prices to rise in the short run⁵⁰ (Keynes, 1936). Moreover, in most ARMs the loan-to-value ratio was 80 per cent or more, and payments during the first 2-3 years were exceptionally low, but ballooned thereafter. These features along with tax-deductibility of interests made mortgage financed home purchases a two-way bet for the investor: if house prices rose before the rates are reset, with the accumulated home equity he could refinance the mortgage or sell the house outright with a profit; if the prices went down below the amount of loan outstanding, he could walk out of the

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⁴⁹ Recall the loss suffered by Isaac Newton in the South Sea Bubble in the 1720s and by Irving Fisher in the 1929 stock market crash. Fisher's assessment of the situation on the eve of the crash constitutes a most eloquent testimony of the triumph of emotion over reason: "Stocks have reached what looks like a permanently high plateau."

⁵⁰ And hence pushes the prices up. Such behaviour produces volatility, but cannot be considered irrational.

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mortgage with very little loss remembering that the payments made may not be more than the total (imputed) rent for the period of his occupancy.

In sharp contrast, the behaviour of mortgage insurers, banks and other financial entities having direct or indirect exposure to the mortgage market defies all economic logic. Compared with the home buyers, long-term fundamentals of the housing market should have been of much greater concern to these entities, but palpably were not.⁵¹ What is much more curious, all financial organisations including rating agencies are now-a-days guided by highly sophisticated models of assessment and management of risks where there is (or should be) little room for irrational exuberance of individual economic agents. We thus need to go beyond the Shiller hypothesis and consider the interplay of real, financial and psychological factors for an adequate explanation of the roots and the unravelling of the housing troubles.

IV. The Housing Cycle: Interaction of Real and Financial Factors

For identifying the main forces at work and their intertwining in the course of the housing boom and bust, it seems useful to distinguish among three phases of the housing cycle: recovery, boom, and downturn. We have already mentioned the significance of some of these factors in the previous two sections in the context of our discussion of the mortgage market and alternative explanations of the subprime crisis. We need now to examine their role along with that of other factors in the course of the upward and the downturn phases of the cycle.

Recovery 1996-2000

The initial optimism in the housing market may be traced to a combination of real and financial factors operating during 1996-2000. The earlier quinquennium 1991-95 was characterised by a depressed housing market, with both nominal and real home prices drifting downward, and the latter falling below the equivalent real rent. Nominal prices started recovering from Q₂, 1996; however, only from Q₁, 1997 did the Case-Shiller inflation manage to catch up with the CPI inflation. In fact, it took about three more quarters before the housing market seemed to have finally recovered from the slump it had descended into and the signs of a robust upturn in home prices along with some improvement in housing starts became clearly discernible (*Tables A.2 and A.3*).

⁵¹ With the risk borne by lenders rather than home buyers. Thus the subprime crisis proved wrong not only the IMF (2007), but Socrates (or Plato) as well!

The most important factor behind the recovery and the surge of the housing market was the all round improvement of the macro-economy during the second half of the 1990s. Between the two periods, 1991-95 and 1996-2000, the average GDP growth registered a 1.6 percentage point increase, from 2.5 to 4.1 per cent, along with a decline in the unemployment and CPI inflation rates from 6.6 and 3.1 per cent to 4.6 and 2.5 per cent respectively (*Table 2*). No less if not more important perhaps was the fact that this improvement from Q_1 , 1996 onward was practically uninterrupted until late 2000⁵² (*Table A.2*). As the economy experienced robust GDP growth with falling unemployment over five successive quarters (from Q_1 , 1996 to Q_1 , 1997), first the nominal and then the real home prices stopped declining (in March 1996 and April 1997 respectively). It was the continuation of this exceptional growth-employment scenario during Q_2 , 1997- Q_4 , 2000 that seems to have led house prices to rise at a faster rate than CPI and ended up fostering a boom psychology.

The role of financial factors during this phase of the housing cycle was mostly supportive, not crucial. For one thing, except for two temporary 25 basis point cuts⁵³ (in October-November, 1998) in the wake of the Russian debt default and the Long-Term Capital Management (LTCM) debacle, monetary policy was far from loose during the entire period; in fact, the overall trend of both the funds rate and the yield on Treasury Bills was mildly positive—something which suggests the dominance of demand side factors during this quinquennium.

Despite the absence of an easy money policy, the recovery and surge of the housing sector were not impeded by a financial constraint. The reason lay primarily in the transformation of the mortgage market noted in Section II. Changes in the legal-cum-institutional framework along with securitization and other financial innovations helped greatly in augmenting the supply of mortgage loans; so did the entry of private mortgage insurers and private mortgage pools for financing first (conforming) prime, then jumbo, Alt-A and subprime borrowers. As *Table 1* indicates, though subprime originations were on the rise, their share in the total (at about 12 per cent) was not large enough to affect significantly the trend in the housing market; it was the prime (and partly Alt-A) mortgages that constituted the major source of home loans during this period. However, there was as yet no evidence of loan pushing. What financial innovations did, it seems, was to raise the elasticity of supply of loans by ensuring easy flow of funds from the domestic and the global capital market; but the increase in mortgage finance was driven primarily by demand side factors, viz., high GDP growth and growing labour absorption.

Despite the absence of an easy money policy, the recovery and surge of the housing sector were not impeded by a financial constraint. The reason lay primarily in the transformation of the mortgage market.

⁵² When GDP growth slowed to 2.5 per cent—still a respectable figure when compared with that of most OECD countries.

⁵³ The Fed started raising the rate from June 1999.

Home price inflation itself raised the supply of mortgage loans and helped in sustaining the boom. The declining default rate made an increasing number of applicants eligible for mortgage loans, enabled MBSs and CDOs earn high credit ratings, and helped in drawing substantial funds from the domestic as well as the international capital market.

Housing Boom 2001-05

Unlike in 1996-2000, the home price inflation and the construction boom over the period 2001-05 cannot be accounted for by the performance of the macroeconomy; in fact, on that account the housing market ought to have been sluggish rather than booming. The average GDP growth and unemployment rates in this period were 2.3 and 5.4 per cent respectively compared with 4.1 and 4.6 per cent respectively in the previous quinquennium (*Table 2*). Even if one ignores the downturn⁵⁴ from Q₁, 2001 to Q₂, 2003, in the rest of the period also the average GDP growth was lower and the unemployment rate higher than in 1996-2000. Under this condition a rational economic agent would not expect (a) an increase in long-term GDP growth and a fall in the natural rate of unemployment beyond what had been attained in 1996-2000, and hence (b) a continuing rise in real house prices. Nor should such an investor have been swayed by declining interest rates over 2001-04, since the fall, as *Table A.2* suggests, was clearly a consequence of the Fed's anti-cyclical policies⁵⁵ and hence should not have been of much significance in deciding on the acquisition or financing of an asset expected to last for 50 years or more. Quite clearly, the housing market during this period exhibited all the symptoms of a bubble.

The formation of the bubble and its sustenance may be traced to the mutually reinforcing impact of the following set of factors. First, with an uninterrupted rise in home price inflation⁵⁶ during 1996-2000, there appears to have occurred an increasing optimism among economic agents more and more of whom came round to expect house prices to increase indefinitely. Such belief, when widely held, tends to raise house prices through an increase in both the reservation price of home owners⁵⁷ and the demand price of prospective buyers.

Second, home price inflation itself raised the supply of mortgage loans and helped in sustaining the boom. Prolonged price increases boosted the accumulated amount of home equity⁵⁸ and reduced significantly the rate of default: with the equity at his disposal an owner could easily refinance the mortgage debt or sell the house outright. The declining default rate made an increasing number of applicants eligible for mortgage loans, enabled MBSs and CDOs earn high credit ratings, and helped in drawing substantial funds from the

⁵⁴ Following the bursting of the dotcom bubble.

⁵⁵ So that there was nothing to believe that the interest rate would tend to go down in the long run.

⁵⁶ And not simply in the absolute level of house prices. See *Table A.2*.

⁵⁷ This is what is relevant on the supply side since additional houses that can be built in the short run are small in relation to the existing stock. This also makes the Marshallian rather than the Walrasian adjustment mechanism more relevant in the housing market.

⁵⁸ Measured by the difference between the current market price of the house and the amount of mortgage debt outstanding.

domestic as well as the international capital market.⁵⁹ At the same time the fall in the perceived riskiness of exposure in the mortgage market led to a shrinkage in the interest spread on mortgage loans⁶⁰ (implying a rightward shift of the supply schedule).

Third, the augmented supply of credit fuelled the actual and hence expected home price inflation, which, given the low borrowing cost, made housing a highly attractive investment option. In other words, through its positive effect on both the demand and the supply side of the mortgage market, the home price inflation tended to become self-perpetuating.

Fourth, with an increasing number of borrowers buying houses primarily as investment rather than for long-term residential purposes, expectations of short-term capital gains and losses, *a la* Keynes (1936), rather than the economic fundamentals of the housing market, became a major factor in the course of the formation of the bubble.

Finally for the link between the easy money policy and the home price bubble. In our discussion on the Taylor thesis in the previous section we have discounted the role of the Fed in the formation and bursting of the bubble: in respect of an extremely durable investment and its financing, rational economic agents, we have argued, would be guided by long-term rather than palpably transient factors. However,

TABLE 5
Fed Funds Rate and Yields on U.S. Government Securities

	1	2	3	4	5	6
1	Year	Fed Funds Rate*	6 Month**	10 Year#	20 Year#	30 Year#
2	1995	5.83	5.56	6.57	6.95	6.88
3	1996	5.30	5.08	6.44	6.83	6.71
4	1997	5.46	5.18	6.35	6.69	6.61
5	1998	5.35	4.83	5.26	5.72	5.58
6	1999	4.97	4.75	5.65	6.2	5.87
7	2000	6.24	5.90	6.03	6.23	5.94
8	2001	3.88	3.34	5.02	5.63	5.49
9	2002	1.67	1.68	4.61	5.43	5.43
10	2003	1.13	1.05	4.01	4.96	NA
11	2004	1.35	1.58	4.27	5.04	NA
12	2005	3.22	3.39	4.29	4.64	NA
13	2006	4.97	4.81	4.8	5	4.91
14	2007	5.02	4.44	4.63	4.91	4.84

* Federal Funds Effective Rate.

** Annualized using a 360-day year or bank interest on a discount basis.

Yields on actively traded non-inflation-indexed issues adjusted to constant maturities.

Source: <http://www.federalreserve.gov/releases/h15/data.htm>.

⁵⁹ Especially since there was a significant slowdown in demand for production and investment loans in other sectors during 2001-04.

⁶⁰ Over the yield on government securities of similar maturity.

While the short-term interest rates are directly affected by the federal funds rate, it can affect long-term rates only through changes in expectations of economic agents regarding the future short-term rates.

though the exceptionally low interest rate regime after 2000 was obviously due to the Fed's counter-cyclical policy, on the face of it the policy seems to have had some effect on the housing market.

As *Table 5* shows, changes in the federal funds rate and that in the yields on the short- as well as the long-term government bonds were strongly and positively correlated.⁶¹ Since the rates on the fixed and adjustable rate mortgages were set with a mark-up on the yields of long- and short-dated government securities respectively, the Fed policy might appear to have played an important role in fostering the housing boom over the period 2001-05. Note however that while the short-term interest rates are directly affected by the federal funds rate, it can affect long-term rates only through changes in expectations of economic agents regarding the future short-term rates: when a cutback (hike) in the funds rate induces people to expect a fall (rise) in short-term interest rates in the future, the current long-term interest rate⁶² would also tend to fall. It is through such changes in expectations that a loose money policy can provide an upward thrust to home prices and residential investment irrespective of whether mortgages are fixed or adjustable rate⁶³: given the prospective stream of future rents, an expectation of a fall in future interest rates would make economic agents revise upward their expected home prices in the future—which through its favourable impact on both the demand and the supply side of the mortgage market, as we have discussed, tends to add to the inflationary pressure in the housing market.

The problem with the above line of reasoning lies in accounting for the positive relationship between the current short-term interest rates and the expected future short-term rates in the long run. Since the short-term rates during the reference period were driven by the Fed's anti-cyclical policies, rational economic agents, we have argued, should not have based their long-term expectations on the current changes in short-term rates. Nor is it reasonable to invoke socio-psychological factors, as in the case of the stock or the home price bubble, to account for such expectations in respect of interest rates. A more plausible explanation of the phenomenon may perhaps be sought in terms of changes in the core inflation expectations. As *Table A.2* shows, there was a mildly declining trend in the core inflation during 1995-2000 and the trend became strongly negative over $Q_1, 2001—Q_2, 2004$. This fall was generally attributed to two sets of factors. First, the Fed, it was widely believed, was becoming increasingly adept at taming inflation (as well as at avoiding large swings in economic

⁶¹ Except in 2005 for the 20-year government securities.

⁶² Which approximates the average of future short-term rates plus a risk premium.

⁶³ As the previous footnote suggests, with lenders and borrowers having similar expectations, the equilibrium amount of loan originations will not depend significantly on the form of the mortgage.

activity) so that the declining trend in the average inflation rate was expected to continue also in the future. Second, with continuation of improvements in transport facilities, the increasing importance of cheap imports from China and other low-cost countries, and rising factor productivity along with the dominance of inflation hawks among central bankers practically everywhere, an expectation of a downward drift in inflation did not appear unreasonable.

The change in inflation expectations in their turn led economic agents to believe that the average (or cyclically adjusted) short-term interest rates would tend to soften in the future. Note that the strongly downward movement of the core inflation rate from early 2001 to mid-2004 coincided with the sharp cutbacks in the federal funds rate⁶⁴ so that this policy, rather than the change in people's expectations regarding the longer term inflation *and* hence interest rates, has come to be regarded as *a* if not *the* major factor behind the housing boom. Be that as it may, though inflation expectations might have been important in causing the southward movement of long-term interest rates and played a role behind the sharp rise in mortgage originations, the significance of this factor in an explanation of the house price bubble and bust may easily be overemphasised.

Downturn and Crash 2004/05—

A fair number of indicators suggest that the housing boom started losing its steam from Q₃, 2004, even though it took six more quarters before signs of a serious downturn became evident. The Case-Shiller inflation reached its peak (at more than 20 per cent) in July-August, 2004, was on a steadily downward course thereafter up to end 2005, and came crashing from early 2006 (*Table A.2*). This was also true of the real home price inflation,⁶⁵ though its decline was steeper than that of the Case-Shiller inflation. The tapering off and fall in mortgage originations from 2004 (*Table 1*) are also in accord with the aforementioned phasing of the home price cycle. However, the phasing of residential construction and housing starts were somewhat different. As *Tables A.2* and *A.3* show, the downturn in the growth of housing starts⁶⁶ coincided more or less with that in the Case-Shiller inflation rate. But residential investments as ratios of GDP and aggregate private investment⁶⁷ did not reach their peak until Q₃, 2005, though since then the decline in the two ratios was fairly rapid and amounted to 1.8 and

A fair number of indicators suggest that the housing boom started losing its steam from Q₃, 2004, even though it took six more quarters before signs of a serious downturn became evident.

⁶⁴ Note that there is no one-to-one correspondence between the unemployment rate and the core inflation since traded goods prices have become important for the latter.

⁶⁵ As given by the difference between the Case-Shiller inflation and the CPI inflation rates in *Table A.2*.

⁶⁶ The starts are in numbers and hence are not comparable with investment figures which are in nominal or constant USD terms.

⁶⁷ The second ratio is a better indicator of the behaviour relating to investment in housing.

In the short run real house prices may go up at a faster rate than rent; but this would be in accord with economic fundamentals only if the long-term GDP growth and rent are expected to go up.

8.4 percentage points respectively over the ensuing nine quarters. Since housing starts can be delayed or even abandoned without much difficulty, but residential construction, once in progress, can be postponed only at a fairly high cost, it appears reasonable to take Q₃, 2004 as the upper turning point of the housing cycle, though unambiguous symptoms of the slide became evident only from Q₁-Q₂, 2006.

That the housing boom ended in a crash is not a major surprise: all bubbles burst sooner or later and the US one could be no exception. The problem lies in a satisfactory explanation of the precise timing of the downturn, though this is true in practically all instances. However, it is possible, especially with the benefit of hindsight, to identify the incipient forces that made the home price-cum-construction boom increasingly unsustainable. Since the bursting of a bubble reflects the ultimate insuperability of market fundamentals, for an adequate appreciation of the factors behind the downturn in the housing market, it is useful to start with these fundamentals.

Demand and Supply in the Housing Market

In the absence of speculative bubbles the real home prices, as already observed, should be governed primarily by the flow of expected rent the house is expected to fetch during its life-time.⁶⁸ In any period while the supply of housing services is fixed (given the stock of houses), demand depends mostly on personal income. Hence the expected rent in the long run should, apart from demographic factors, depend on expected GDP growth, the income (and price) elasticity of demand for housing services and the long-term price elasticity of supply of residential houses.⁶⁹

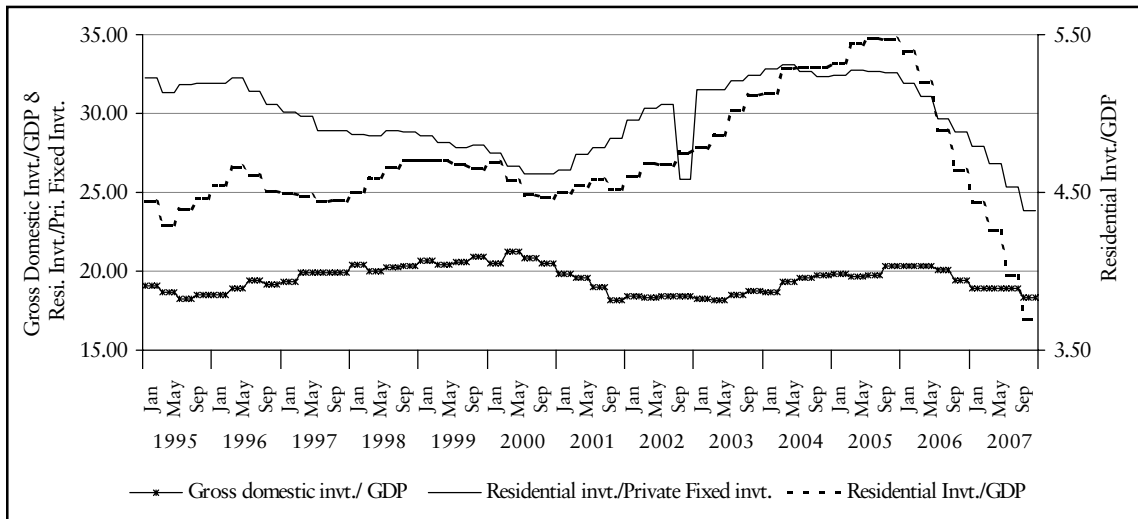
So far as the US economy is concerned, it is pertinent to note that housing as a percentage of personal income remained stable between 1929 and 2007, except for a temporary dip during the Second World War (1939-45). This confirms the overwhelming importance of GDP growth as a driver of rent and real house prices in the long run. In the short run real house prices may go up at a faster rate than rent; but this would be in accord with economic fundamentals only if the long-term GDP growth and rent are expected to go up. The rise in prices leads to an increase in residential construction until the adjustment in supply in relation to the enhanced demand for housing services re-establishes the equilibrium price-rent ratio. But when home prices are driven by short-term expectations based primarily on recent price increases, not only is there a bubble, but the accompanying changes in real investments sow the seeds of its bust and a prolonged supply-demand imbalance in residential houses. Let us consider the nature of this imbalance in the course of the US housing boom and bust.

⁶⁸ Apart from expectations relating to interest rates over the period.

⁶⁹ Which in its turn depends on the long-term elasticity of transformation between houses and other goods and services.

As Table A.2 and Chart 2 show, between 1995 and 2007, aggregate investment as a percentage of GDP was fairly stable, at around 19.5 per cent.⁷⁰ Over the six-year period 1995-2000 the ratio of residential to total investment also remained practically unchanged, averaging 22.95 per cent. But from early 2001 the ratio showed a sharply upward trend, reaching 27.3 per cent by Q₄, 2003, and remaining close to 28 per cent up to 2005. The implication is that over the quinquennium the supply of residential housing services was growing at a faster rate than that for other types of consumption goods. This put downward pressure on real rent, even while real house prices were rising at an unprecedented rate. The point to note in this connection is that the rise in real rent (and in real rent-equivalent prices) is (are) crucially dependent on the increase in income originating in the non-housing relatively to that in the housing sector. Hence the growing supply-demand imbalance in the housing market⁷¹ in the course of the bubble produced a dampening effect on real rent, and made a continuing rise in real house prices more and more unsustainable. The result was not only a downturn and complete reversal of market expectations, but in all probability a long-drawn process of contagion with strong feedback from the rest of the economy—something we shall presently go into.

CHART 2
Time Profile of Investment Ratios



Source: Bureau of Economic Analysis, U.S. Department of Commerce (<http://www.bea.gov>).

⁷⁰ The coefficient of variation was 0.04.

⁷¹ Or what Marx (1894) would have called “disproportionality”, identified as one of the major sources of the capitalist crisis.

Despite its moderation and downward trend, the home price inflation still remained high and came down to the single digit level only in Q₂, 2006. The decline in inflation led to a sharp rise in the subprime delinquency rate in the second half of 2006.

The supply-demand imbalances in the housing market were accentuated further by other structural changes in the US economy. The period under review was, as we have seen, characterised by an accelerated growth in homeownership among the relatively low income earners, backed by a phenomenal rise in subprime lending. However, the period also witnessed a marked increase in inequality of income. Technical-cum-organisational improvements were fast, but severely biased in favour of high-skill labour. Increasing globalisation with burgeoning imports from China and other emerging market economies (EMEs) reduced significantly the demand for common labour relatively to that of capital and skilled labour. The result was that increases in wages and incomes of unskilled workers lagged far behind the rise in profits and salaries. Thus while real prices of all categories of residential houses were rising at a faster rate than real rent, the disjunction was much greater in the fastest growing part of the housing sector. Matters were not helped by (a) large scale production and job losses in the rust belt with its loss of comparative advantage in steel, automobile and other industries; and (b) the resulting negative impact on other economic activities in these regions. Even when demand in other regions was on the rise, difficulties of labour movement and sharp differences in skill requirements of the sunset and the sunrise industries made absorption of common labour (even at lower wages) time consuming. Meanwhile widespread delinquencies and foreclosures in the decaying regions tended to produce a negative impact on investors' sentiment and contributed towards the slowdown of home price inflation and busting of the boom.

Financial Impediments

While the operation of economic fundamentals made a downturn in the housing market inevitable, its actual trigger appears to have come from the financial market. The beginning of the end of the housing boom, as already noted, was from the fourth quarter of 2004 and this was directly related to a sharp decline in mortgage finance. Between 2003 and 2004, the amount of mortgage originations came down by as much as 26 per cent. The fall in prime-cum-Alt A mortgages was much larger (as 34 per cent), and enough to outweigh the 62 per cent rise in subprime loans (*Table 1*). The financial constraint acted as a cooler in the housing market; but despite its moderation and downward trend, the home price inflation still remained high and came down to the single digit level only in Q₂, 2006. The decline in inflation led to a sharp rise in the subprime delinquency rate in the second half of 2006 and started making the housing and the CDO markets progressively bearish (*Table A.2*). It is thus not very difficult to see why practically all analysts identify the latter part of 2006 rather than the second half of 2004 as the upper turning point of the housing cycle. In view of the widespread prevalence of this perception, we need to discuss why the house price inflation, though decelerating, remained

double digit for nearly two years following the sharp fall and stagnation of mortgage loans from 2004.

The explanation of the phenomenon noted above seems to lie in (a) the relative stickiness of homeowners' expectations; and (b) the segmented nature of the housing market. When the decline in prime mortgage originations caused a slowdown in demand for houses at the upper end of the market, many homeowners still expected prices to go up more or less at the same rate and did not reduce their reservation price, especially since with their superior wealth-income position they could afford to wait for a better bargain. The result was a rise in unsold stock of houses and a sluggish downward adjustment in home price inflation. Thus there was a significant decline in sales of new and existing houses from the middle of 2005 (Bernanke, 2007); but the Case-Shiller inflation remained above or close to 16 per cent throughout the second half of the year and exceeded 10 per cent during January-April, 2006. Again, though finance for relatively expensive houses declined, there was a substantial increase in home loans to lower-income group borrowers. The implication was that, given the segmentation of the two categories of houses, while the postponement of sales by better-off homeowners moderated the fall in inflation of good-quality houses, prices of low-income group houses tended to rise. Hence there was a much slower decline in the average home price inflation than one would expect from the fall in aggregate mortgage originations. However, with the rise in the stock of unsold houses, inflation decelerated at a sharper rate, the average expectations reversed, subprime delinquencies mounted, and the excess supply conditions in the housing market became worse and worse.

While considering the sources of decline in housing finance from 2004, it may be noted that for prime mortgage originations there was a relatively thorough scrutiny of the borrowers' overall financial position and other factors that could turn the loans non-performing. Several developments since 2000 tended to raise the financial vulnerability of the US households. As *Table A.4* shows, in sharp contrast to the period 1995-2000 when the increase in household indebtedness was quite slow, between 2000 and 2004 households' mortgage debt and total debt as ratios of household disposable income soared from 67 per cent and 98 per cent to 90 per cent and 122 per cent respectively. The rising debt burden of households along with their large scale home equity withdrawal for financing consumption⁷² apparently made government backed insurers and GSEs cautious in extending their exposure in the mortgage market.

Between 2000 and 2004 households' mortgage debt and total debt as ratios of household disposable income soared from 67% and 98% to 90% and 122% respectively.

⁷² The resulting fall in (net) home equity made the lenders highly vulnerable to a house price shock: if the equity turned negative, households would tend to walk out of the mortgage contract.

The proliferation of subprime ARMs delayed the crash, but tended to create larger imbalances in the housing market and make the crash more severe than it otherwise would have been.

The actual and prospective hardening of interest rates also played an important role in reducing the flow of prime loans from banks and other finance companies. The sharp reduction in the interest spread on these loans during the housing boom made the lenders highly vulnerable to interest rate shocks so that at the first sign of an upward trend in interest rates there was a cutback in low-yield (prime) mortgage loans. The problem for banks was compounded by the fact that (a) their leverage ratio was exceptionally high; and (b) they relied heavily on short-term loans for funding their mortgage-backed assets which were intrinsically long-term (but did not offer a commensurate yield). While SIVs and conduits floated by commercial banks very often borrowed more than ten times their own capital and relied mostly on three-month asset-backed commercial papers (ABCPs), big investment banks had a much larger leverage ratio and apart from ABCPs, also used overnight borrowing facility to the tune of 10 to 15 per cent of their total assets.⁷³ With increases in short-term interest rates prime mortgages with their relatively low and fixed yields⁷⁴ became less attractive.⁷⁵ Hence the increased supply of loans in the subprime markets where returns were higher, ARMs were perceived to provide protection against interest rate shocks, and tranching of mortgage pool securities deemed to offer a way out of the problems of marketability (liquidity) and low credit ratings of subprime mortgage backed securities. However, the proliferation of subprime ARMs delayed the crash, but tended to create larger imbalances in the housing market and make the crash more severe than it otherwise would have been.

V. Towards a Resolution of Subprime Puzzles

In our explanation of the subprime crisis in the previous section our focus has been on the operation of forces behind the housing boom and bust. In order to resolve the puzzles posed towards the end of the introductory section we need to consider the behaviour of and interaction between the real and financial sectors following the eruption of troubles in the mortgage and housing markets. The main issues in this context, let us recall, relate to (a) the disproportionately large fallout of a rise in subprime delinquency whose quantitative significance in relation to the total US financial assets was quite negligible; (b) the relative ineffectiveness of the Federal Reserve in curbing the financial meltdown and recessionary tendencies; and (c) the failure of highly sophisticated risk-management and credit-rating models in raising the shock absorptive capacity of the financial system. Let us consider first

⁷³ Note that neither the off-balance-sheet entities floated by commercial banks nor the investment banks were subject to the Fed rule concerning capital adequacy.

⁷⁴ Recall that the overwhelming part of prime mortgages were fixed rate (Table 4).

⁷⁵ And more risky.

the nature and routes of contagion an appreciation of which is not only directly related to (a), but will be of help in resolving (b) and (c) as well.

Meltdown Mechanism

Our analysis in Section IV makes it clear that though the crisis seemed to originate in the subprime mortgage market, the trouble had for quite some time been brewing in the entire housing sector, and the subprime problems, though by no means unimportant, were not crucial in the bursting of the housing boom. Hence looking at the magnitude of the meltdown suffered by the US⁷⁶ real and financial sectors in relation to the size of subprime defaults provides a distorted view of the casual links behind the crisis. As we have argued, the surge in subprime originations over 2004-06 magnified the already large imbalances in the housing market. What the jump in the delinquency rate of these mortgages along with the more than 10 percentage point decline in the home price inflation rate did was to make these imbalances palpable to economic agents and make them revise downwards their expected prices of both houses and mortgage based securities (MBSs). In the process of this revision, rational agents must have taken into account not only the problems financial institutions with large direct or indirect exposure to the mortgage market would face with the fall in house prices, but also the probable impact of the crisis on the real sector and its feedback on the financial system. Since adjustments in the financial market can be almost instantaneous while that in production and investment is relatively long-drawn, the huge write-downs and losses of financial entities even before the real economy had suffered a substantial slide, are not as unexpected as it might appear at first sight. To see why, we need to go into the mechanism of the downward spiral triggered off by bearish tendencies in the housing market. Let us consider first the routes through which the downward adjustment in the real sector takes place.

House Prices, Residential Investment and Aggregate Demand

There are two major routes through which a decline in home prices affects aggregate output and employment. The first consists of a cutback in residential investment. The magnitude of the impact operating through this route cannot but be substantial for the US economy, remembering that investment in housing accounted for nearly 28 per cent of the country's gross capital formation in 2005. According to Bernanke (2007a), the fall in construction of new houses *directly* reduced the US GDP by 75 basis points over Q₄, 2006—Q₃, 2007. This is apart from the demand reducing effect operating through the multiplier. That a fall in home prices would have a dampening effect on

Though the crisis seemed to originate in the subprime mortgage market, the trouble had for quite some time been brewing in the entire housing sector, and the subprime problems, though by no means unimportant, were not crucial in the bursting of the housing boom.

⁷⁶ Not to speak of the global.

With housing wealth aggregating at around USD 2 trillion, a 10% decline in home prices would effect a USD 100 billion cutback in household consumption in the first round and ultimately cause nearly a 1.3% GDP loss.

residential construction is not very difficult to appreciate. In the present instance apart from the actual fall in prices, the increase in the number of unsold houses and concerns regarding further declines in prices also tended to put off potential investors.

The wealth effect constitutes the second route through which troubles in the housing market are transmitted to the rest of the macroeconomy. The estimated effect (at about 5 per cent) is particularly large for the US economy in view of easy availability of credit against home equity. The quantitative significance of the effect operating through this route may be indicated by the fact that, with housing wealth aggregating at around USD 2 trillion, a 10 per cent decline in home prices⁷⁷ would effect a USD 100 billion cutback in household consumption in the first round and ultimately cause (with a multiplier of about 1.75) nearly a 1.3 per cent GDP loss (at USD 175 billion).

The macroeconomic impact noted above would be magnified by the operation of three other factors. First, the actual and the prospective fall in GDP would tend to reduce aggregate investment. Second, there is a negative feedback effect on the housing sector of the fall in income and employment in the rest of the economy. Third, since the US economy is far from “small”, operation of a negative foreign trade multiplier in the rest of the world due to a US downturn would also produce a negative feedback effect on the country’s economy.

The foregoing analysis suggests why even though other sectors of the (real) economy were relatively healthy to begin with, housing woes could easily degenerate into a general recession. Indeed, the crucial importance of the housing sector in this regard is attested by the fact that (a) eight out of the past ten US recessions were triggered by a fall in home building; and (b) all major declines in housing construction were followed by recessions except in two instances when the Korean and the Vietnam war expenditures helped to keep the aggregate demand afloat (Leamer, 2007; Feldstein, 2007).

Financial Deceleration

In our analysis of housing boom and bust in the previous section we have emphasised how—in the context of (a) the surge in ARMs with teaser rates and high loan-to-value ratios, and (b) large scale withdrawal of home equity for financing consumption—a fall in home prices led to a sharp rise in subprime default and foreclosure rates. The initial loss on account of this was not very large; however, the loss snowballed not only because of the contractionary process in the real sector considered above, but also since what Bernanke *et al* (1999) call the financial accelerator now operated in the reverse direction, magnifying the initial loss manyfold. Indeed, the financial

⁷⁷ According to Shiller (2007) in view of the wide gap between the rent equivalent and actual prices, a 50 per cent decline is “entirely possible”.

revolution over the last decade, summarised in Section II, has significantly strengthened the operation of the acceleration mechanism in both upward and downward directions. Let us consider the main channels through which a loss in the mortgage market tends to get magnified because of complex ramifications of the present-day financial system.⁷⁸

To the extent the increased delinquency causes only a commensurate fall in profits of commercial and investment banks exposed to the mortgage market, the adverse effect on the financial sector remains moderate. However, a jump in default rates tends to reduce prices of MBSs and CDOs and the reduction could be significant because of (a) expectations of further falls in home prices and the consequent rise in default and foreclosure rates in the future; and (b) the cumulative financial meltdown triggered off by the mortgage loss. Note that even without any feedback effect from the rest of the real sector, an increase in foreclosures itself tends to depress home prices in the neighbourhood and hence leads to further delinquencies and foreclosures, putting additional pressure in the market for mortgage based securities. Even a moderate fall in prices of these securities (irrespective of its reason) can, under the mark-to-market rule,⁷⁹ cause a substantial decline in the value of banks' assets and force them to make corresponding provisions in the balance sheet. As financial entities try to solve the balance-sheet problem by selling MBSs, the resulting fall in their prices reinforces the process of financial deceleration.

A few observations on some features of the process outlined above appear to be in order at this stage. First, the deceleration constitutes an important instance of the fallacy of composition so common in macroeconomics: To any individual holder, MBSs are highly liquid⁸⁰ and can be easily encashed to rearrange the portfolio; however, when a large number of holders try to do so, everybody suffers further capital loss, the portfolio rearrangement becomes still more difficult, and bankruptcies mount.

Second, when the leverage ratio is high, as it was for investment banks, SIVs, conduits and other entities with large exposure in the MBS market, the financial meltdown including bankruptcies also tends to be large. Indeed, as the leverage ratio rises, the extent of financial meltdown goes up at a faster rate. The reason is fairly simple. With (say) a 10:1 leverage ratio, a unit amount of write-down requires a financial firm to sell securities worth 10 units. Thus the higher the leverage ratio, the greater the downward pressure on securities prices,

A jump in default rates tends to reduce prices of MBSs and CDOs and the reduction could be significant because of expectations of further falls in home prices and the consequent rise in default and foreclosure rates in the future.

⁷⁸ Ignoring for the moment the loss due to the fall in output and employment as also the interaction between financial and real sectors which we take up in the next subsection.

⁷⁹ With the reprimands after the Enron debacle fresh in their memories, the auditors and accountants, it seems, are not bending the rules this time.

⁸⁰ In the sense that they are easily marketable without any loss of value.

Financial deceleration is strengthened by the slide in output and employment which in its turn is aggravated by drying up of sources of funds for supporting investment and consumption.

and the larger the capital loss and write-down resulting therefrom. Again, in a regime of declining asset prices, creditworthiness of a financial firm with a higher leverage ratio declines more and makes borrowing more expensive.⁸¹ The result is that the firm will be forced to liquidate more of its assets than what is indicated by the initial leverage ratio. Hence arises the possibility of a relatively small decline in asset prices pushing an otherwise efficient firm into a financial quagmire when the leverage ratio is high.

Third, when a large write-down forces investment and commercial banks to offload not only MBSs, but other assets as well, their market tends to turn bearish. Under these conditions investors try to switch to the safe haven of Treasury Bills so that problems faced by financial entities tend to become more serious. No wonder, their cumulative capital losses and write-downs could add up to several times the direct losses due to the rise in subprime delinquency.

The financial woes arising from the mortgage market were aggravated by large scale credit-rating downgrades in the course of the crisis and the opacity of structured securities constructed out of mortgage pools. Prices of securities that had been downgraded or put under credit watch tended to nosedive, accelerating thereby the meltdown in the financial market. The downgrades were only partly due to the actual increase in mortgage defaults; the more important reason was the change in the rating methodology in the context of the palpable deficiency of the models the agencies had earlier been using. The resulting loss of trust in the rating system of MBSs and the lack of transparency in CDOs sent alarm bells ringing throughout the financial market and produced a logjam which the Federal Reserve have been struggling to handle since August 2007, without much success so far.

Note finally that financial deceleration is strengthened by the slide in output and employment which in its turn is aggravated by drying up of sources of funds for supporting investment and consumption. Given the mutually reinforcing factors operating in the real and the financial markets, it is thus not very difficult to appreciate the enormity of banks' write-downs and losses in relation to the mortgage defaults during the period⁸² Q₃, 2006—Q₃, 2007.

Ineffectiveness of Monetary Policy

Our account of adjustments in the real and the financial markets following the rise in mortgage delinquencies helps to solve the riddle relating to the inability of the Federal Reserve to effectively deal with the contractionary tendencies in the economic system. As we have

⁸¹ Or even impossible, when the firm becomes quantity constrained in the loan market.

⁸² By September 2007 the financial consequences had become so serious that all analysts, including the investment banks and the IMF (2007a), became apprehensive of the prospects of the US and the world economy.

observed earlier, cuts in policy rates, which by their nature are anti-cyclical and expected to be reversed,⁸³ are unlikely to have a significantly positive impact on long-term investment expenditure. This in fact was so when the federal funds rate was brought down drastically over 2001-03 in the wake of the dotcom crash.⁸⁴ Residential investment did rise and helped to moderate the economic slide; however, the reason lay, as already noted, in surging home prices aided by the mortgage revolution, not in the easy money policy: despite the steep fall in short-term interest rates, investment in the non-housing sector failed to pick up during Q₁, 2001—Q₁, 2004.

However, the monetary loosening played an important role in keeping the 2001-03 downturn exceptionally mild. The combination of high home price inflation and extremely low short-term rates induced a large scale withdrawal of home equity for financing household consumption and went a long way in reversing from 2002 the slide in GDP growth the economy had suffered in 2001 (*Table A.2*). It is thus not very difficult to appreciate why in the present instance cuts in the federal funds rate have failed to provide any significant stimulus to aggregate demand: the negative wealth effect on consumption magnified by the multiplier operating under the current crisis cannot be countered by the fall in short-term interest rates (when the value of the potential collateral has declined drastically or turned negative).

The only major route through which a cheap money policy can conceivably raise domestic demand under the current economic scenario is through an exchange rate depreciation. With other major central banks keeping their policy rates unchanged, the outflow of capital due to a reduction in the federal funds rate would tend to weaken the USD, reduce the trade deficit and raise aggregate demand through the operation of the foreign trade multiplier. However, given the importance of the dollar as a vehicle currency even as of now and the enormous amount of the USD denominated asset held by central banks and financial entities throughout the world, a sharp depreciation of the dollar is likely to engender serious turmoils in the global including the US financial system. This together with the fact that the US trade-GDP ratio is not that large⁸⁵ and the economy is by no means “small”, rules out (the interest rate-induced) depreciation as a potent

The negative wealth effect on consumption magnified by the multiplier operating under the current crisis cannot be countered by the fall in short-term interest rates when the value of the potential collateral has declined drastically or turned negative.

⁸³ So that long-term interest rates remain unaffected. A fall in long-term rates following a cut in the policy rate generally signifies expectations of a long-drawn slack in the economy, necessitating continuation of the easy money policy by the central bank—expectations that militate against a significant pick-up in private investment.

⁸⁴ A decline in short-term rates reduces the cost of working capital and adds to profits for a given level of output; but this by itself would not constitute a major source of addition to aggregate demand unless producers' expectations relating to medium and long-term demand turns favourable.

⁸⁵ So that the required depreciation has to be large.

While a cheap money policy is required to moderate the slide in financial markets and provide some help in the process of cleaning up of banks' balance sheets, the main anti-cyclical instrument under the current scenario has to be fiscal.

means of tackling the current crisis. Indeed, with high oil prices pushing up inflation and tending to add to the US trade deficit,⁸⁶ the problem of boosting domestic demand through a weakening of the currency has become still more intractable.

The implication of the foregoing analysis is that, while a cheap money policy is required to moderate the slide in financial markets and provide some help in the process of cleaning up of banks' balance sheets, the main anti-cyclical instrument under the current scenario has to be fiscal. In fact, in tackling the previous recession the government took recourse to a significant fiscal stimulus. This time also a programme of providing tax relief is on the anvil; but the fiscal expansion required as of now is much larger and more urgent. Apart from the monetary policy problems noted above, it is important to recognise that in view of the fundamental imbalance in the housing market it will take years before residential investment recovers to its normal level. Hence, along with income tax rebates temporary (or time-bound) fiscal sops⁸⁷ for stimulating investment are necessary for countering the short-term problem of demand deficiency and ensuring that the (full-employment) GDP growth does not decline in the medium run.

Regulation, Risk Management and Credit Rating

The foregoing analysis helps to locate the major weaknesses in the system of mortgage finance during 1996-2006 and draw some analytical and policy conclusions whose relevance extends beyond the subprime crisis. These weaknesses consist of regulatory oversight on the one hand and use of inappropriate risk management and credit rating models on the other. Along with the increasing importance of securitization and private mortgage pools, the period saw a shift from the book-and-hold to the originate-to-distribute model of mortgage origination. As is now widely recognised, while earlier the originators had to be much more careful in assessing the creditworthiness of mortgage borrowers,⁸⁸ under the new system, he could pass on the mortgage loan to a finance company for a fee, and go practically scot free if the loan soured. Hence arose the serious moral hazard as originators were more interested in enhancing their fee income than in ensuring the quality of credit—a problem that went completely unaddressed under the regulatory framework in force.

The moral hazard problem noted above was real enough, but its significance for the current crisis seems to have been blown out of all proportions by most commentators. The problem was by and large absent for prime mortgages passing through the federally backed insurance system and GSEs. Indeed, the sharp fall in the quality of

⁸⁶ Since the demand for petroleum products is price inelastic, at least in the short run.

⁸⁷ In order to quicken the pace of private investment.

⁸⁸ Since in the event of a default he would have to bear the entire loss.

originations was mostly confined to subprime ARMs (Bernanke, 2007), which, as we have seen, had proliferated over 2004-06, but still constituted a relatively small part of the outstanding amount of mortgage debt. Thus while the regulatory oversight of the moral hazard problem associated with the originate-to-distribute system was by no means venial, in the present instance it should not be considered mortal either.

But the same cannot be said of the central bank's forbearance of the subterfuge adopted by banks to circumvent the capital adequacy norm by permitting them to set-up off-balance-sheet entities for purposes of large scale dealings and investments in structured products. Apart from the fact that the resulting non-transparency was hardly conducive to effective supervision, the growing threat of the systemic crisis due to highly leveraged investments of SIVs and conduits (in MBSs with borrowings from the short-term money market) seems to have escaped the Fed's attention altogether until it was too late.

The crisis has also brought to the fore regulatory inadequacy of a more general nature. The Federal Reserve lays down rules for commercial banks and supervises their activities; but investment banks and other financial entities including insurance companies come under other regulatory authorities that are presumably not very strict in respect of capital adequacy, transparency or asset-liability mismatch. Nor is avoidance of a systemic crisis in the financial system a major objective of these authorities. However, as the on-going turmoil illustrates, with close interlinkages among these different types of financial institutions, a meltdown in the balance sheet of a big investment bank or some other non-bank financial intermediary can quickly cause serious contagion in the entire financial system. This underlines the need for imposing prudential norms for these intermediaries as well, though the norms need not be identical to those for commercial banks.

However, our analysis of the housing bubble and bust suggests that even with regulatory power over all finance companies the Fed would have found it extremely difficult to prevent the crisis. Given the operation of the financial accelerator and the fact that even while the housing boom was in full swing, the US economy was not overheated and increases in the general price level remained moderate, short of imposing quantitative controls on finance companies' holding of securitized debts or exposure to the mortgage market, the Fed could not have done much to curb the growing imbalance in the housing sector. However, the options would hardly have been acceptable to most economists and policy makers.

Much more significant than the regulatory oversight was the failure of the widely used risk management and credit rating models. The most important sources of this failure are common to both sets of models, and it is to them that we turn in the final part of our discussion.

First, it is now widely recognised that when there is a major change in the institutional or policy regime, economic agents become

The growing threat of the systemic crisis due to highly leveraged investments of SIVs and conduits (in MBSs with borrowings from the short-term money market) seems to have escaped the Fed's attention altogether until it was too late.

With the adoption of the originate-to-distribute system incentives of mortgage brokers and originators got severely distorted. Development of large markets for securitized loans tended to create similar moral hazard problems.

subject to a different set of incentives and disincentives. The resultant change in the agents' behaviour alters the economic outcome as well so that some of the regularities or the economic trends prevailing under the earlier regime no longer hold. We have noted how legislative changes and technical-cum-financial innovations led to a radical transformation in the system of mortgage lending over 1996-2006. As already observed, with the adoption of the originate-to-distribute system,⁸⁹ incentives of mortgage brokers and originators got severely distorted. Development of large markets for securitized loans tended to create similar moral hazard problems among the players in the construction and distribution chain of MBSs. Under the new models of mortgage lending, e.g., ARMs with teaser rates and high loan-to-value ratios, the behaviour of borrowers and the default rates under various shocks differed from that of borrowers having fixed rate mortgages with a relatively low loan-to-value ratio. Similarly, there would be significant differences between the delinquency of borrowers who view the purchase of a house as a pure investment and of those who derive emotional satisfaction from homeownership and become attached to their houses.⁹⁰ Given the nature of changes in the mortgage and housing markets, it is thus not very difficult to see how economic profiles of mortgage borrowers tended to become unreliable and historical data concerning credit scores and default rates become inappropriate for credit rating of MBSs and for taking decisions relating to a financial institution's optimal exposure to the mortgage market. This is apart from the fact that the prolonged double digit home price inflation created a serious bias in the estimates of probability of default rates on the basis of observed data for different categories of borrowers. Indeed, remembering that the mortgage revolution itself played an important role in fuelling the home price inflation and creating growing imbalances in the housing market, a major failure of the models lay in not factoring in the outcome of the interaction between the mortgage and the housing markets under the new financial system.⁹¹

Second, there is a fundamental difference between the risk associated with home loans and company debts. The risk of default in the latter case depends not simply on how far the company is prone to cyclical or technical shocks, but more importantly on its efficiency in respect of production, marketing and management of finance. The default risk for any given category of a company's bonds will be lower

⁸⁹ Which the originators and brokers found much more attractive under the new regime.

⁹⁰ Recall that thanks to tax benefits and availability of easy mortgage finance an increasing number of borrowers belonged to the first category.

⁹¹ This failure constitutes yet another example of how even highly sophisticated economic agents do not behave "rationally" (taking account of the macro consequences of the regime change), contrary to the presumption in the Lucas Critique (Lucas, 1976).

to the extent its management is more efficient, the *overall* debt-equity ratio is smaller, and the demand for its product or input supply are less prone to volatile shocks. In respect of a mortgage borrower however similar factors are not of much consequence. The homeowner may be highly efficient in his job or profession; he may be unlikely to remain unemployed for long; his *total* debt may be fairly small in relation to total asset. Yet, when a house price decline turns the home equity (sufficiently) negative, irrespective of his asset-income position, the mortgage borrower would default.⁹² Quite clearly, unlike in the case of a company bond the crucial (if not the only) factor that matters in the case of a mortgage loan is the market value of the house in relation to the amount of mortgage loan outstanding. The implication is that, contrary to the contention of credit rating agencies, for mortgages and hence MBSs the default risk cannot meaningfully be separated from the market risk: indeed, it is the factors operating in the housing market as a whole rather than those affecting specific categories of borrowers that are of the essence in respect of home loan delinquency.

The distinguishing characteristic of the mortgage debt noted above suggests why the usual models of risk management and credit rating are liable to be inappropriate for the purpose at hand. Thus the cardinal rule for reducing risk is to diversify the portfolio. Hence, creation of structured financial products out of (expected) future cash flows of a large number of borrowers is supposed to reduce the risk significantly (given the average return). This would be so when the factors leading to default vary widely across different borrowers. This is why a finance company can effect a significant reduction in its risk by lending to borrowers engaged in widely varying types of economic activities and in different geographical areas: with low (or negative) correlation among the returns from different components of the loan portfolio, the variability of the average return becomes small, in fact lower than that for each individual loan. However, since the most important factor driving default in mortgage loans (*viz.*, fall in house prices) is the same *for* all borrowers, the degree of correlation in their default rates would tend to be high⁹³ and diversification would not be of much avail in reducing risk.

It is important to recognise that neither set of models has taken into account the consequences of the behaviour of investors in the mortgage market on the rest of the system and the feedback resulting therefrom. This oversight or neglect constituted a most serious flaw in the context of the quantitative significance of both the aggregate mortgage debt and the quantum of mortgage-backed securities. One

Since the most important factor driving default in mortgage loans is the same *for* all borrowers, the degree of correlation in their default rates would tend to be high and diversification would not be of much avail in reducing risk.

⁹² Unless his attachment to the house is strong enough to forgo the opportunity of a pecuniary gain, or rather, avoiding a pecuniary loss.

⁹³ Since the ratio of the outstanding mortgage debt to the prevailing house price is not the same for all borrowers and the extent of home price deflation can differ across cities and regions, the correlation will be less than perfect.

Even when a few large entities try to reduce their exposure to the mortgage market the liquidity of the securities would turn out to be significantly less than what was assumed in the risk management models.

result of this was the serious fallacy of composition committed by entities like SIVs and investment banks in their assessment of liquidity risk and market risk concerning investments in MBSs. For an individual investor holding a small amount of these securities, they are almost perfectly liquid: the securities can be disposed of at a moment's notice with no effect on prices. But if all investors try to encash these assets—as they would in the event of an adverse house price shock—the liquefaction becomes virtually impossible without huge capital losses. In fact, this would also be partly true even when a few large entities like the Citigroup try to reduce their exposure to the mortgage market: both directly and through the adverse impact on expectations of other investors the liquidity of the securities would turn out to be significantly less than what was assumed in the risk management models.

Finally for the weakness due to the neglect of the feedback effect. We have already elaborated on the nature of intertwinement between the financial and the real factors in the course of the housing boom and bust, and on the close connection between home prices, residential investment, default rates and financial meltdown. How neglect of these factors can seriously distort the model results is illustrated by the stress tests conducted by some highly reputed investment banks in early 2007. According to these tests “... even under serious house price declines that are historically unprecedented, most investors with exposure to subprime mortgages through securitized structures will not face losses” (IMF, 2007). One cannot help concluding that sans an economically sound foundation, models for number crunching from observed data, however sophisticated they may seem, are liable to prove seriously wrong when it matters most, viz., in estimating the impact of some major shocks, real or financial.

APPENDIX TABLE A.1
Federal Funds Rate and Discount Rate 1995-2007

		Discount rate		Federal Funds Rate	
		Change	New level	Change	New level
1995	Feb 1	0.5	5.25	0.5	6
	Jul 6			-0.25	5.75
	Dec 19			-0.25	5.5
1996	Jan 31	-0.25	5	-0.25	5.25
1997	Mar 25			0.25	5.5
1998	Sep 29			-0.25	5.25
	Oct 15	-0.25	4.75	-0.25	5
	Nov 17	-0.25	4.5	-0.25	4.75
1999	Jun 30			0.25	5
	Aug 24	0.25	4.75	0.25	5.25
	Nov 16	0.25	5	0.25	5.5
2000	Feb 2	0.25	5.25	0.25	5.75
	Mar 21	0.25	5.5	0.25	6
	May 16			0.5	6.5
	May 19	0.5	6		
2001	Jan 3	-0.25	5.75	-0.5	6
	Jan 4	-0.25	5.5		
	Jan 31	-0.5	5	-0.5	5.5
	Mar 20	-0.5	4.5	-0.5	5
	Apr 18	-0.5	4	-0.5	4.5
	May 15	-0.5	3.5	-0.5	4
	Jun 27	-0.25	3.25	-0.25	3.75
	Aug 21	-0.25	3	-0.25	3.5
	Sep 17	-0.5	2.5	-0.5	3
	Oct 2	-0.5	2	-0.5	2.5
	Nov 6	-0.5	1.5	-0.5	2
	Dec 11	-0.25	1.25	-0.25	1.75
2002	Nov 6	-0.5	0.75	-0.5	1.25
2003	Jan 09		2.25		
	Jun 25	-0.25	2	-0.25	1
2004	Jun 30	0.25	2.25	0.25	1.25
	Aug 10	0.25	2.5	0.25	1.5
	Sep 21	0.25	2.75	0.25	1.75
	Nov 10	0.25	3	0.25	2
	Dec 14	0.25	3.25	0.25	2.25
2005	Feb 2	0.25	3.5	0.25	2.5
	Mar 22	0.25	3.75	0.25	2.75
	May 3	0.25	4	0.25	3
	Jun 30	0.25	4.25	0.25	3.25
	Aug 9	0.25	4.5	0.25	3.5
	Sep 20	0.25	4.75	0.25	3.75
	Nov 1	0.25	5	0.25	4
	Dec 13	0.25	5.25	0.25	4.25
2006	Jan 31	0.25	5.5	0.25	4.5
	Mar 28	0.25	5.75	0.25	4.75
	May 10	0.25	6	0.25	5
	Jun 29	0.25	6.25	0.25	5.25
2007	Aug 17	-0.5	5.75		
	Sep 18	-0.5	5.25	-.50	4.75
	Oct 31	-0.25	5	-.25	4.50
	Dec 11	-0.25	4.75	-.25	4.25
2008	Jan. 22	-0.75	4	-0.75	3.5
	Jan.30	-0.5	3.5	-0.5	3

Source: Federal Reserve Bank of New York, (<http://www.newyorkfed.org/markets/statistics/dlyrates/fedrate.html>)

APPENDIX TABLE A.2
US Macroeconomic Profile 1995-2007

	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>June</i>	<i>July</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
1995												
GDP Growth rate*		3.35			2.20			2.46			2.02	
Unemployment rate	5.6	5.4	5.4	5.8	5.6	5.6	5.7	5.7	5.6	5.5	5.6	5.6
Fed funds rate**	5.53	5.92	5.98	6.05	6.01	6	5.85	5.74	5.8	5.76	5.80	5.6
Yield on 6 month T-Bill	6.21	6.03	5.89	5.77	5.67	5.42	5.37	5.41	5.3	5.32	5.27	5.13
CPI inflation	2.80	2.86	2.85	3.05	3.19	3.04	2.76	2.62	2.54	2.81	2.61	2.54
Core CPI Inflation	2.91	2.97	2.96	3.15	3.08	3.01	3.00	2.99	2.98	3.11	3.03	3.03
Case-Shiller inflation	1.47	1.34	0.86	0.43	0.14	-0.13	-0.18	-0.22	-0.18	-0.31	-0.36	-0.40
CS infl.- CPI infl.	-1.34	-1.53	-1.99	-2.62	-3.04	-3.17	-2.94	-2.84	-2.72	-3.12	-2.97	-2.94
CS infl.- Yield on 6m T-Bill.	-4.74	-4.69	-5.03	-5.34	-5.53	-5.55	-5.55	-5.63	-5.48	-5.63	-5.63	-5.53
1996												
GDP Growth rate*		2.45			3.94			3.97			4.42	
Unemployment rate	5.6	5.5	5.5	5.6	5.6	5.3	5.5	5.1	5.2	5.2	5.4	5.4
Fed funds rate**	5.56	5.22	5.31	5.22	5.24	5.27	5.4	5.22	5.3	5.24	5.31	5.29
Yield on 6 month T-Bill	4.92	4.77	4.96	5.06	5.12	5.25	5.3	5.13	5.24	5.11	5.07	5.04
CPI inflation	2.73	2.65	2.84	2.90	2.89	2.75	2.95	2.88	3.00	2.99	3.26	3.32
Core CPI Inflation	2.96	2.89	2.81	2.62	2.68	2.67	2.66	2.60	2.65	2.52	2.58	2.64
Case-Shiller inflation	-0.34	-0.26	0.14	0.63	0.95	1.09	1.09	1.15	1.21	1.42	1.66	1.88
CS infl.- CPI infl.	-3.07	-2.91	-2.70	-2.27	-1.94	-1.66	-1.86	-1.73	-1.79	-1.57	-1.59	-1.44
CS infl.- Yield on 6m T-Bill.	-5.26	-5.03	-4.82	-4.43	-4.17	-4.16	-4.21	-3.98	-4.03	-3.69	-3.41	-3.16
1997												
GDP Growth rate*		4.49			4.37			4.79			4.34	
Unemployment rate	5.3	5.2	5.2	5.1	4.9	5	4.9	4.8	4.9	4.7	4.6	4.7
Fed funds rate**	5.25	5.19	5.39	5.51	5.50	5.56	5.52	5.54	5.54	5.5	5.52	5.5
Yield on 6 month T-Bill	5.1	5.06	5.26	5.37	5.3	5.13	5.12	5.19	5.09	5.09	5.17	5.24
CPI inflation	3.04	3.03	2.76	2.5	2.23	2.3	2.23	2.23	2.15	2.08	1.83	1.7
Core CPI Inflation	2.50	2.50	2.43	2.61	2.55	2.42	2.41	2.29	2.22	2.28	2.15	2.27
Case-Shiller inflation	1.99	2.01	2.35	2.50	2.70	3.18	3.53	3.89	4.08	4.43	4.79	5.36
CS infl.- CPI infl.	-1.05	-1.02	-0.41	0.00	0.47	0.88	1.30	1.66	1.93	2.3	3.0	3.66
CS infl.- Yield on 6m T-Bill.	-3.11	-3.05	-2.91	-2.87	-2.60	-1.95	-1.59	-1.30	-1.01	-0.66	-0.38	0.12
1998												
GDP Growth rate*		4.69			3.80			3.71			4.51	
Unemployment rate	4.6	4.6	4.7	4.3	4.4	4.5	4.5	4.5	4.6	4.5	4.4	4.4
Fed funds rate**	5.56	5.51	5.49	5.45	5.49	5.56	5.54	5.55	5.51	5.07	4.83	4.68
Yield on 6 month T-Bill	5.03	5.07	5.04	5.06	5.14	5.12	5.03	4.95	4.63	4.05	4.42	4.4
CPI inflation	1.57	1.44	1.37	1.44	1.69	1.68	1.68	1.62	1.49	1.49	1.55	1.61
Core CPI Inflation	2.26	2.26	2.26	2.13	2.19	2.24	2.24	2.47	2.35	2.23	2.34	2.45
Case-Shiller inflation	5.92	6.60	7.13	7.53	8.00	8.45	9.00	9.34	9.82	9.74	9.49	9.12
CS infl.- CPI infl.	4.35	5.16	5.76	6.09	6.31	6.77	7.32	7.72	8.33	8.2	7.9	7.51
CS infl.- Yield on 6m T-Bill.	0.89	1.53	2.09	2.47	2.86	3.33	3.97	4.39	5.19	5.69	5.07	4.72

... continued on following page

	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>June</i>	<i>July</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
1999												
GDP Growth rate*		4.24			4.42			4.43			4.70	
Unemployment rate	4.3	4.4	4.2	4.3	4.2	4.3	4.3	4.2	4.2	4.1	4.1	4
Fed funds rate**	4.63	4.76	4.81	4.74	4.74	4.76	4.99	5.07	5.22	5.2	5.42	5.3
Yield on 6 month T-Bill	4.33	4.44	4.47	4.37	4.56	4.82	4.58	4.87	4.88	4.98	5.2	5.44
CPI inflation	1.67	1.61	1.73	2.28	2.09	1.96	2.14	2.26	2.63	2.56	2.62	2.68
Core CPI Inflation	2.33	2.15	2.03	2.20	2.08	1.96	2.07	1.90	2.07	2.12	2.06	1.88
Case-Shiller inflation	8.90	8.84	8.87	9.28	9.23	9.27	9.24	9.32	9.39	9.67	10.23	10.79
CS infl.- CPI infl.	7.23	7.23	7.14	7.00	7.14	7.31	7.10	7.06	6.76	7.1	7.6	8.11
CS infl.- Yield on 6m T-Bill.	4.57	4.40	4.40	4.91	4.67	4.45	4.66	4.45	4.51	4.69	5.03	5.35
2000												
GDP Growth rate*		4.08			4.85			3.52			2.24	
Unemployment rate	4	4.1	4	3.8	4	4	4	4.1	3.9	3.9	3.9	3.9
Fed funds rate**	5.45	5.73	5.85	6.02	6.27	6.53	6.54	6.50	6.52	6.51	6.51	6.4
Yield on 6 month T-Bill	5.5	5.72	5.85	5.81	6.1	5.97	6	6.07	5.98	6.04	6.06	5.68
CPI inflation	2.74	3.22	3.76	3.07	3.19	3.73	3.66	3.41	3.45	3.45	3.45	3.39
Core CPI Inflation	2.11	2.16	2.45	2.27	2.38	2.55	2.48	2.59	2.53	2.53	2.63	2.57
Case-Shiller inflation	11.04	11.42	11.97	12.38	13.12	13.39	13.23	13.11	13.17	13.47	13.81	14.12
CS infl.- CPI infl.	8.30	8.20	8.21	9.31	9.93	9.66	9.57	9.70	9.72	10.0	10.4	10.73
CS infl.- Yield on 6m T-Bill.	5.54	5.70	6.12	6.57	7.02	7.42	7.23	7.04	7.19	7.43	7.75	8.44
2001												
GDP Growth rate*		1.86			0.59			0.35			0.23	
Unemployment rate	4.2	4.2	4.3	4.4	4.3	4.5	4.6	4.9	5	5.3	5.5	5.7
Fed funds rate**	5.98	5.49	5.31	4.8	4.21	3.97	3.77	3.65	3.07	2.49	2.09	1.82
Yield on 6 month T-Bill	4.95	4.71	4.28	3.85	3.62	3.45	3.45	3.29	2.63	2.12	1.88	1.78
CPI inflation	3.73	3.53	2.92	3.27	3.62	3.25	2.72	2.72	2.65	2.13	1.90	1.55
Core CPI Inflation	2.57	2.79	2.61	2.66	2.55	2.71	2.70	2.64	2.63	2.63	2.73	2.78
Case-Shiller inflation	14.58	14.52	14.13	13.39	12.23	11.31	11.00	10.83	10.81	10.48	9.93	8.88
CS infl.- CPI infl.	10.85	10.99	11.21	10.12	8.61	8.06	8.28	8.11	8.16	8.3	8.0	7.33
CS infl.- Yield on 6m T-Bill.	9.63	9.81	9.85	9.54	8.61	7.86	7.55	7.54	8.18	8.36	8.05	7.10
2002												
GDP Growth rate*		1.03			1.27			2.22			1.87	
Unemployment rate	5.7	5.7	5.7	5.9	5.8	5.8	5.8	5.7	5.7	5.7	5.9	6
Fed funds rate**	1.73	1.74	1.73	1.75	1.75	1.75	1.73	1.74	1.75	1.75	1.34	1.24
Yield on 6 month T-Bill	1.73	1.82	2.01	1.93	1.86	1.79	1.7	1.6	1.6	1.56	1.27	1.24
CPI inflation	1.14	1.14	1.48	1.64	1.18	1.07	1.46	1.80	1.51	2.03	2.20	2.38
Core CPI Inflation	2.61	2.55	2.44	2.49	2.54	2.26	2.20	2.36	2.24	2.19	2.02	1.96
Case-Shiller inflation	8.16	7.80	7.91	8.49	9.58	10.61	11.59	12.34	12.80	13.49	14.12	15.00
CS infl.- CPI infl.	7.02	6.66	6.43	6.85	8.40	9.54	10.13	10.54	11.29	11.5	11.9	12.62
CS infl.- Yield on 6m T-Bill.	6.43	5.98	5.90	6.56	7.72	8.82	9.89	10.74	11.20	11.93	12.85	13.76

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	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>June</i>	<i>July</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
2003												
GDP Growth rate*		1.49			1.81			3.05			3.68	
Unemployment rate	5.8	5.9	5.9	6	6.1	6.3	6.2	6.1	6.1	6	5.8	5.7
Fed funds rate**	1.24	1.26	1.25	1.26	1.26	1.22	1.01	1.03	1.01	1.01	1.00	0.98
Yield on 6 month T-Bill	1.2	1.18	1.13	1.14	1.08	0.92	0.95	1.03	1.01	1	1.02	0.99
CPI inflation	2.6	2.98	3.02	2.22	2.06	2.11	2.11	2.16	2.32	2.04	1.77	1.88
Core CPI Inflation	1.91	1.80	1.74	1.48	1.53	1.47	1.52	1.31	1.25	1.31	1.09	1.15
Case-Shiller inflation	15.27	15.38	15.03	14.46	13.69	12.76	12.30	12.09	12.37	12.55	12.95	13.43
CS infl.- CPI infl.	12.67	12.40	12.01	12.24	11.63	10.65	10.19	9.93	10.05	10.5	11.2	11.55
CS infl.- Yield on 6m T-Bill.	14.07	14.20	13.90	13.32	12.61	11.84	11.35	11.06	11.36	11.55	11.93	12.44
2004												
GDP Growth rate*		4.12			4.13			3.17			3.15	
Unemployment rate	5.7	5.6	5.8	5.6	5.6	5.6	5.5	5.4	5.4	5.5	5.4	5.4
Fed funds rate**	1	1.01	1	1	1.00	1.03	1.26	1.43	1.61	1.76	1.93	2.16
Yield on 6 month T-Bill	0.97	0.99	0.99	1.09	1.31	1.6	1.66	1.72	1.87	2	2.27	2.43
CPI inflation	1.93	1.69	1.74	2.29	3.05	3.27	2.99	2.65	2.54	3.19	3.52	3.26
Core CPI Inflation	1.20	1.25	1.56	1.77	1.71	1.81	1.76	1.70	1.96	2.01	2.22	2.16
Case-Shiller inflation	14.03	14.79	15.93	17.16	18.40	19.87	20.47	20.40	19.99	19.62	19.14	18.70
CS infl.- CPI infl.	12.10	13.10	14.19	14.87	15.35	16.60	17.48	17.75	17.45	16.4	15.6	15.44
CS infl.- Yield on 6m T-Bill.	13.06	13.80	14.94	16.07	17.09	18.27	18.81	18.68	18.12	17.62	16.87	16.27
2005												
GDP Growth rate*		3.18			3.01			3.22			2.88	
Unemployment rate	5.2	5.4	5.2	5.1	5.1	5	5	4.9	5.1	5	5	4.8
Fed funds rate**	2.28	2.50	2.63	2.79	3.00	3.04	3.26	3.50	3.62	3.78	4.00	4.16
Yield on 6 month T-Bill	2.61	2.77	3	3.05	3.08	3.13	3.42	3.66	3.67	3.99	4.15	4.18
CPI inflation	2.97	3.01	3.15	3.51	2.80	2.53	3.17	3.64	4.69	4.35	3.46	3.42
Core CPI Inflation	2.26	2.36	2.30	2.19	2.19	2.09	2.08	2.18	1.97	2.07	2.12	2.22
Case-Shiller inflation	18.69	18.84	18.64	18.03	17.29	16.39	15.85	15.78	15.98	16.13	16.17	15.93
CS infl.- CPI infl.	15.72	15.83	15.49	14.52	14.49	13.86	12.68	12.14	11.29	11.8	12.7	12.51
CS infl.- Yield on 6m T-Bill.	16.08	16.07	15.64	14.98	14.21	13.26	12.43	12.12	12.31	12.14	12.02	11.75
2006												
GDP Growth rate*		3.31			3.22			2.37			2.60	
Unemployment rate	4.7	4.7	4.7	4.7	4.7	4.6	4.7	4.7	4.5	4.4	4.5	4.4
Fed funds rate**	4.29	4.49	4.59	4.79	4.94	4.99	5.24	5.25	5.25	5.25	5.25	5.24
Yield on 6 month T-Bill	4.31	4.52	4.62	4.72	4.82	4.97	5.06	4.97	4.89	4.92	4.95	4.88
CPI inflation	3.99	3.60	3.36	3.55	4.17	4.32	4.15	3.82	2.06	1.31	1.97	2.54
Core CPI Inflation	2.11	2.06	2.10	2.30	2.39	2.64	2.74	2.83	2.93	2.77	2.62	2.56
Case-Shiller inflation	15.06	14.05	12.32	11.10	9.84	8.35	6.86	5.33	3.84	2.59	1.42	0.22
CS infl.- CPI infl.	11.07	10.45	8.96	7.55	5.67	4.03	2.71	1.51	1.78	1.3	-0.6	-2.32
CS infl.- Yield on 6m T-Bill.	10.75	9.53	7.70	6.38	5.02	3.38	1.80	0.36	-1.05	-2.33	-3.53	-4.66

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	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>June</i>	<i>July</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
2007												
GDP Growth rate*		1.55			1.89			2.84			2.47	
Unemployment rate	4.6	4.5	4.4	4.5	4.5	4.6	4.7	4.7	4.7	4.8	4.7	5
Fed funds rate**	5.25	5.26	5.26	5.25	5.25	5.25	5.26	5.02	4.94	4.76	4.49	4.24
Yield on 6 month T-Bill	4.95	4.96	4.89	4.86	4.78	4.76	4.83	4.38	4.05	4.01	3.46	3.23
CPI inflation	2.08	2.42	2.78	2.57	2.69	2.69	2.36	1.97	2.76	3.54	4.31	4.08
Core CPI Inflation	2.67	2.72	2.48	2.36	2.26	2.20	2.20	2.10	2.13	2.14	2.33	2.43
Case-Shiller inflation	-0.51	-1.30	-1.82	-2.69	-3.40	-3.96	-4.38	-4.87	-5.53	-6.67	-8.42	
CS infl.- CPI infl.	-2.59	-3.72	-4.60	-5.26	-6.09	-6.65	-6.74	-6.84	-8.29	-10.2	-12.7	
CS infl.- Yield on 6m T-Bill.	-5.46	-6.26	-6.71	-7.55	-8.18	-8.72	-9.21	-9.25	-9.58	-10.68	-11.88	
* GDP Growth rates are quarterly growth rates.												
** Federal funds effective rate.												
<i>Sources:</i> 1) http://www.federalreserve.gov/releases/h15/data/Monthly/H15_TB_M6.txt ;												
2) U.S. Department of Labor, Bureau of Labor Statistics (http://www.bls.gov/);												
3) Standard & Poor's (www.standardandpoors.com);												
4) http://www.clevelandfed.org/research/inflation/US-Inflation/mcpi.cfm ;												
5) http://research.stlouisfed.org/fred2/data/GDPC1.txt .												

APPENDIX TABLE A.3
US GDP and Investment 1995-2007

	1995				1996				1997			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
GDP growth rate (y-o-y)	3.35	2.20	2.46	2.02	2.45	3.94	3.97	4.42	4.49	4.37	4.79	4.34
Gross domestic invt./ GDP	19.07	18.65	18.26	18.47	18.48	18.95	19.40	19.15	19.32	19.88	19.96	19.92
Residential invt./ Gross domestic invt.	23.29	23.01	24.05	24.14	24.58	24.59	23.74	23.54	23.23	22.52	22.26	22.36
Residential invt./Gross pvt. domestic invt.	27.93	27.81	28.98	28.99	29.60	29.50	28.31	28.10	27.68	26.66	26.23	26.21
Residential invt./ Private Fixed invt.	32.21	31.30	31.85	31.91	31.94	32.24	31.42	30.60	30.12	29.85	28.88	28.91
Growth rate of Housing Starts (y-o-y)	-4.82	-12.23	-2.68	-3.71	10.32	16.18	6.08	-0.02	-1.92	-1.31	-2.91	8.12
	1998				1999				2000			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
GDP growth rate (y-o-y)	4.69	3.80	3.71	4.51	4.24	4.42	4.43	4.70	4.08	4.85	3.52	2.24
Gross domestic invt./ GDP	20.40	20.02	20.26	20.32	20.64	20.43	20.58	20.88	20.52	21.23	20.83	20.54
Residential invt./ Gross domestic invt.	22.04	22.93	23.00	23.13	22.79	23.02	22.73	22.28	22.85	21.54	21.54	21.74
Residential invt./Gross pvt. domestic invt.	25.64	26.95	27.17	27.18	26.70	27.14	26.76	26.24	26.99	25.21	25.29	25.56
Residential invt./ Private Fixed invt.	28.65	28.58	28.95	28.81	28.62	28.17	27.81	28.00	27.53	26.67	26.16	26.14
Growth rate of Housing Starts (y-o-y)	8.79	6.53	11.91	12.42	9.67	0.13	1.19	-3.93	-2.94	0.78	-8.91	-6.69
	2001				2002				2003			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
GDP growth rate (y-o-y)	1.86	0.59	0.35	0.23	1.03	1.27	2.22	1.87	1.49	1.81	3.05	3.68
Gross domestic invt./ GDP	19.84	19.56	19.04	18.13	18.42	18.37	18.43	18.39	18.26	18.18	18.52	18.74
Residential invt./ Gross domestic invt.	22.66	23.23	24.06	24.92	24.98	25.48	25.38	25.82	26.18	26.73	27.09	27.28
Residential invt./Gross pvt. domestic invt.	26.89	27.93	28.78	30.37	30.39	31.05	30.90	25.82	31.86	32.55	32.91	32.93
Residential invt./ Private Fixed invt.	26.46	27.44	27.87	28.40	29.58	30.37	30.57	25.82	31.51	31.50	32.08	32.46
Growth rate of Housing Starts (y-o-y)	-3.25	2.73	6.38	1.68	7.35	3.74	6.11	10.17	0.75	3.71	11.33	17.69

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	2004				2005				2006			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
GDP growth rate (y-o-y)	4.12	4.13	3.17	3.15	3.18	3.01	3.22	2.88	3.31	3.22	2.37	2.60
Gross domestic invt./ GDP	18.67	19.35	19.59	19.76	19.87	19.65	19.75	20.34	20.37	20.33	20.04	19.39
Residential invt. / Gross domestic invt.	27.45	27.29	27.00	26.76	26.76	27.71	27.73	26.87	26.47	25.55	24.42	23.96
Residential invt. /Gross pvt. domestic invt.	33.04	32.70	32.29	31.92	31.83	33.12	33.09	31.92	31.48	30.53	29.20	28.91
Residential invt./ Private Fixed invt.	32.80	33.07	32.68	32.30	32.39	32.77	32.69	32.55	31.88	31.05	29.69	28.84
Growth rate of Housing Starts (y-o-y)	10.50	10.47	4.62	-3.46	7.99	5.88	6.22	5.26	2.69	-9.26	-18.84	-24.85
2007												
			Q1	Q2	Q3	Q4						
GDP growth rate (y-o-y)			1.55	1.89	2.84	2.47						
Gross domestic invt./ GDP			18.96	18.91	18.88	18.32						
Residential invt. /Gross domestic invt.			23.40	22.53	21.05	20.13						
Residential invt. /Gross pvt. domestic invt.			28.39	27.42	25.67	24.77						
Residential invt./Private Fixed invt.			27.89	26.82	25.37	23.80						
Growth rate of Housing Starts (y-o-y)			-31.35	-21.33	-23.72	-25.96						
Source: 1) Bureau of Economic Analysis, U.S. Department of Commerce (http://www.bea.gov); 2) http://www.census.gov/const/www/newresconstindex_excel.html .												

TABLE A.4
US Household Income, Saving and Debt 1995-2006

Figures are in Percentages

1	2	3	4
Year	Household Saving/Household Disposable Income	Total Household Debt /Household Disposable Income	Home Mortgage Debt /Household Disposable Income
1 1995	4.38	90.42	61.97
2 1996	3.66	91.73	62.53
3 1997	2.96	92.21	63.03
4 1998	3.77	92.90	63.66
5 1999	1.71	96.17	66.47
6 2000	1.63	97.80	67.23
7 2001	1.44	102.81	71.28
8 2002	2.16	108.85	77.14
9 2003	2.04	116.43	84.38
10 2004	1.84	121.92	90.35
11 2005	0.14	129.39	97.60
12 2006	0.06	134.56	102.41

Source: 1) Bureau of Economic Analysis, U.S. Department of Commerce (<http://www.bea.gov>);
2) Federal Reserve Statistical Release (<http://www.federalreserve.gov/releases/h15/data.htm>).

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