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From New Deal Institutions to Capital Markets:  
Commercial consumer risk scores and the making of subprime mortgage  
finance<sup>1</sup>

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**Abstract [203 words]**

The investment fueled U.S. mortgage market has traditionally been sustained by New Deal institutions called government sponsored enterprises (GSEs). The recent subprime mortgage crisis has drawn attention to the fact that these agencies, which once dominated mortgage backed securities underwriting, have largely been replaced by risk tolerant channels of lending, securitization and investment fueled by investment banks and private capital players. This research traces the movement of a specific brand of commercial consumer credit analytics into mortgage underwriting. It demonstrates that what might look like the spontaneous rise (and fall) of an ostensibly 'free' market divested of direct government intervention, has been thoroughly embedded in the concerted movement of calculative risk management technologies. The transformations began with a sequence of GSE decisions taken in the mid-1990's to implement a consumer risk score called a FICO<sup>®</sup> into automated underwriting systems. Having been endorsed by the GSEs this scoring tool was gradually hardwired throughout the industry to become a distributed and collective 'market device'. As the paper will show, once modified by specific GSE interpretations, the calculative properties generated by credit bureau scores reconfigured the investment grade mortgage finance into two parts: the conventional, risk-adverse, GSE conforming 'prime' and an infrastructurally distinct, risk-avaricious, investment 'subprime'.

**Key words [8]**

calculative chain, consumer credit scoring, FICO<sup>®</sup> scores, market device(s), mortgage finance, risk based pricing, social studies of finance, subprime

*“The shift from reliance on specialized portfolio lenders financed by deposits to a greater use of capital markets represented the second great sea change in mortgage finance, equaled in importance only by the events of the New Deal.”*

*FRB Chairman Ben Bernanke  
August 31, 2007<sup>2</sup>*

### **Introduction: From New Deal institutions to Capital Markets**

At the tail end of 2006, the ‘subprime’ hit the news with a bang when default rates shot up in a segment of mortgage finance that had previously received little attention in mainstream reporting. Against rising central bank interest rates, and following the collapse of the housing bubble, borrowers bearing certain high-risk classes of loans ceased to maintain their repayment schedules. By the turn of 2007, the unanticipated inability of lenders to raise enough capital from borrowers impeded their own instalment payments to international residential mortgage backed securities (RMBS) holders. Major subprime lenders declared bankruptcy and several high profile hedge funds imploded. As regularized transnational circuits of capital flow broke down in the space of only a few months, the problem amplified into a financial crunch that soon took on global proportions. This series of all too recent and as yet ongoing events has made evident the long chain of financial connections that have come to co-ordinate the economic agencies of ordinary U.S. homeowners with those of international capital investors.

Those working at the intersection of ‘social studies of finance’ and ‘social studies of accounting’ might immediately suspect that instabilities in the segment named ‘subprime’ have been accompanied by important organizational and infrastructural changes whose underlying significance, through disruption, are perhaps only now coming to light. One of the most dramatic of these transformations has occurred in the business of mortgage finance which sits at the nexus between the markets for real estate and those for asset backed securities. As emphasized by Federal Reserve Board Chairman Ben Bernanke in

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<sup>2</sup> Remarks made by Chairman Ben S. Bernanke at the Federal Reserve Bank of Kansas City’s Economic Symposium, Jackson Hole, Wyoming, August 31, 2007. The text is available online at <http://www.federalreserve.gov/boarddocs/speeches/2007/20070831/default.htm>

a speech responding to current events in the last ten years (quoted above), U.S. mortgage finance has shifted from an industry driven by government sponsored enterprises (GSEs) and specialized deposit-funded lenders, to an industry fuelled in large part by high-risk investment capital. No longer the purview of local banks and savings co-operatives, consumer mortgages have become the asset class feeding some of the most popular debt securities for sale on Wall Street.

The shift towards the unfettered involvement of private capital in mortgage lending and its downstream effects are becoming widely recognized in the U.S. A *New York Times Magazine* contributor who had just received a letter informing him that his mortgage obligations were being transferred to another financial group, expressed his personal sense of shock in this way: "...it came to me as a thunderous revelation: my debts were some other people's assets" (Kirn, 2006). In this spirit, the movement towards big capital has been tied to many of the most cited reasons in mainstream commentary for how mortgage credit became unsustainably amplified in the last few years. The profit driven interests of investment banks and hedge funds have ostensibly encouraged unscrupulous and irrational lending; fraudulent income reporting; a reduced responsibility towards the personal situation of borrowers; naïve borrowing in the face of increasingly complex financing options; and negligence on the part of the federal agencies who should have been protecting consumers from predatory lending. Deployed in the style of a classic 'sociology of errors' (Bloor, 1991), the *post hoc* denunciation of deleterious actions triggered by this new brand of mortgage finance reads like a stale list of 'the usual suspects' – the ones that are routinely rolled out whenever there is an issue with crushing consumers indebtedness (Black, 1961).

This kind of reasoning leaves us open to two popular poles of argumentation: either to the ideologically driven conclusion that the current financial crisis is due to the natural excesses of free-marketeering, run amock; or to a moralistic accusation that investment bankers allowed themselves to be seized by an 'irrational exuberance' (Shiller, 2005), a greed-induced passion that temporarily overcame their otherwise sound economic good sense. Either way, these perspectives sidestep the pressing contemporary question of

how a financial network for lending so freely has come into being. Crisis or no crisis they fail to provide a compelling account of how these private capital players have managed to encroach, in practice, upon a marketplace the federal government has had to actively sustain through specialized government sponsored institutions since the New Deal. If government chartered institutions were once necessary to make the connections for liquid mortgage finance to exist – and in particular for making mortgage funding available to credit strapped populations – a move towards financial markets that moves around these institutions cannot be sufficiently explained by a spontaneous ramping up of credit supply and demand; and even less so by some kind of natural willingness among capital investors to cater to a consumer segment called the ‘subprime’.

How has mortgage finance been rendered open to the practices of high-risk investment that appeal to big capital players? Surely, something might be said about the genesis and development<sup>3</sup> of subprime finance as a novel network of investment grade lending in and of itself. It is perhaps of interest, then, to take a step back from the collapse and to investigate the implementation of new calculative infrastructures and their consequences on how mortgage finance is arranged. To track such a change means taking up the painstaking search into the most mundane of details so familiar to social studies of science (Bowker & Star, 2000; Star, 1999) and of accountancy (Hopwood, 1987; Hopwood & Miller, 1994); it means exploring the innovations that have re-configured markets, their machineries and their places (Beunza & Stark, 2004; Caliskan, 2007; Guala, 2001; Muniesa, 2000; Zaloom, 2006). In the case of the diffused industry of mortgage finance it means prying into the everyday apparatuses of underwriting and into the rise of consumer risk management techniques that have permitted a dramatic production of increased liquidity. Such an analysis would conclude that understanding subprime lending is less about unravelling the motivations and psychologies that might lead to financial overextension, than it is about understanding the development of technical apparatuses that have supported the practical activities of a new cadre of financial agents (Hopwood, 2000).

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<sup>3</sup> The term ‘genesis and development’ is borrowed from the work of Ludwig Fleck, a classic text in science studies on the establishment of scientific facts (Fleck, 1981).

Instead of questioning why so much mortgage credit was extended to borrowers at a high-risk of defaulting; instead of conflating the crisis with a set of culturally familiar categories such as the ‘poor’ or the ‘economically vulnerable’; instead of presuming to know what it is that is collapsing and offering calculatively empty, off-the-shelf reasons for why, this paper traces the technical constitution of an investment subprime – at once a class of consumers, a set of ‘exotic’ mortgage products, and a class of mortgage backed securities – as a viable network of high stakes financial action. To this end, this paper will explore the importation of a distributed calculative (Hutchins, 1995) analytic apparatus into mortgage origination by the government sponsored enterprise (GSE) fondly known by its nickname ‘Freddie Mac’. In 1995, the agency adopted a commercially available consumer risk assessment tool called a FICO<sup>®</sup> credit bureau score, which was originally designed to control risk in consumer credit (credit cards, small loans etc.). At that time, Freddie’s goal was simple and clear: it wanted to standardize underwriting practices in the federally sanctioned, prime mortgage lending by introducing a consistent means of screening credit risk into its newly automated system.

The question of consistent assessment is central to markets formation. If the problem of markets is to organize heterogeneous actors to agree upon the qualities of goods (Callon, 1998b; Callon, Méadel & Rabeharisoa, 2002), then the recent unprecedented explosion secondary subprime financial activity must be the result of a process through which a stable and extended chain of mortgage valuation has been put into place. Rather than assuming that calculation is a monolithic means to market organization, however, this research takes for granted that calculative activities are by nature disorderly – that is, that at the outset, there are as many potential solutions to a problem of valuation as there are participating agents. From this position, stories about paradigmatic shifts towards quantification, models or risk management are inadequate, for even if such movements could spontaneously occur, it is unlikely that agents working on a problem of evaluation independently would spontaneously come to the same results. Instead of taking-for-granted the singularity of calculative frames, the empirical question of markets is to document the work through which calculative multiplicity is selectively reduced and

overcome. To this end, this paper follows the gradual, sequential and material movement of a specific risk management tool as it spread from the GSEs through the mortgage industry.

What this account intriguingly suggests is that the displacement of the New Deal institutions through the activation of capital players is not a result of inaction or inattention on the part of GSE managers. To the contrary, the intensification of high-risk lending has been built out of the GSE's very own initiatives to wrest calculative control over mortgage finance.<sup>4</sup> The key word is 'built'. The GSE's authoritative endorsement of a particular commercial solution to the problem of consumer credit risk assessment created the conditions of its widespread adoption, but this alone did not guarantee that all players would resort to the same risk management tool. Once marked by the government agencies' authoritative interpretation and entrenched in their newly automated underwriting software, continuous infrastructural investment had to be made to ensure that FICO<sup>®</sup> scores would be taken up and used in similar ways, across the industry. Ratings agencies such as Standard & Poor's would play an active role in stifling calculative diversity by translating the FICO<sup>®</sup> into non-government channels for securitization. As the paper will argue (see *Figure 1*), it is around the achievement of this common interpretation of the scores that a gradual shift away from credit *control-by-screening* and towards credit *control-by-risk* has occurred. It is through this calculative shift that the original GSE markets were reconfigured, and then circumvented, by a second, infrastructurally distinct circuit of mortgage investment qualified as 'subprime'.

### **Tracking the FICO<sup>®</sup> credit bureau scores**

Work on financial markets is only one part of a broader research movement towards an anthropology of markets that considers exchange as the outcome of intensive processes of economic formatting<sup>5</sup> (Callon, 1991; 1998a; Callon & Caliskan, 2008)<sup>6</sup>. Although the

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<sup>4</sup> For a key statement on how the state and accounting might be analyzed as mutually constitutive see (Miller & Rose, 1997).

<sup>5</sup> The term 'economic formatting' might be thought of as a less cumbersome term for what Callon has also called 'economization'. It refers to the process through which activities, arrangements and behaviours are

social studies of finance<sup>7</sup> as a movement is perhaps broader than influential science and technology studies renditions would have it (compare (Godechot, 2001) to (MacKenzie, 2006)) an attentiveness to technologies of calculation – both mathematical and non-mathematical variants (Callon & Muniesa, 2002) – has certainly been central to work in this field. Calculation comes into play in retail markets (Cochoy & Grandclément, 2006; Lave, 1988; Lave, Murtaugh & de la Rocha, 1984) or labor markets (Godechot, 2006), among others, but it plays a special role in finance where the products being exchanged are not only the objects of calculation, but are in and of themselves (as with securities and derivative products) mathematical derivations based on underlying commodities, risk estimates or indices (Lépinay, 2007; Millo, 2007). This is why the investigation of a financial market is often enmeshed with an anthropology of calculation, an exercise in tracking the history and circulation of facts, figures and formulas<sup>8</sup>.

Tracking calculative devices can be an extremely fruitful method for following the constitution of the financial products as well as the coordinated assessment of their qualities, around which are configured market forms (Lépinay, 2002; MacKenzie, 2003; Muniesa, 2000). The case of consumer credit scoring in the U.S. is a case in point. Credit scoring originally referred to a number of statistical techniques used for predicting credit risk that produced a credit score: the punctual empirical assessment of the odds that a

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qualified as ‘economic’. Because Callon argues that there are multiple definitions of what is economic and that these are perpetually under construction, controversy and maintenance, cases of economic formatting can only be identified empirically according to the definitions that actors themselves deploy for what constitutes an economic situation.

<sup>6</sup> SSF is also much narrower than the field of economic sociology (Smelser & Swedberg, 1994; Swedberg, 2003) although it might be brought into relationship with the sociology of markets (Fourcade-Gourinchas, 2007). For a statement on the ‘sociology of financial markets’, see (Knorr Cetina & Preda, 2005). For an early sociological take on financial markets that predates the SSF movement see (Adler & Adler, 1984; Baker, 1984).

<sup>7</sup> Several research networks have been organized to support work in this maturing research movement. Donald MacKenzie’s ESRC professorial fellowship sponsors a researcher’s list and conferences for the U.K. (see: <http://www.sociology.ed.ac.uk/finance/index.html>). The Social Studies of Finance Network (see: <http://www.ssfm.org/>), run out of the LSE’s Department of Information Systems, which is partnered to the French network ‘Association d’Etudes Sociales de la Finance’ (see: <http://ssfa.free.fr/>) at CSI, Ecole Nationale Supérieure des Mines de Paris. In the U.S., the website for the Social Studies of Finance conference hosted by David Stark at the Center on Organizational Innovation (COI, New York, 3-4 May, 2002) has also served as an important resource.

<sup>8</sup> Much excellent work in science and technology studies has been devoted to tracing the history and circulations of things, tools and technologies (Clarke & Fujimura, 1992; Daston, 2000; Kohler, 1994; Latour, 1987; Levinson, 2006; Rheinberger, 1997).



consumer might default on a loan expressed as a probability. Over time the term has been diffracted in two directions: scoring techniques have been extended beyond default predictions to address such questions as the likelihood that a consumer might respond to a marketing campaign or generate revenue by making use of the revolving function on a credit card; and secondly among credit data analysts, scoring has come to loosely refer to any system that produces a rank ordering of a population of credit consumers even if this does not involve strict probabilities or numerical scores.

The proliferation of credit scoring activity in backstage banking has come to the attention of several social scientists concerned about a paradigmatic shift towards quantitative risk management in consumer finance (Guseva & Rona-Tas, 2001; Leyshon & Thrift, 1999; Marron, 2007)<sup>9</sup>. But what distinguishes these studies from those in the social studies of finance is that they do not treat scoring pragmatically as a set of concrete systems worthy of detailed exploration so much as they exploit it as a terrain on which to theorize grander themes such as rationalization, quantification, discipline and governance. Because credit scoring is portrayed as an example of a larger movement, these studies tend to put aside the formal properties of technical systems. Analysing technologies in terms of how they fit into bigger pictures means taking for granted the significance of a trajectory of innovation that shapes specific tools. Yet, from a science and technology studies inspired perspective, it is within the detailed of these processes that the formal calculative properties of technical systems – in and of themselves the potential agents of change – are created and established.

As I have discussed elsewhere the distinctive properties of the credit scoring system in the U.S. are very much a product of idiosyncratically unfolding processes (Poon, 2007). Credit scoring is not only body of statistical methods that is being applied within financial institutions to assemble and digest consumer credit information into a decision making tool; it is also a thriving industry for ‘analytics’ in which a range of consumer risk management products designed and marketed by specialized firms circulate with

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<sup>9</sup> For an exploration of the equivalent practices of risk calculation in corporate finance see (Kalthoff, 2005). It is interesting to note that commercial lending is much less quantified than U.S. consumer lending.

stabilized contents as commercial goods. These firms may have little or no ability to generate consumer data on their own, but each one possesses a delicate *savoir-faire* (De Certeau, Giard & Mayol, 1998), a prized ‘way of doing’ based on accumulated experience, artisanal skills, and in-house software that allows practitioners to exploit credit information and fix the results of their analysis into applications suited for business decision-making. The U.S. origins of an industry for credit analytics can be traced to the pioneering effort beginning in the late 1950’s of a single firm – Fair Isaac & Company Incorporated (today, Fair Isaac Corporation) – to sell ‘custom application scorecards’, a statistical tool originally adapted to the needs of finance companies.<sup>10</sup>

The commercial basis of credit scoring provides a unique opportunity for understanding the material transfer of risk management practices. Similar to the way in which formulas issued from academic scientists might bear the signature of their author(s) – the Black-Sholes-Merton option pricing formula is a key example of this – proprietary credit scoring models made by credit analytics providers will bear the brand mark of their maker. This means that many of the tools for the statistical analysis of credit data have an independent and distinctly traceable origin from the more diffuse and maverick methods for data mining into which credit scoring as a practice is currently being subsumed. The most celebrated invention issued from this fruitful circumstance of corporate innovation is called a ‘credit bureau score’. A U.S. bureau score is any consumer credit risk estimate that is calculated using individual level credit (and repayment) information compiled and periodically refreshed from a number of sources, such as revolving credit card lines, small personal loans and auto financing.<sup>11</sup> Financial institutions issuing credit, regardless of their contribution to the data pool, can purchase

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<sup>10</sup> The original Fair Isaac scorecards were custom crafted algorithmic tools designed to capture patterns of default in firm-level consumer credit data. The tool rendered scoring possible at the point of retail sale by representing the algorithm as sets of figures to be added on a printed card. Today, scorecards are no longer visible as they have been embedded into electronic systems. Although Fair Isaac continues to be a leader in the field, today, they face increasing competitive pressure from rival providers as well as in-house analytics groups.

<sup>11</sup> Credit bureau data can be negative (default information), or positive (repayment information). U.S. bureaus keep both kinds. There are other major data gathering operations in business that compile consumer credit histories and provide other marketing services (such as preparing direct solicitation mailing lists), but by strict definition a U.S. bureau sells actual credit histories and is subject to the Fair Credit Reporting Act (FCRA) 15 U.S.C § 1581 et seq.

commercial risk scores, available in several distinct brands from each bureau, as a generic tool that aids in evaluating the overall credit risk of an individual borrower.

The strength of the bureau scores as risk management aids is that they give competitive lending firms equal access to general snapshots of the consumer that are continuously recalculated as new data is amassed from participating lenders. Such scores are by no means produced from an 'ideal' data set. They are parasitic and pragmatic constructions that make the most of information that is readily available at the bureaus as a resource for manufacturing pre-packaged analytic products. These back-boxed statistical figures are in large part 'behavioural scores'. They do not seek to qualify static qualities of the person so much as they constitute a temporally responsive picture of consumer risk that is useful for tracking a person's ongoing relationship to credit. Unlike classic 'application scores' which use data provided directly by a consumer on a form, it is noteworthy that bureau scores are calculated in the absence of input on income, occupation, or socio-demographic characteristics, even the ones that may legally be considered, because this kind of data is simply too costly to be accessed and reliably maintained by the bureaus.

Beyond the fact that bureau scores exist, there is an additional and important peculiarity about the U.S. market for scores. Through an unexpected business configuration achieved by Fair Isaac, three statistically distinct proprietary scoring algorithms were put in place at Trans Union, Equifax and Experian, the three major credit bureaus. As a result of these joint ventures similar scores are manufactured by these otherwise highly competitive organizations under a common FICO<sup>®</sup> brand-label. The FICO<sup>®</sup> line of scores numerically tags an estimated 75% of the U.S. population eligible for consumer credit on a linear scale of 300-850 units, trademarked by Fair Isaac. The robustness and penetrance of the pan-bureau 'product' with its high substitutability and low switching costs explains why, in a situation where product proliferation and heavy competition among multiple, *sui generis* statistical solutions would otherwise be expected, there exists instead, a single analytic product that saturates the market for scores. The co-ordinating effects of this widely circulating piece of 'economic information' (Callon, 2002) are

significant: the overwhelming commercial success of this tool is arguably what has given recent U.S. consumer credit markets their coherence, confluence and vibrancy.<sup>12</sup>

As the FICO<sup>®</sup> has travelled through financial institutions it has become a distinctive *market device* (Callon & Muniesa, 2002; Callon, Muniesa & Millo, 2007a), that is, as a traceable technological system involved in aligning the decision-making of lenders with regards to the qualities of borrowers. A market device is any distributed technological arrangement that participates in the production of calculative agencies that are firm enough to render a singular qualification of market goods and therefore sustain the coming together of agents in acts of exchange (for a number of concise case studies see (Callon, Muniesa & Millo, 2007b)). In short, it is a social scientific concept for identifying objects of investigation whose analysis can demonstrate that “Calculation is neither a universally homogeneous attribute of humankind, nor an anthropological fiction” (Callon et al., 2007a, p 5). The implication of this provocative phrase is that market devices are by no means technologically determined, that is to say they do not exist prior to their own implementation in actual practice. That technologies become market devices is achieved through active translation (Callon, 1986) through which they are adjusted, interpreted, modified, and reworked into becoming calculative infrastructure.

Before their use in mortgage making, the FICO<sup>®</sup> scores had already become a genuine market device in the wider U.S. consumer credit markets (personal loans, credit cards, retailer credit) insofar as their circulation had singularized calculations of consumer risk and had considerably reified the position of the consumer into a highly governable person (Miller & O’Leary, 1994) in those markets. It is in large part through these scores (assisted by a smattering of other scoring devices), that the competitive basis of consumer credit have undergone a dramatic turn from one set of calculative agencies into quite another. Over the past few decades, consumer credit markets have progressively moved away from blunt forms of profitability based on tighter consumer selection – *credit*

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<sup>12</sup> The argument that FICO<sup>®</sup> scores are pieces of manufactured economic information, is being developed more fully in the author’s PhD dissertation, University of California San Diego (expected 2008).

*control-by-screening* characterized by simple but rigid barriers of exclusion designed to sift for acceptable credit quality; and towards razor sharp segmentation games that demand superior product matching – *credit control-by-risk* characterized by a segmented accommodation of varying credit qualities. To remain competitive, consumer finance operations must do additional statistical work to refine the risk estimates produced by FICO<sup>®</sup>, supplementing these with in-house data and subtle re-calculation. But this does not undermine the fundamental effect that shared commercial risk scores have had on coordinating lenders’ overall vision of an accessible population as well as their strategies for product design and targeted marketing. The result is a risk segmented and saturated U.S. market for consumer credit.

Credit scoring is a prime example of how numbers might matter to market activity not so much because of what they represent and whether they represent accurately, but because of what they enable agents to *do* (Vollmer, 2007). From a perspective that is sensitive to the generative capacities<sup>13</sup> of calculative tools in action it should come as no surprise that the movement of a tool such as the FICO<sup>®</sup>, from consumer credit into the mortgage finance<sup>14</sup>, might provoke the configuration of a specific set of economic agencies heretofore unseen in mortgage making. A method that has therefore proved useful for making the emergence of these agencies visible is to track the details of the scores’ movement through their uptake by the government sponsored agencies and out into mortgage making infrastructures. (For clarity, the handful of institutions involved is described in *Table 1*.) As this research will show, the government agencies’ interpretation of how to use the tool, impressed upon the scores, has led to the bipartite organization of today’s U.S. mortgage markets into the conventional prime and high-risk subprime. Grasping the scores’ bubbling potential to reconfigure the calculative underpinnings of the mortgage markets, however, first requires an understanding of how

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<sup>13</sup> A distinction should be made here between the notion of ‘capacities’ and that of ‘generative capacities’ with regard to technology. Generative capacities are possibilities that inhere in technical systems, but they are not developed without continued enrolment and innovation. In the current case, the possibility of risk based pricing inheres within credit scoring but it not necessarily expressed if users do not develop this capability through additional innovation. The GSEs for instance, do not.

<sup>14</sup> In U.S. economic reporting loans secured by real estate have traditionally been treated separately from consumer credit, the latter referring to retail credit, credit cards, small loans, and car financing. The distinction reflects the different institutional pathways through which these kinds of credit are originated.

credit quality was previously assessed in the absence of numerical consumer credit scores by institutions acting as market devices.

### **Government sponsored mortgage market making**

In the U.S., homeownership is not just a part of the ‘American Dream’; it is also actively facilitated by specialized state initiated institutions. Since the Great Depression, the U.S. federal government has played an important role in making a liquid and stable mortgage market (Carruthers & Stinchcombe, 1999). As part of the New Deal, the Federal Housing Administration (FHA) was started in 1934 to provide guaranteed insurance to mortgages, and the Federal National Mortgage Association (FNMA) in 1938 to create a government assisted market for loans. In 1968, the FNMA was transformed from a government owned institution into a government sponsored enterprise (GSE), changing its name to ‘Fannie Mae’. A second GSE, ‘Freddie Mac’ (Federal Home Loan Mortgage Corporation, FHLMC), was created in 1970.<sup>15</sup> Freddie’s charter demanded that it “promote access to mortgage credit throughout the Nation (including central cities, rural areas, and underserved areas)”.

The enterprises were created to fulfil an equalizing and democratizing function. By the From the 1970’s on, the stated mechanism by which it was to accomplish this mission was “by increasing the liquidity of mortgage investments and improving the distribution of investment capital available for residential mortgage financing”.<sup>16</sup> The federal government’s intention was that the GSEs would ‘attract private capital for public purpose’, serving as a kind of ‘institutional market maker’<sup>17</sup> by liaising homeowners

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<sup>15</sup> Today, the GSEs are federally chartered but publicly traded, profit-oriented corporations which were established “to overcome then-existing legal and institutional impediments to the flow of funds for housing” (Congressional Budget Office, 2003, p1). This document is available online at <http://www.cbo.gov/ftpdocs/41xx/doc4199/05-06-03-GSEs.pdf>. The GSEs currently rank among the largest companies in the U.S. and are actively traded on the NYSE. For a detailed description of how these agencies operate today as well as of the challenges they face see (Frame & White, 2007).

<sup>16</sup> Federal Home Loan Mortgage Corporation Act January 2005 12 U.S.C.1451 Sec. 301 4. It is noteworthy that the original FNMA did not securitize loans but purchased and held them (Sarah Quinn, personal communication).

<sup>17</sup> The technical definition of a ‘market maker’ in finance is an exchange member who is positioned to take responsibility for making the market. These figures are obligated to buy and sell from their own account

borrowing funds to buy houses in the primary markets to capital holders seeking investment opportunities in the secondary markets. The GSEs were not intended to make loans like banks. Rather, their purpose was to facilitate the movement of debts in one direction in order to generate renewed funds in the other, either by purchasing and holding, or packaging and selling financial instruments called mortgage-backed securities (MBS). Considered a type of bond, the original GSE-MBS was a simple pool of conforming mortgages called a ‘single class pass-through’ (Adelson, 2004), which was calculated to yield a certain percentage as they matured.<sup>18</sup>

To understand the reasons for the GSEs it is important to recognize that the default state of debts is inertial. As a part of their production, debts are entangled in managerial rules, institutional relationships, and local processes of decision making. A recent handbook on asset securitization by the Office of the Comptroller of the Currency (OCC) explains, “in the days before securities, banks were essentially portfolio lenders; they held loans until they matured or were paid off”. Under this arrangement loans, including mortgages “were funded by deposits, and sometimes by debt, which was a direct obligation of the bank (rather than a claim on specific assets)” (Comptroller of the Currency, 1997, p 2). A securities market only works, then, providing that debts can be converted into mobile and transferable goods whose qualities buyers and sellers can come to agree upon in the present, even though these qualities will only be expressed in the future. The value of a simple MBS, its quality, depended on the credit risk (estimated rate of default) and the prepayment risk (estimated rate of payment in advance of the due date) of the pooled assets, as either event could decrease the eventual return to the investor. The need to assess these qualities explains why specialized agencies were required to provide the production function necessary to bring securitization and the liquidity advantages that accompany it, into being.<sup>19</sup>

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when ever there is an excess of orders in either direction. For a detailed description of this profession see (Abolafia, 1997). The term is employed only loosely here.

<sup>18</sup> For an lively description of the early problems in organizing a mortgage backed bond market in the 1980’s see (Lewis, 1990), a engaging memoir of the writer’s days in the employment of Solomon Brothers.

<sup>19</sup> The advantage of MBSs for lenders is that they provide more liquidity than keeping primary loans on the books. Today, securitization has come to be seen as increasingly financially desirable because these carry lower capital requirements under Basel, which in turn “improves return on capital by converting an on-

In the securities markets, this function has belonged in large part to third party ratings providers such as Standard & Poor's, alongside Fitch's and Moody's (Sinclair, 2005). The system of credit rating they manufacture is an important financial indicator. Ratings describe the overall quality of pools of loans underlying debt securities such as bonds and other financial instruments issued from private companies or even from nation states (treasury bonds). Like information printed on packaging (Cochoy, 2002), performance testing to report on products in a consumer magazine (Mallard, 2007), or classifications of grain that allow different growers to merge their stocks (Cronon, 1992, p 97-119), ratings are what allow investors to know something about the contents of investments so they can decide what to buy. Providing standardizing information about mortgage holders in the days before individual level credit bureau scores was a challenge and "investors and other market participants faced greater difficulties in comparing the riskiness of loans from different lenders" (Adelson, 2004, p 5). Although the ratings agencies are experts in the process of evaluating the credit risk of million dollar asset pools, nation states and large corporations, they have not traditionally been attuned to fine processes of rating individual mortgage consumers. For this, even they have had to follow behind the authoritative market making guidelines set by the GSEs.<sup>20</sup>

The government agencies have therefore had to serve as an all-in-one expert institutional solution to the both the problem of standardizing underwriting (quality control of individual loans) and the downstream problem of certifying securities (quality control of aggregated loan pools). In the absence of competing market forces and with the weight of the federal government behind them, they have filled their function by keeping a firm hand on the micro-organization of loan origination. The GSEs calculated a value of loans and loan pools, but their methods were not quantitative. Instead, prior to the advent of

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balance-sheet lending business into an off-balance-sheet fee income stream that is less capital intensive" (Comptroller of the Currency, 1997, p 4).

<sup>20</sup> It was not until 2001 that Freddie's products began to be independently rated by S&P. This move is part of the increasingly complex intertwining of the government sponsored and private investment mortgage markets described in the last section of the paper. The testimony of Leland Brendsel, then Chairman and CEO of Freddie Mac before the U.S. Senate Committee on Banking, Housing and Urban Affairs, Subcommittee on Housing and Transportation on this topic is available online at [http://banking.senate.gov/01\\_05hrg/050801/brendsel.htm](http://banking.senate.gov/01_05hrg/050801/brendsel.htm).



scoring, their main strategy was to issue thick books of underwriting guidelines, stringently designed to screen out good quality from bad quality loans. The GSE's independently devised ratings grades, carved through their thicket of rules, which became recognized across the industry: A, for prime investment, A-, B, C and D for non-investment grade or less than prime. The ratings agencies did provide their own systems for rating RMBS, but for the most part they confined their efforts to certifying asset pools outside of GSE control. However, although the pools they rated might have been excluded by the agencies due a variation in the underlying loan configurations, “[u]ntil the mid 1990's all loans included in securitized pools in the non-conforming market were assumed to meet agency prime loan credit standards” (Raiter & Parisi, 2004). The privately securitized loans were ‘non-prime’ (as distinguished from subprime), because they were considered acceptable from a credit risk standpoint according to the official GSE rulebooks.<sup>21</sup>

Each of the thousands of lenders around the country could use the GSE classification systems for loan origination. But the limiting property of a rule-based form<sup>22</sup> of rating, its Achilles weakness, was that the interpretation of the rules on the ground “differed from one company to the next” (Adelson, 2004, p 5). Due to the imperfect transmission of a standard meaning of the rule, what ended up happening in practice was that “one lender's ‘A-’ looked a lot like another lender's ‘B’” (Raiter & Parisi, 2004, p 3). Given the wide margins of uncertainty in the resulting grades, the GSEs rendered their debt products attractive by investing exclusively in ‘A’ quality loans and offering only a modest return on investment. They further sweetened the deal by offering to share the risk burden with investors, guaranteeing the value of the principal (although not of the interest). The agencies “promise the security holders that the latter will receive timely payment of interest and principal on the underlying mortgages”, and for their services they claim “an annual “guarantee fee” of about 20 basis points on the remaining principal” (Frame & White, 2007, p 85). Under these conditions, in a market dominated

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<sup>21</sup> For example, a loan that “conforms to traditional prime credit guidelines, although the LTV, loan documentation, occupancy status or property type, etc. may cause the loan not to qualify under standard underwriting programs” (Raiter & Parisi, 2004, p 2). Another example is ‘jumbo loans’ which are loans that exceeded the government imposed size caps that were placed on the GSEs until this year.

<sup>22</sup> For a theoretical discussion of the notion of a form see (Thévenot, 1984).

by long term 15 and 30 year fixed interest rate loan products, it is easy to see why mortgage securitization was an unappealing proposition to the fast-paced, high-return world of private equity.

### **Automating mortgage underwriting and the importation of bureau scores**

The shift from away from rule-based rating towards a system of score-based rating for RMBS marked a fundamental change in mortgage underwriting. However, this shift need not have passed through the FICO<sup>®</sup> scores, and indeed this was not Fair Isaac's original inclination. By the early 1990's the company's success at making and marketing bureau scores for the consumer credit markets was nearing its nadir and the company was seeking new opportunities for expansion. According to oral history<sup>23</sup> they set their sights on the mortgage industry, hiring professionals from the field with the idea of developing a specialized credit risk score for home loan underwriting. Their analytic scouts soon discovered that the way credit data was brought into the mortgage underwriting was through an 'RMCR' – a residential mortgage credit report. The practice of merged reporting, a system of gathering the personal data that would be fed through the GSE guidelines, had grown out of the days when the bureaus were small geographically scattered operations and where an individual might have reports lodged in several places all containing relevant information. Fair Isaac's first instinct, therefore, was to try and partner with report merging firms to develop a scoring system for RMCR data.

The problem with scoring the RMCRs was that the reports were infamous for being inherently unreliable. To create an RMCR a mortgage broker would assemble data from several credit bureaus and “bring in other elements that might not necessarily be part of the credit bureau. So they would do a verification of employment, or verification of income”. However, the process of merging reports provided commission motivated mortgage brokers with “the wiggle room, [...] to manipulate the system to get a mortgage

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<sup>23</sup> As part of this research the author has carried out interviews with numerous former Fair Isaac employees, two of whom were bureau score specialists who worked almost exclusively with the mortgage industry through the 1990's. Both interviews were carried out in September, 2006.

loan through”. In addition to merging data, the other “service [brokers] did was to ‘cleanse’ the credit report. They formatted it a certain way, and then if the mortgage worker said, ‘this information is wrong’ they would manually fix it on their merged credit report”. GSEs were aware of these kinds of procedural loopholes which they tried to close by passing more and more supplementary rules. So as time went on, the mortgage underwriting guidelines became “so rigid that if you followed them by the letter no one would ever originate a loan”! The situation only reinforced the brokers’ motivation to invent resourceful ways to drive loans forward and to keep the system moving. This meant that Fair Isaac’s business strategy (an isomorphic imitation of the bureau scoring project) would eventually stall. The GSEs, which fixed the rules for the secondary market, would not accept to purchase loans underwritten by a novel score calculated from merged reports whose content they knew were subject to manipulation.<sup>24</sup>

In the same period, the GSEs had begun their own searching for automated solutions to tighten the system. Expected to balance a complex set of objectives – promoting flexible and affordable housing, all while maintaining their reputation for investment quality products, rewarding their shareholders, and adequately controlling risk<sup>25</sup> – the agencies were facing considerable pressure from all sides to gain consistent knowledge of the quality of loans they were purchasing from mortgage originators. Numerous efforts were being made, in particular at Fannie Mae, to produce automated underwriting programs based on mentored artificial intelligence (AI)<sup>26</sup>. In their original conception, these kinds of systems “simply converted existing underwriting standards to an electronic format” (Freddie Mac, 1996, Chapter 1 Improving the World’s Best Housing Finance System)<sup>27</sup>.

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<sup>24</sup> All quotations in this paragraph are taken from the interviews cited above.

<sup>25</sup> One way of keeping housing affordable has been to offer loans to less solvent borrowers but to distribute risk by arranging an appropriate amount of mortgage insurance from a network of other federally mandated institutions such as the Federal Housing Administration (FHA) or the Department of Veterans Affairs (VA).

<sup>26</sup> General Electric Capital, a financial subsidiary of General Electric (GE), also came out with an AI based system (automated but not statistical) called GENIUS in the same period.

<sup>27</sup> In March 1996, Leland C. Brendsel, then Chairman and CEO of Freddie Mac, testified before a subcommittee of the Senate Banking Committee, on HUD oversight. Part of the purpose of his appearance was to discuss “the extraordinary benefits that automated underwriting is bringing to home mortgage lending”. Following the presentation, Senator Carol Moseley-Braun (D-IL) commissioned the agency to prepare a report “on automated underwriting and credit scoring and their impacts on the wide range of American families who borrow money to purchase homes” (Freddie Mac, 1996). The document is available

They were attempts “to try to train a system to reproduce the credit decisions of a human underwriter (or group)”. While simple automation “brought speed and consistency to the underwriting process” they could not, however, ‘optimally predict defaults’. Industry reports seem to agree that by mid-1990’s “mentored AI systems had largely lost out to or begun to progress to statistical mortgage scoring—which brought the key advantage of modeling the actual likelihood of mortgage default” (Straka, 2000, p 214).

A genuine ‘mortgage score’ was a statistical undertaking considerably more ambitious than anything a free standing analytics firm with no way to generate empirical data of their own could have undertaken. Such a score would be made from a model in which credit data (such as bureau data) figure in alongside industry specific data on the characteristics of the property and the type of loan being considered, as well as information on income and personal finance. With their massive stores of historical mortgage data the GSEs were the only institutions in a position to envisage and implement such a project. It was at this point that Freddie Mac made series of crucial decisions that would lay down the calculative foundations for dramatic change. Not only did Freddie decide to pursue statistical underwriting to the detriment of the traditional rule-based methods, but, secondly, rather than testing the bureau holdings for the most predictive combination of consumer credit data for mortgage lending, they opted to insert consumer credit data pre-digested in the form of numerical commercial bureau scores into their nascent systems.<sup>28</sup> Inspiration or caprice, the exact reasoning behind the decision to adopt the general commercial risk scores is unknown to even the makers of the FICO<sup>®</sup> scores whose own ambition was to design and market a consumer risk calculation specifically adapted to mortgage risk.

What is certain is that Freddie Mac’s primary objective was to include a reliable selection of consumer credit data into their automated systems in a form that could not be locally

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online at <http://www.freddiemac.com/corporate/reports/moseley/mosehome.htm>. In the absence of page numbers I have indicated chapter titles.

<sup>28</sup> In an industry review article, John Straka, then Director of Consumer Modeling at Freddie Mac reveals that Freddie originally endorsed both FICO<sup>®</sup> default risk scores and the competitive CNN-MDS bankruptcy risk scores. But since the prediction of bankruptcy is narrow in scope than default and were only available from a limited number of bureaus, the latter seem to have fallen out of the picture.

manipulated by the brokers. As the giants in the field, the agency's gesture was designed to simultaneously restrain the artful brokers, to provide a way to monitor credit standards (Schorin, Heins & Arasad, 2003) and to create a criterion of commensurability (Espeland, 1998) for assembling and describing prime, GSE quality MBSs. It should be noted however, that these goals might have been equally achieved by employing electronically transferred raw credit data purchased from the bureaus, and dissolving them seamlessly into the proprietary algorithms the GSEs were assembling from scratch.<sup>29</sup> The astounding result was that although 'credit data' was only one category of information included in mortgage scores, it was now reduced to a discreet factor whose composition could potentially become invariable between automated systems. While the estimates of property value, the loan to value ratio, personal income, and any number of other factors included in the mortgage might be calculated in many different ways, providing the industry followed Freddie's guidelines for FICO<sup>®</sup> scores, the interpretation of credit risk could ostensibly be the same across all automated systems.<sup>30</sup>

Treated side by side with the mortgage industry, Fair Isaac received a letter from Freddie Mac dated July 11, 1995<sup>31</sup>. Firmly grounded in the tradition of *credit control-by-screening* – that is, of seeking to lend only to those of a credit quality that made them highly unlikely to default – Freddie announced its decisions, including a third significant stipulation: that a FICO<sup>®</sup> score of 660 was the eyeball threshold for their definition of loans eligible for the prime investment. Within a month Fanny Mae swiftly followed suit adopting the identical convention in October to demarcate their prime loans. Industry

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<sup>29</sup> In fact, this is precisely what Fannie Mae has done in an attempt to remove FICO<sup>®</sup> scores from their models when the issue of their non-transparency became a heated political issue (Quinn, September 2000). However, although Fannie Mae's Desktop Underwriter system no longer uses FICO<sup>®</sup> scores as part of its internal risk assessment of individual loans, lenders must still submit scores with loan applications. This strongly suggests that the scores are an essential to the process of securitization, that is, to describing the quality of securities products to the secondary markets, even if they are not employed in the loan underwriting process. The incident confirms that there are many ways to adequately calculate consumer credit risk in mortgage origination, but only one calculation that allows buyers to compare the quality of Fannie's products to others. This is essentially what it means to say that the FICO<sup>®</sup> constitutes a 'market device'.

<sup>30</sup> This is true with a couple of caveats. Firstly, since the contents of the bureaus are not exactly the same scores calculations for an individual file vary between the three providers. Secondly, since the score shifts over time as new information is accumulated, it can change within the period of loan underwriting.

<sup>31</sup> Freddie Mac Industry Letter from Michael K. Stamper, "The Predictive Power of Selected Credit Scores" July 11, 1995 as referenced in (Avery, Bostic, Calem & Canner, July 1996).

insiders suggest that Fannie had no choice because they suddenly found themselves besieged by bad paper – that is, by loans that passed through their rule-based guidelines but which were adversely selected because many had already been picked over and rejected by Freddie<sup>32</sup>. The decision to use FICO<sup>®</sup> as well as GSE manner of interpreting them was materially hardwired into the system through the release of proprietary, agency designed, automated underwriting software that would henceforth be used to underwrite all loans destined for agency purchase. The first system in circulation was Freddie Mac’s Loan Prospector<sup>®</sup> which became commercially available to all Freddie Mac lenders in February 1995. Fannie Mae’s Desktop Underwriter<sup>®</sup> soon followed suit.

The FICO<sup>®</sup> feature of automated system design was politically useful when the software was showcased to legislators<sup>33</sup>. A score within a score in both systems, FICO<sup>®</sup> could be neatly isolated and pulled out of the formula as a discrete factor; it could be independently interpreted and understood as having meaning. For example, to explain statistical automation, discreet, individualized FICO<sup>®</sup> scores conveniently substitute for the quality of ‘creditworthiness’ which government officials and the public had come to recognized as being an essential part of loan evaluation. In a report to a subcommittee of the Senate Banking Committee the section devoted to explaining the use of commercial credit bureau scores made an explicit equivalence between the use of FICO<sup>®</sup> scores and an evaluation of ‘creditworthiness’ even though the former is a quality assigned statistically with respect to the aggregate, and the latter has traditionally been considered a personal property of the individual often thought to be interchangeable with ‘character’. Through this analogy with known concepts (even though the commonalities were thin<sup>34</sup>) FICO<sup>®</sup> helped circumvent some of the technical difficulties in explaining statistical underwriting to lay audiences.

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<sup>32</sup> Former Fair Isaac mortgage and bureau score specialist A, interview, September, 2006. A similar story is reported in (Dallas, 1996).

<sup>33</sup> See footnote 27.

<sup>34</sup> As mentioned earlier, FICO<sup>®</sup> scores are behavioural scores which means that they fluctuate according to changing credit behaviour. They are not based on a fixed quality of the person such as ‘character’ even though they were cast as a substitute for this traditional quality of the person in loan underwriting.

The effect of bureau scores was not only to facilitate the evaluation and pooling of loans, but it also introduced a common lexicon into the industry. The same Senate Banking report took great pains to explain the demarcation of a categorical break at FICO<sup>®</sup> 660. Freddie Mac's independent studies showed that this score corresponded to their existing standards, such that "borrowers possessing weak credit profiles [...] as FICO scores under 620", were found to be "18 times more likely to enter foreclosure than borrowers with FICO scores above 660" (Freddie Mac, 1996, Chapter 3 Looking Inside Loan Prospector). Given the GSE mandate to help and not hinder homeownership, 660 was intended to be a soft minimum score and not a firm cutoff since, the ultimate evaluation depended on the contribution of all of the other factors that could be weighted in through the larger mortgage scoring algorithm. In this regard statistical analysis made the distinction between acceptable and not acceptable less immediately clear to the system user (Standard & Poor's, 1999, p 10). Nevertheless, FICO<sup>®</sup> 660 rapidly became a free standing benchmark of prime investment grade status, recognizable among to underwriters, securitizing bodies, investors, regulators, and later (after 2001<sup>35</sup>) to informed consumers as well. The overall effect was that a 'prime lender' could now identify as catering to consumers with 660 FICO<sup>®</sup> scores and above. By default, anyone willing to develop products that catered to risk scores lower than a FICO<sup>®</sup> 660 would become a high-risk or 'subprime' lender.<sup>36</sup>

### **The ratings agencies adopt the scores**

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<sup>35</sup> Brokers were quick to inform consumers whose loan applications were rejected that the 'reason' was the weakness of their FICO<sup>®</sup> scores. The discovery of the scores on the eve of the refinancing boom and housing bubble, led to protests by consumer advocates arguing that the scores should be released to the public. In 2000 the California State legislature ruled that consumers would have a right to be told their scores. Rather than risk further regulation, Fair Isaac conceded and hastily created a dot.com that made individuals' scores available to them for a fee.

<sup>36</sup> Beyond the distinction between prime and subprime, FICO<sup>®</sup> scores are considered basic descriptors in mortgage finance. In addition to front end pricing sheets, scores are ubiquitous component in the representation of a firm's holdings in investor presentations, annual reports, SEC 8-K as well as in 10-k filings to fulfil the pool level disclosure reporting requirements of the SEC (111(b)(11) of Regulation AB). Finally, they are being used by economists as an analytic tool for visualising and evaluating the trajectory of current events. For one example of this kind of work by Federal Reserve researchers see (Chomsisengphet & Pennington-Cross, 2006), which traces the 'evolution of the subprime mortgage market' by the recording the volume of loan origination by score, but not the technical practices that sustain these increase.

It is important to note that the demarcation of subprime lending by FICO<sup>®</sup> scores is a distinct moment from its amplification into a functioning financial circuit. The development of the subprime into a coherent network of mortgage finance in which securitization could take place was not a given. It would itself have to be materialized. To create a circuit of subprime finance would require a proliferation of specialized underwriting software equally grounded around and further reinforcing the use of the specific brand name credit scores elected and interpreted by the GSEs. If at any moment another solution to evaluating consumer risk had been incorporated into private software when faced with the consumer, lenders would have produced a series of disconnected risk assessments. While this situation would not have precluded the emergence of subprime finance, it would have demanded a patch work of solutions to the problem of commensuration, which would have complicated the calculative picture and, much like the previous system of letter grades, considerably weakened the transferability of risk into the secondary markets.

The GSEs continued to play an active role in the project statistical automation. Given the mortgage industry's growing appetite for the swiftness of automation (although not necessarily for statistical underwriting<sup>37</sup>), as well as the propensity of the industry to follow the government agencies' every lead, the effects of the new GSE systems would not stop at the borders of the government sanctioned mortgage finance. Reports to government officials confirm that Freddie was eager "[t]o address lender demand for an automated underwriting service capable of evaluating loans in any mortgage market" and not only in the conventional, conforming one. Freddie soon "joined forces with [Standard and Poor's], a rating agency with significant experience evaluating subprime loans" (Freddie Mac, 1996, Chapter 5 Expanding Markets, Lowering Interest Rates Across Markets). Standard and Poor's (S&P) interest in Loan Prospector<sup>®</sup> was to test how this system for underwriting, a pre-packaged algorithm from their point of view,

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<sup>37</sup> In the mortgage industry the changes brought about by 'automation' are frequently conflated with the introduction of 'analytics' (statistical analysis) because these occurred simultaneously. As the paper has described to automate traditional rule-based underwriting could have occurred without the introduction of statistical underwriting. Automation favours the introduction of statistical analysis but does not determine it. There was a process of translation to brings automation and statistical underwriting together.



might further contribute to rating securities in a secondary market that had been interchangeably referred to as non-conforming or non-GSE.

Under manual underwriting, most forms of rating were done at the level of the portfolio (at the level of a lender's pool of loans). In the absence of automation and scores, the secondary market had learned to rely on indicators designed to describe the risk level of the aggregated pool, such as a calculation of the average interest rate (WAC<sup>38</sup>), or the geographical distribution of loans across regionally distinct housing markets. Before the introduction of commercial bureau scores, securitizing bodies "weren't used to looking at metrics that allowed you to drill so deeply into an individual consumer credit profile so effectively". In other words, until 1995, the description of the risk of each individual loan through underwriting was done with an entirely separate set of tools, metrics and vocabulary than those used to describe a securitized pool of loans as a composite whole. Individualized consumer risk scores interpreted by the GSEs and funnelled through their automated underwriting systems introduced a substantially "different view than what [the ratings agencies, securities firms and bond issuers] were accustomed to evaluating".<sup>39</sup>

Work had to be done to educate each of the securitization and ratings agencies 'about how credit scores worked'. Once Fair Isaac caught wind of the direction of change, the scorecards makers actively went out and "urged them to use [bureau scores] as components in their analysis".<sup>40</sup> Some securitizing bodies were harder to convince, but from Fair Isaac's standpoint S&P was an ally that 'got it right away'. Score-supported statistically based underwriting programs began to flow into and merge with the rating phase of securitization. The rating agency regarded the result of these changes as positive in that "For the first time, a totally integrated risk management capability is available to loan originators, portfolio managers, investors, traders and regulators" (Raiter, Gillis, Parisi, Barnes, Meziani & Albergo, 1997, p 1). For S&P the implications of automated underwriting extended well beyond the moment of underwriting, because as

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<sup>38</sup> WAC refers to Weighted Average Coupon. The term coupon refers to the stated percentage rate of interest paid out to a security.

<sup>39</sup> Former Fair Isaac mortgage and bureau score specialist B, personal communication, May 24<sup>th</sup>, 2007.

<sup>40</sup> Former Fair Isaac mortgage and bureau score specialist B, personal communication, May 24<sup>th</sup>, 2007.

their research would show, “the use of credit and mortgages scores is not limited to the origination process” (Raiter et al., 1997, p13). A 1997 S&P report on innovations in mortgage underwriting enthusiastically affirmed that in addition to rendering underwriting faster and more consistent, statistical automation could go one step further, giving rise “to the introduction of standardized risk grades” (Raiter et al., 1997, p 13).

In sharing metrics for risk quantification, the primary and secondary markets were to be placed on the same calculative platform. A recent fact sheet for S&P’s mortgage security rating system called LEVELS<sup>®</sup> (c1996) reflects the taken-for-granted nature of this change. The program is said to combine “the power of automation with Standard & Poor’s time-tested ratings criteria to assess the credit risk of individual *or* pooled residential mortgage loans” (emphasis added).<sup>41</sup> So while LEVELS<sup>®</sup> was developed to rate *pools* of securities, in a statistical regime it can equally be used to evaluate *individual* loans. This is, in fact, what LEVELS<sup>®</sup> was designed to do. It performs a loan-by-loan analysis as a means of assembling an investment quality asset pool (Raiter et al., 1997, p 28). Through a common use of FICO<sup>®</sup> scores the calculative field could be vertically integrated<sup>42</sup>, even though the chain of institutional intermediaries between borrowers and lenders (brokers, lenders, ratings agencies, underwriting systems, investors and so on) remained populated by heterogeneous and diverse economic agents. If access to a rich source of mortgage data was secured, and then supplemented by commercially accessible consumer risk scores, a system of risk estimation could be devised that held its meaning as products moved fluidly from the level of individual loans up into that of aggregated asset pools.

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<sup>41</sup> S&P 2006 Product Fact Sheet: LEVELS<sup>®</sup>, Loan Evaluation and Estimates Loss System. The document is available at <http://www2.standardandpoors.com/spf/pdf/fixedincome/LEVELS2006.pdf>.

<sup>42</sup> Vertical integration refers to the ability to communicate the quality of the loans with calculative continuity as they are converted from single mortgages, into pools of paper, and on into securities. At every stage in the chain of transfer FICO<sup>®</sup> plays role in calculation even though the content of what the actors are calculating (whether to grant a mortgage, how to price a pool of loans, whether to invest in a security...) is different. Vertical integration constitutes a chain of production. This is distinct from horizontal integration (see next paragraph, main text) which denotes the ability to compare between the financial products originating from different competitive producers.

Several competing systems of automated statistical underwriting tools were soon in the works beyond the GSE models.<sup>43</sup> While using Freddie’s Loan Prospector<sup>®</sup> or Fannie’s Desktop Underwriter<sup>®</sup> would facilitate the sale of loans to one of the GSEs, distinctive models built off of data from non-conforming, non-conventional loan specialists became available on the commercial market for automated systems or simply for use in-house. Even though the valuation made of individual mortgages at the moment of underwriting could be methodologically aligned with the valuation of the asset pool (not to mention to the calculation of mortgage insurance), the existence of separate, competing systems to carry out this work for non-GSE destined loans impeded horizontal market integration. Outside of the GSE controlled market, there was an open season on innovation. The hardwiring of other brands of bureau scores, or at the very least, other interpretations of the FICO<sup>®</sup> became distinct possibilities. Private label securitization tools cropping up all over – each based on proprietary databases, built by in-house analytics teams, with preferences for certain statistical methods, a unique take on variables, and a distinctive statistical *savoir faire* – could be expected to produce a diverse set of algorithms and therefore a different set of risk calculations.

Controlling the problems that flourishing calculative diversity posed was S&P’s business. As a certifying body, a calculating expert and a gateway to the secondary markets, it initiated a service to validate underwriting systems. For system developers willing to submit their software creations to external evaluation, an initial development review was “intended to validate the soundness and statistical validity of the process used to build the predictive system”. Once the data used to develop the system was received from the vendor S&P would perform “a series of statistical analyses that determine how well the system measures risk relative to actual loan performance, what key predictive variables have the most influence on the system’s score, and finally the observed default rates associated with various scores.” In its most basic level validation checked the internal soundness of models. With regards to solving the problem of horizontal coordination,

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<sup>43</sup> Examples of early subprime underwriting systems included ‘CLUES’ (Countrywide’s Loan Underwriting Expert System). Countrywide Financial was one of the top 10 subprime lenders in the U.S., which flourished and then declined with the collapse of the recent real estate bubble. There were several other systems produce by mortgage insurance firms, such as GE Capital ‘Mortgage Insurance Omniscore’, and Mortgage Guaranty Insurance Corporation’s plainly named ‘Mortgage Score’.

however, these results were “then compared with those of other automated underwriting systems and discussed with the issuer” (Raiter et al., 1997, p 3-12). Acting to produce coordination in financial markets, S&P aligned the risk outcomes of various models, by imposing definitions or by modifying the factors they took into account.<sup>44</sup>

Because FICO<sup>®</sup> was a standard ranking criterion that S&P itself used to test the soundness of an underwriting model this effectively put pressure on vendors to include FICO<sup>®</sup> scores in their models. This was not merely a suggestion. A key incentive to adopt FICO<sup>®</sup> the was that pools of loans tagged with an S&P validated ‘mortgage score’ could be more easily rated for securitization by S&P’s proprietary securities rating system. As a final part of validation S&P offered to “calibrate each system against a model portfolio of credit reports and mortgage application information to facilitate use of scores by Standard & Poor’s LEVELS™ [sic] model” (Raiter et al., 1997, p 9). In 1998, “only 50% of Prime [...] and 30% of Non-prime mortgages incorporated a credit score in their underwriting data file” (Raiter & Parisi, 2004). By 2003 this had increased to virtually 100%. What is more, a 1999 document to update the industry on the methods of rating in a post-automation era crisply announced that having “reviewed the guidelines established by Fannie Mae and Freddie Mac”, S&P would endorsed “similar guidelines for selecting FICO scores included with new loans submitted for rating” (Standard & Poor’s, 1999, p 14). So once S&P had implemented credit bureau scores as “an integral factor in our underwriting review”, validation and rating gave S&P the opportunity not only to push the FICO<sup>®</sup> scores, but to transmit the specific interpretations of them that it had absorbed from its earlier collaboration with the GSEs.

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<sup>44</sup> This document explained that the process of validation and testing would begin when S&P received “a sample data file of a pool of approximately 10,000 to 15,000 loans randomly selected over three years of origination” (sent in Salomon 400 data format). In addition, they required “1,000 bad loans specifically selected to augment this randomly selected group”. The process of validation required a commitment to a deep fix. The document emphasized that “for a system to enjoy validation benefits, Standard & Poor’s requires the vendor to agree contractually not to make any modifications to its system without first notifying Standard & Poor’s and to provide Standard & Poor’s with sufficient information to determine the impact of such modification” (Raiter et al., 1997, p 10). The system would be re-validated by S&P semi-annually with fresh data, on a continuous basis.

The Freddie Mac–S&P connection was not the only means through which the FICO<sup>®</sup> scores have been extended beyond the GSE market. The FICO<sup>®</sup> had already generated a lot of momentum following their implementation at the GSEs, and S&P would admit it was in large part “[d]ue to the overwhelming utilization of credit scores” seeping into the industry that it became “a factor in our current credit risk analysis” (Standard & Poor's, 1999, p 20). The point of this account has been simply to demonstrate one material channel through which bureau score-supported underwriting passed out of the GSE market into the non-GSE market. The S&P endorsement had specific consequences in opening up an alternative passage point to securitization that piggy-backed on GSE risk management practices, but moved them into alternative software systems, outside of the government sanctioned market and of GSE control. Within a proliferation of underwriting programs, algorithms, mortgage scores, ratings agencies, and lenders, for practical intents and purposes, in the mortgage industry there are two independently functioning circuits of mortgage finance — the government sanctioned prime and the private label subprime. What divides them are information systems, their regard for risk, and product development; what unites them is a common reliance on FICO<sup>®</sup> scores.

### **The calculative shift from screening to risk**

The difficulty of precisely evaluating individual mortgage quality is the reason why, for half a century, there was only weak investment activity outside of a slow and steady, federally chartered prime investment market. The government sponsored enterprises were a quasi-obligatory passage point to the production and sale of investment quality residential mortgages backed securities because they were the only institutions in a position to certify the quality of loans and securities. Held together by these institutions in their active role as market devices, this non-quantitative but nonetheless calculative arrangement (Callon & Muniesa, 2002) worked to stabilize the quality of securities and to produce a steady secondary market. It was on the authority of the institutions’ guidelines that the market was made. The paper has described how the market coordination provided by the institutional guidelines (institutional market devices) was supplanted by

the coordination provided commercial consumer scores (statistical market devices). What remains to be shown is the mechanism through which this created an avalanche in subprime securities investment.

The GSEs guidelines embodied traditional credit production practices in which lending was reserved to arrangements where borrowers could be considered ‘creditworthy’ and all cases that failed to make this standard were rejected. As ethnographic studies have shown, however, establishing creditworthiness under traditional lending was subject to subtle negotiations in which numerous forms of justification could come into play (Wissler, 1989). What was considered ‘manipulation’ of the RMCR reports by brokers grew out of the permissiveness of this type of practice. Such activities were able to occur, because the definition of the creditworthiness, even when filtered through rules and guidelines, was being flexibly assembled in the moment of loan production rather than being taken from fixed criteria. It is precisely this aspect of traditional consumer lending that demanded the stabilizing force of the GSEs in quality assessment. Despite its local and practical multiplicity, though, in the practice of *control-by-screening* lenders tended to act as though they faced two kinds of people – those who deserve to be worked with and those who did not. The credit manager’s mandate was to minimize risk by distinguish as clearly as possible between these groups.

Empirically derived credit scoring techniques have created a new kind of consumer whose calculability defied conventional assumptions about the binary nature of creditworthiness. Individuals viewed through statistics no longer need to be classified as either in or out of the market. Armed with a gradated sliding scale, people all along a spectrum of risk can be offered specially designed products at alternative terms and prices. There is nothing that precludes using the scale from being used conservatively to screen for high quality borrowers, as the GSEs clearly intended.<sup>45</sup> But once in place, the score scale is a generator of calculative possibility. It became a platform for creative design work for brings lines of risk calibrated products, both mortgages and securities,

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<sup>45</sup> It is not incidental that the original Fair, Isaac scorecard was actually designed to do *control-by-screening*. In its original conception the flexibility of the scoring tool acted as a switch that allowed credit managers at finance companies to adjust the risk level at which floor personnel were screening.

into existence. The introduction of a numerical scale of consumer credit quality into mortgage origination permitted calculative actions that were simply unanticipated from within the conventional frameworks of the GSEs. This is how *control-by-screening* was concretely edged out by the productivity of *credit control-by-risk* whose characteristic is to act at the level of population, harnessing a variety of credit qualities through a proliferation of financial goods.

In both screening and risk forms of lending there is elasticity in credit arrangements, a multiplicity configurations under which lending can occur. The first tends to create loan paper on a case-by-case basis while the second distributes a variety of standardized products to markets segments. Although they achieve this fit in different ways, in both types of credit practice the terms and the property type must be appropriately matched to the borrower in order to make the loan. The difference that is most relevant to this paper, however, is as follows: once ‘creditworthiness’ is expressed through a statistical scale of gradated risk, a loan can be arranged for people who are of low credit quality; that is, for those who would not be considered particularly ‘creditworthy’ from a screening point of view. Screening is a *risk minimizing* strategy; statistical lending is a *risk management* strategy, that is, one that embraces risk (Baker & Simon, 2002). It is this displacement – the result of an innovative fusion between FICO<sup>®</sup> and the ratings agencies – that catapulted the ‘subprime’ from a specialized low profile area of non-conforming lending into a burgeoning financial market. It is through the rise of this risk management apparatus that subprime loans escaped the books to become the raw materials for mass produced financial products destined for mainstream consumption.

That subprime had developed as a distinct financial space yet one positioned with a high degree of congruence to the prime is an historical phenomenon produced by the material history of technology that has been presented here. Private label sources did not invade GSE territory, instead they have built their endeavour up beside it. Although these specialized lenders can and do underwrite conventional loans to prime eligible

individuals<sup>46</sup>, they have clearly preferred to exploit more lucrative subprime lending opportunities. So although the existence of information that provides an incremental and linear ranking of risk could theoretically have given rise to a confluent market space open to an infinite variety of competitive decisions on how to segment the mortgage market, what we find instead is the entrenchment of a fairly tangible break. The binary partition is the conservative imprint of the GSE's upon the FICO<sup>®</sup> technology for the purposes of screening for prime market candidates. Once the institutional benchmark for how the scores should be used was hardwired into the material infrastructure of underwriting and rating software it ran deep enough in the infrastructure to cleave the lending space in two. These spaces are distinguished by their distinctive risk management practices.

While the GSEs have tended to stick to their 'plain vanilla' prime market loans after the adoption of bureau scores, a new breed of lending outfits continued to work with the scores to innovate techniques of granular risk-based pricing with hundreds of potential price levels (Collins, Belsky & Case, 2004). In 1996, First Franklin Financial<sup>47</sup> CEO and co-founder William D. Dallas published an ambitious article entitled 'A time of innovation' in the trade journal *Mortgage Banker*. He stated that it was clearly "unsuitable for lenders to sell what is truly a subprime loan (loans that fail to meet secondary market agency standards) to the secondary market corporations" (Dallas, 1996). Having engaged with Fair Isaac, Freddie Mac and Standard & Poor's, he enthusiastically predicted the growth of a subprime business arguing that "there are much higher margins and reduced risk when you properly price a subprime loan instead of

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<sup>46</sup> As the crisis has unfolded the consumer fairness issue is to assess when a subprime loan is justified and when it is predatory. Many prime eligible borrowers did take out subprime loan products during the bubble. While consumers in disadvantaged areas may have done so because they had greater geographical access to subprime lenders, some were attracted to these loans by their lower monthly payment schemes which could be advantageous especially when making multiple property investments. Treasury Secretary Paulson's proposed plan (unveiled in December 2007) which included freezing interest rates on adjustable rate mortgages, but only for individuals with credit scores of 660 or more, is a perfect example of how FICO<sup>®</sup> scores are being redeployed to refine and justify the distinctions between prime and subprime treatment through ongoing policy intervention. Such decisions reduce ambiguities in the definition of subprime by strictly aligning a category of loan products with a category of borrowers. The consequences of this on market mobility have yet to be discussed.

<sup>47</sup> 1<sup>st</sup> Franklin Financial Corporation operates in Georgia, Alabama, South Carolina, Mississippi and Louisiana. In the heart of the real estate bubble First Franklin was bought by Merrill Lynch as a 'subprime specialist' for 1.3 billion, an acquisition that would weight heavily on the firm only a year later as the market collapsed (Keoun, 2007).



mispricing it and jamming it into the prime pipeline” (Dallas, 1996). First Franklin’s slogan – ‘Score it, price it, close it’ – captures the élan of score infused private label finance. With FICO<sup>®</sup> poised to act as a vertical bridge between the primary and secondary markets, it was a short step from systematically originating subprime mortgage loans to moving these up through the ratings agencies and into investment portfolios.

A 2004 Joint Center for Housing Studies (Harvard University) working paper by two employees of Standard & Poor’s has provided evidence that this separation is empirically meaningful (Raiter & Parisi, 2004). Examining the relationship between FICO<sup>®</sup> scores and mortgage coupons (interest rates) from data in S&P’s proprietary database of 9.3 million residential mortgages, the study concluded that rational risk based pricing had become more refined and more expansive since 1998. By ‘rational’ they meant that that the interest rate of the loans increase as the FICO<sup>®</sup> scores decreased, but also that “the coupon rate charged on the loan at origination [...] translated into true dollar costs over the life of the loan” (p 20). What is perhaps more significant is the finding that “risk-based pricing is more efficiently applied in the *nonprime* arena” (emphasis added) which implied that “lenders are more concerned about accurately pricing default risk in a market segment that is perceived to be of higher risk than in the prime” (p 18). Vaunting the qualities of LEVELS<sup>®</sup> the paper drew attention to the fact that while the GSEs “would provide one mortgage rate for all borrowers qualifying for a particular product, originators in the non-conforming market could provide a range of coupons dependent on their ability to stratify risk” (p 6).<sup>48</sup>

These alternative dynamics of subprime lending are now take to be matters-of-fact in the banking industry. The FRB’s Commercial Bank Examination Manual and the Bank Holding Company Supervision Manual both observe that a FICO of 660 is the reported industry benchmark for the subprime lending (consumer credit and mortgages) although they are careful to indicate that the government guidance does not endorse any “single

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<sup>48</sup> It is perhaps not incidental that the first author, Frank Raiter, was, as managing director of Residential Mortgage Group within S&P Structured Finance unit, a key advocate of credit scoring during the period of industry automation. The study discussed here is perhaps somewhat tautological in that it uses FICO<sup>®</sup> scores to show that the market is rational, when it is arguable the rationale of the FICO<sup>®</sup> that has made the market able to perform this rationality.

definitive cutoff point for subprime lending” (Federal Reserve Board, 1994a, p 11; 1994b, p11)<sup>49</sup>. The Commercial manual goes on to frankly state that “Subprime loans command higher interest rates and loan fees than those of offered to standard-risk borrowers” (Federal Reserve Board, 1994b, p 2). As long as lenders charge prices that are high enough to cover the higher loan-loss rates and overhead costs, associated with this business then the subprime can be expected to be profitable. Moreover, this manual points out that “The ability to securitize and sell subprime portfolios at a profit while retaining the servicing rights makes subprime lending attractive to a larger number of institutions, further increasing the number of subprime lenders and loans” (p 2). Indeed, under these conditions it does not seem at all astounding that securitization would be infinitely more attractive in the subprime than in the prime.

### **The GSE paradox**

During the housing bubble the mortgage market grew due to a proliferation of lending that did not meet the agencies risk management criteria because the GSE’s ‘non-accepts’ – the very loan categories they eliminated and deemed *hors du marché* – became private-label’s main market. The result is a startling paradox: “Fannie and Freddie have become the opposite of what they were. They are now lenders to safe markets, while private institutions serve markets that were once liquidity-deprived” (Thornbert, 2007). So although the GSEs exist to better attract capital to the market, as Richard Syron, Chairman and CEO of Freddie Mac pointed out to the recent Congressional Committee on Financial Services inquiry, today, “Numerous investors compete vigorously for mortgage assets” (Syron, 2007). The record of Syron’s testimony indicates that mortgage risk is, in all actuality, widely dispersed among many investors. For the duration of the housing boom, it was investment capital that generously funded a proliferation of mortgage options, and attended to the very groups that are arguably most in need of ownership assistance according to the mandate of the GSEs.

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<sup>49</sup> The FRB examination manuals provide guidance to supervisory personnel in planning and conducting bank inspections, although they are not legal documents.

The central observation is that “the issuers of private-label residential MBS are holding the aces that were once held by government-sponsored enterprises (GSEs), Fannie Mae and Freddie Mac” (England October 2006). “Once a junior – but powerful – player in the market private-label residential mortgage backed securities (RMBS) are now the leading force driving product innovation and the net overall volume of mortgage origination” (England October 2006). As the composition of loan originations moves towards non-standard products and as the secondary market attracts less risk restricted firms willing to fund those loans, “[the GSE’s] share of U.S. residential mortgage debt outstanding (MDO) has dropped significantly, while the MDO share for competing investors has grown dramatically” (Syron, 2007, p 30)<sup>50</sup>. Freddie Mac and Fannie Mae continue to be “large forces in the mortgage market”, but it is becoming widely recognized that they are playing “a small and diminishing role in the subprime business as large Wall Street institutions and hedge funds have become more active” (Bajaj, 2007).<sup>51</sup>

Some recent production figures from the heart of the real estate boom drive home the magnitude and acceleration of these changes. By 2003, private-label accounted for 24 percent, or some \$586 billion of RMBSs. At that time, most of the loans involved were ‘jumbo prime mortgages’, that is, mortgages considered to involve a low credit risk but whose size would exceed the purchasing limits imposed on the GSEs in their charters. In only the first two quarters of 2006, however, private-label issuance had grown to nearly the same amount as in all of 2003 – to \$577 billion – and their percentage share of the market had leapt up to 57 percent.<sup>52</sup> What is even more striking is how these figures are distributed by type of market or market segment. While the issuance showed a healthy increase from \$57 billion (Q1-03) to \$67 billion (Q1-06) in the prime segment, it had

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<sup>50</sup> Document available online at <http://www.freddiemac.com/corporate/about/policy/pdf/syron3-15-07finaltestimonypdf.pdf>.

<sup>51</sup> In addition to facing new sources of competition, the GSEs have been besieged by harsh accusations of ‘creative bookkeeping’. In response to these affairs, H.R. 1461 the Federal Housing Reform Act of 2005 was passed on October 26, 2005. The Federal Housing Reform Act of 2007 introduced March 9 (H.R. 1427), was being debated at the time of writing. Bills have included provision to force the Agencies to raise capital reserves and to divert funds towards affordable housing in high-risk groups. Although the bill does not specify how high-risk will be assessed, an educated guess is that this will be determined at least in part by the participation of FICO<sup>®</sup> scores or some other bureau tool. The potential repercussion of these and other capital requirement to the agencies’ potential hold on even the prime market is clearly discussed in (Frame & White, 2007).

<sup>52</sup> Source: Inside Mortgage Finance Database, reported in (England October 2006).

more than tripled – from \$37 billion (Q1-03) to \$114 billion (Q1-06) – in the ‘subprime’. It has further been reported that in 2003, “62 percent of originations were conventional, conforming loans underwritten to GSE guidelines. By contrast, in the first half of 2006, only 35 percent of mortgages were conventional, conforming loans” (England October 2006).

In the last decade private capital has been tripping over itself – or so it appeared – to become a handmaiden to the American Dream. The subprime collapse has turned the tables back again, and the GSEs are now taking a sound scolding from their masters in Congress for having left vulnerable populations, the very groups most in need of temperate government assistance to the Wall Street wolves. In its defense, Syron has diplomatically pointed out that “Freddie Mac’s business is confined to the residential mortgage market – in good times and bad. We can’t diminish our support for this market when there are more profitable investments to be had elsewhere”. Unlike the private equity funds, hedge funds, non-bank financial institutions, the GSEs need to maintain more conservative portfolios because they have a “statutory requirement to provide liquidity to the nation’s mortgage market” (Syron, 2007). Perhaps the final blow of irony is that as the crisis began, the GSEs themselves were caught holding some \$170 billion in private-label subprime securities<sup>53</sup> which they would never have underwritten themselves. Like so many others, they had purchased these as investments because they were triple-A rated by the ratings agencies<sup>54</sup>.

### **Conclusion: Calculative chains and financial action**

It seems to make obvious sense today that lenders should be moving all kinds of loans into the capital markets. High-risk loans flying off the books – this is indeed as Ben Bernanke has put it, a ‘great sea change’ from the days when the GSEs were the

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<sup>53</sup> This figure was reported in an Office of Federal Housing Enterprise Oversight (OFHEO) news release available online at: <http://www.ofheo.gov>.

<sup>54</sup> A statement to this effect was made by James B. Lockhard III, director of the OFHEO at the Federal Reserve Bank OF Chicago’s 44<sup>th</sup> Annual Conference on Bank Structure & Competition, at the luncheon address, May 16, 2008 (author’s field notes). The increasingly complex relationship between the GSEs and the ratings agencies manifests itself in numerous ways as indicated earlier in footnote 20.

chartered institutions necessary to facilitate mortgage finance in a risk minimizing fashion. Rather than taking simplified dynamics of ‘supply and demand’ or ‘risk versus return’ as naturalized backdrops of this type of change, this paper has proposed that we take the practical configuration of these economic principles into material devices as an object of investigation. Instead of searching for accelerations of financial activity in the ideas and motivations of market participants this means examining the moments when the material content of industry practices have changed, and how these changes generate novel pathways of microeconomic market participation which gradually become amplified into macroeconomic circuits of capital flow.

Adapting tools from science and technology studies and the social studies of accounting, to the social study of finance, this paper has presented a calculatively sensitive account of the origins of the subprime mortgage market. It has traced the movement of commercial consumer credit analytics into mortgage underwriting as a means of demonstrating that what might look like the spontaneous rise of a ‘free’ capital market divested of direct government intervention, has been thoroughly embedded in the concerted movement of technological apparatuses. When dealing with the recent breakdown of this financial circuit, the approach replaces ‘transgressions of economic common sense’<sup>55</sup> with the ‘generative calculative practices of economic agency’ (Callon & Law, 2003; Preda, 2006; Rose & Miller, 1992). In this view, financial phenomenon are no longer categorised as the results of correctness or falsity, of rationality or irrationality, so much as they are analysed symmetrically according to how financial activities are framed, constituted and brought into being – until as it may happen, their own internal consistency brings them to the point of overflow and collapse (MacKenzie, 2006).

FICO<sup>®</sup> scores can therefore be said to have reconfigured mortgage markets, putting into place a space of potential high-risk investment action. The intriguing plot twist is that these scores were introduced into the mortgage industry by risk-adverse government agencies. When the GSEs adopted the FICO<sup>®</sup> they interpreted scores conservatively,

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<sup>55</sup> The reference to ‘transgressions’ points to both the errors that are attributed to having followed economic ideas too closely, as well as to those that are said to result from overriding a naturalized economics.

assuming they could be used to reinforce the binary spirit of the traditional form of *credit control-by-screening*. But because the tool had inscribed within it the possibility of making financially meaningful risk management calculations, it enabled the rise of a new form of financial activity: *credit control-by-risk*. As FICO<sup>®</sup> scores were hardwired across a number of independent information processing infrastructures they aligned the calculative activities of distinct groups of actors. The new control proliferated outside of the government facilitated market through developments in private automated loan evaluation software, giving rise to a vibrant and invested subprime.

What the exercise of tracking shows is that the scores have not achieved these effects abstractly or from a distance. Shifting from one form of market calculation to another requires a gradual and continuous process of material extension in which scores have travelled long distances, lodge themselves in many places, and participated in traceable processes. Thus it is not quantification, model building or numerical expression *per se*, that should be linked to increased channels for high-risk investment in the mortgage industry. Nor can responsibility for the changes be flatly pinned on the GSEs for having adopted the scores in the first place. It is the pioneering journey of FICO<sup>®</sup> scores throughout the industry that integrated, assembled and aligned different market agents. The integrity of the chain – which might have been truncated had an alternative solution or even another interpretation of this solution been adopted at any point along its length – is what has rendered these diverse agents capable of engaging together in a distinctive and coherent, globe spanning circuit of productive subprime real estate finance.

This is not a story of technological diffusion because continuous distribution, adaptation, discovery and innovation have mattered. The scores did not diffuse unhindered, but passed through and were adjusted at several institutional passage points. Nor is it a story about technology selection where a technical method is purposively promoted by overtly politicized actors because it coheres to the needs of a greater particular movement or political program (for this kind of account see (Burchell, Clubb & Hopwood, 1985)). Instead, the political outcomes of this case (broadly speaking) have unfolded within the messy and uncertain process of constituting the scores as appropriate tools for mortgage

finance. Political change results from the multiple local movements that remake the technology into a market device. In this story a risk management apparatus becomes in and of itself the diffused principle of coordination between groups with different interests and objectives. This why an overarching or driving ‘discourse’ or preexisting ‘rationality’ is notably absent – because actors who are not discursively aligned at the outset end up being organized through shared risk management practices.<sup>56</sup>

A technological platform for common calculation can be the carrier of profound political displacement and of astounding economic change. But since statistical solutions are naturally multiple the achievement of such a platform has to be taken as an analytic puzzle not as a causal force. As a form of modelling for simplifying and disambiguating through a process of abstraction (Rosenblueth & Wiener, 1945), calculative problems can be framed in multiple ways, and calculative solutions are constantly threatened by the introduction of alternative possibilities (Callon, 1998a; Callon & Law, 2003). From Fair Isaac’s point of view the impetus for selecting their product across the board is its scientific superiority within a competitive market for scores. Yet as we have seen, the constitution of this staying power was deeply entangled with the activities of government and ratings agencies whose endorsements, independent research initiatives, interpretations and automated systems greatly contributed to re-qualifying and singularising (Callon et al., 2002) this particular brand of consumer risk scores such that it became a calculatively effective risk management product for another market situation.

Once this calculative tool was stabilized in infrastructure it intensified and generated downstream complexity<sup>57</sup> as it made co-ordinated and coherent collective decision

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<sup>56</sup> The insightful observation that accounting systems can participate in the creation of their own organizational contexts is discussed in (Hopwood, 1983).

<sup>57</sup> A topic entirely omitted in this paper that is crucial to the unfolding of the eventual subprime induced crash is the rise of structured finance, credit enhanced securities with what are called ‘senior subordinated structures’. These investment vehicles are built with tiers of mutually insuring, differentially graded tranches that layer risk unequally at different rates of return in the design of the product. In the crisis it was the junior classes of these products held by hedge funds that degraded first as they are built to do, but not as rapidly as they did. That single class pass-through gave way to these structured securities after 1997 (Adelson, 2004) strongly suggests that the adoption of commercial credit scores played a role in the development of structuring. This paper touches upon only the immediate capital market innovation that followed behind the introduction of FICO® scores.

making possible. As the case exemplifies, in the absence of sustained calculation no financial action is possible at all, and there little or no mortgage market. Hence the initial role of government institutions, one kind of market making device whose rule-based way of achieving common calculability performs a low-risk mortgage market with limited investment products. The shift towards circulating credit bureau scores, on the other hand, has performed high-risk markets with differentiated and structured products. As devices, both the GSEs and FICO<sup>®</sup> scores have proved workable solutions to the problem of rendering financial action possible. What is remarkable, is that in achieving their objectives through different tools, methods and organizational arrangements, each one assembles mortgage markets with distinctive qualities of financial action.

The purpose of this research is to draw attention to the role that new calculative devices have played in changing the nature of U.S. consumer credit.<sup>58</sup> If risk is tied to the capacity to make decisions as Millo and Holzer (Millo & Holzer, 2005) have cogently suggested – that is to say, a decision not to lend at all is a zero risk decision – then the unfolding volatility of subprime finance as well as its amplified supply and demand are related not so much to having misjudged risk, but rather to economic agents having acted upon the novel risk-based entities that were materialized, shaped and carried by the FICO<sup>®</sup> credit bureau scores. The explosion of subprime lending was not caused by fraudulent or irrational activity, but by the over-coordination of market actors around stabilized frames of risk provided by third party commercial consumer analytics companies. It was not from a dearth of information (information asymmetry), but from the *presence* of innovative forms of digitized consumer risk scores that the infamous model of originate-to-distribute model (creating profit by pushing loans in volume onto the secondary markets) was put into action. In this view, the crisis should be studied as the temporary achievement of a tight financial order, not as the result of disorder.

The protracted, subprime catalyzed credit crisis of 2007 is perhaps less the outcome of having acted in error, than it is the outcome of having acted, period. Contemporary

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<sup>58</sup> It is noteworthy that the U.K.'s commercial bureau scoring system is the most similar to that of the U.S., largely due to the influence of Fair Isaac.



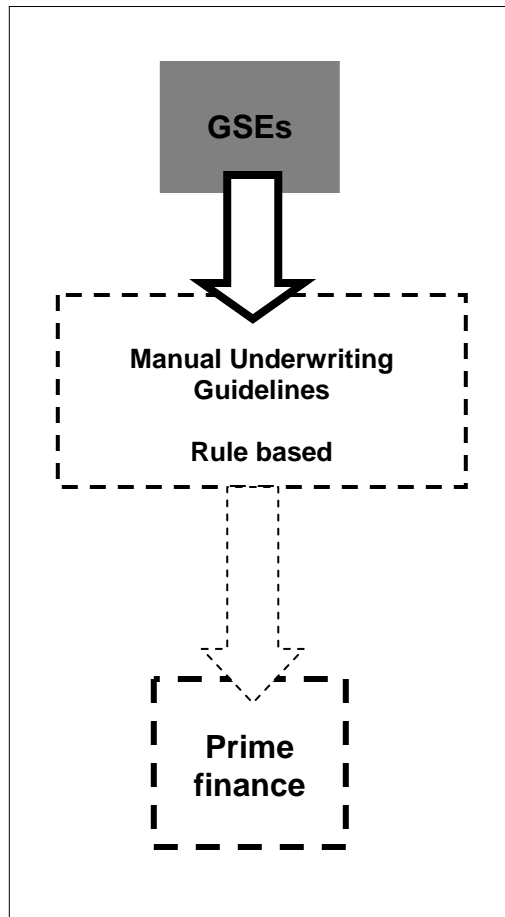
financial turbulence is the empirical result of having engaged with novel conditions of calculative possibility.

**Table 1** *Overview of the major institutions featured in the paper*

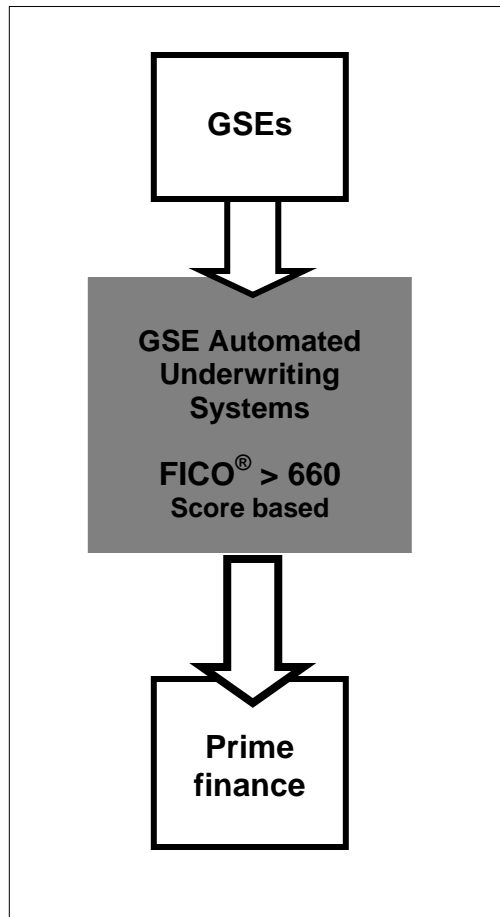
<u>Type of institution</u>	<u>Name</u>	<u>Role in mortgage market</u>	<u>Relevant technological contributions</u>
<b>Government sponsored agencies (GSEs)</b>	<b>Freddie Mac, FHLMC</b> Federal Home Loan and Mortgage Corporation	Formed to purchase and assemble pools of loans into investment grade securities, the GSEs created the traditional guidelines and letter grades for rating mortgages and securities. They spearheaded efforts to automate the mortgage industry in the mid-1990's, adopting the FICO® scores and benchmarking the prime market at FICO® 660.	RMBS, the original simple pool, residential mortgage backed securities
	<b>Fannie Mae, FNMA</b> Federal National Mortgage Association		Prime market automated underwriting software: <b>Loan Prospector</b> ® (Freddie Mac) <b>Desktop Underwriter</b> ® (Fannie Mae)
<b>Consumer credit bureaus</b>	<b>Experian</b>	Defined by and subject to special laws, these are competitive repositories of data on consumers collected from lending institutions and the public record. The business, which was started by 'mom and pops', has slowly been consolidated. Today, the three firms hold statistically significant information on an estimated 75% of the U.S. population eligible for credit (i.e. over age 18).	Originally providers of credit reports, by 1991 all three had independently entered into joint ventures with Fair Isaac to produce and sell a statistical consumer analytic product called a <b>FICO</b> ® score, a risk management tool for credit solicitations and account management. Since then each has implemented multiple scoring algorithms and sell several brands of competing credit scores
	<b>Equifax</b>		
	<b>Trans Union</b>		
<b>Consumer analytics firm</b>	<b>Fair Isaac</b>	A pioneering credit analytics firm started by Bill Fair and Earl Isaac in 1956. Developer of the 'scorecard', a basic credit scoring tool. In the mid-1980's they began engineered the statistical algorithms implemented at the bureaus to produce FICO® scores.	The group attempted and failed to create a commercially viable 'mortgage score' out of <b>RMCR</b> (residential merged credit reports), the traditional data of mortgage underwriting. When the GSEs adopted the FICO® they turned support towards that product.
<b>Ratings agencies</b>	e.g. <b>Standard &amp; Poor (S&amp;P)</b>	S&P worked with the GSEs to test statistical underwriting in the non-prime market and offered a model validation service that actively hardwired the GSE interpretation of the FICO® into numerous alternative underwriting systems.	<b>LEVELS</b> ®, S&P's proprietary mortgage securities evaluation program that issues a letter rating for investors to indicate the credit quality of pools of loans. The system prefers loans tagged with FICO®.
<b>Subprime specialists</b>	e.g. <b>Countrywide, 1<sup>st</sup> Franklin Financial</b>	Specialized subprime operations. Some created proprietary underwriting software and packed mortgages into subprime securities issued through the ratings agencies while retaining servicing rights over the loans.	e.g. <b>CLUES</b> ® (Countrywide's Loan Underwriting Expert System). This system relies on FICO® scores.

**Figure 1** Summary of the argument

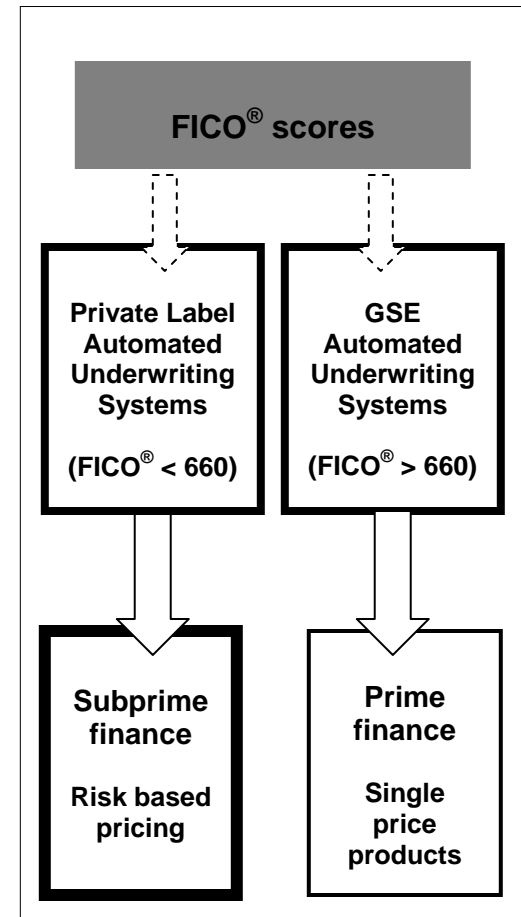
*Market device A - GSE institutions*



*Calculative shift (1995)*



*Market device B - FICO® risk scores*



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