


**Conventions and the
process of market
formation: the case of the
market for non-prime
mortgage-based securities**

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The article develops the hypothesis that conventions can be key to the development of markets for previously untraded financial assets. It argues that the absence of historical data on the performance of assets may induce agents to form beliefs in ways that preclude the formation of markets for certain financial instruments. Conversely, in the absence of trading, the data on the basis of which agents could revise their beliefs will not be produced, giving rise to a feedback loop that hinders the process of market-formation. The article contends that one of the ways of overcoming this state is the development of conventions about the distribution of future payoffs. It then shows that the emergence of the conventions that credit rating agencies could reliably measure the riskiness of non-prime residential mortgage-securities (RMBSs), and that the FICO score could reliably give a quantitative expression of the creditworthiness of individual borrowers was a crucial enabling condition of the formation of a market for RMBSs in the United States.

Keywords: conventional valuation, probability, mortgage-backed securities, credit rating agencies, credit scores.

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In a highly influential paper published almost a century ago, John Maynard Keynes contended that ‘the fact that our knowledge of the future is fluctuating, vague and uncertain, renders Wealth a peculiarly unsuitable subject for the methods of the [neo]classical economic theory’ (Keynes, 1937: 213). In a radically uncertain world, one cannot meaningfully assign probabilities to the possible future states of the world, making it unreasonable for investors to value assets by discounting their future payoffs. This is why, according to Keynes, real agents do not assess the available alternatives in the manner devised by neoclassical economics; rather, they are forced to adopt an alternative decision-making method which relies heavily on ‘conventional judgement[s]’ of value (ibidem: 214).

Keynes was aware that such a method of valuation has ‘weak points’ (1978: 153). ‘[B]eing based on so flimsy a foundation’, conventional valuations are ‘subject to sudden and violent changes’ (Keynes, 1937, p. 214), which may lead to economic disruptions and crises. However, contrary to contemporary behavioural economists (e.g. Shiller, 2014), Keynes regarded conventional valuation as a fairly reasonable way of comparing assets. More precisely, he considered that this method is the rational way to proceed in a world where the outcomes of investment decisions are radically uncertain (Mizuhara, 2003), and where therefore there often exists no rational basis on which to discount future cash flows. In this sense, Keynes put forward an innovative understanding of the process of asset valuation, which regards conventions at one and the same time as that which allows agents to behave reasonably in the market and that which makes markets unstable.

This article expands on Keynes’s insights by exploring two interrelated hypotheses: that conventions can play a major role in the formation of markets for previously untraded financial assets; and that, precisely because conventions play such a key role in the process of market-formation, the development of markets for previously untraded assets can be financially destabilising. Building on recent choice-theoretical developments which account for the impact of ambiguity-aversion in decision-making processes (Gilboa and Schmeidler, 2004), the article shows that, given radical uncertainty, agents do not devise a single set of priors for

future asset payoffs; and this, in turn, prompts them to adopt decision-making methods which preclude the formation of markets for poorly understood assets (Easley and O'Hara, 2010; Mukerji and Tallon, 2001). Conversely, in the absence of markets, the information on the basis of which agents could devise new priors that are consistent with trading is not generated – which, in turn, gives rise to a feedback loop that hinders the development of markets for certain assets.

The article shows how this feedback loop preventing the development of markets may be overcome by the formation of conventions about the future distribution of payoffs, and applies this insight to the understanding of the development of the non-prime residential mortgage-backed securities (RMBSs) market in the United States. The mainstream literature has widely acknowledged that one of the key factors contributing to the explosive growth of this market was the failure of credit rating agencies (CRAs) to adequately assess the riskiness of securities derived from personal debt. According to this view, (Ashcraft et al., 2011; Gennaioli and Shleifer, 2018: 53–6; Hull, 2011: 188–9; Richardson and White, 2009; Financial Crisis Inquiry Commission, 2011), in the decade that preceded the great financial crisis (GFC), CRAs have broadly overrated non-prime RMBSs,¹ inducing investors to demand irrational amounts of these assets and supporting the expansion of the supply of personal credit. This literature has generally overlooked, however, that CRAs have not contributed to the development of the RMBSs market solely by *overrating* debt-securities. Rather, the fact that these agencies *started to rate* such assets was in itself a major cause of the development of the market for RMBSs.

As statements by market participants collected by the US Financial Crisis Inquiry Commission (FCIC) reveal, it was only after CRAs started rating non-prime RMBSs that investors began to even consider adding these poorly understood assets to their portfolios. Building on this evidence and on data on the volume of RMBSs outstanding from 1989 to 2007, this article develops the hypothesis that, regardless of their overoptimistic assessments, the very fact that agencies helped

¹ Although they constitute the most important form of ABS in terms of value and volume, RMBSs are only a specific type of ABS (see below).

stabilise expectations on the future yields of RMBSs was instrumental in shaping investors' subjective valuations in such a way as to increase their willingness to hold these new types of assets. To put it more precisely, *the emergence of the convention that the agencies' ratings represented an adequate assessment of the likelihood of default was a key enabling condition of the formation and growth of the market for non-prime RMBSs.*

In developing these arguments, the article contributes to the literature in three ways. First, it throws light over some hitherto neglected connections between the increasing importance of rating techniques and the development of the market for securitised personal debt, thus expanding our understanding of the processes that promoted the explosive growth of household indebtedness in the US before the GFC. Second, it enhances our understanding of the economic significance of conventions, revealing that, contrary to the mainstream view, the role of conventions is not only to lower transaction costs (Young, 1996) and/or distort prices of existing assets (Shiller, 2014); rather, convention-formation can also act as an enabling condition of the constitution of markets for new types of financial assets. Third, the article provides evidence for Keynes's original insights that, in the face of radical uncertainty, (rational) agents tend to rely on conventional forms of valuation; and that, precisely for that reason, asset markets tend to be inherently unstable.

1. Securitisation and the problem of valuation

One of the key financial innovations of the last quarter of the 20th century was the securitisation of household debt. Securitisation is 'the process and the result of converting regular and classifiable cash flows from a diversified pool of illiquid existing or future assets of similar type, size and risk category into tradable, debt and equity obligations' (Jobst, 2006: 732). It represents a significantly recent financial innovation: personal debt only began to be securitised in the 1970s, when home mortgages were firstly pooled by US government-backed agencies. In the 1980s, banks and other lending institutions started to pool and securitise credit card and auto loans (Jobst, 2008). It was only in the second half of the 1990s,

however, that the market for securitised personal debt really took-off (Bhidé, 2017).

The process of polling together loans and transforming them into tradable commodities gives rise to asset-backed securities (ABS). ABSs derived from personal debt can take different forms, depending on the types of underlying loans, the issuing institutions and the way cash flows are paid to security holders. In contemporary financial markets, one finds ABSs that are derived from mortgages, student loans, credit card loans, auto loans, and so on. These securities are sometimes issued by the asset originator (e.g. commercial banks, mortgage banks or finance companies); more often, however, loans are transferred to legally separate asset holding corporations – such as special-purpose vehicles (SPV) set up by originators ‘specifically to purchase the assets and realize their off-balance-sheet treatment for legal and accounting purposes’ (Jobst, 2008: 48) – which become responsible for holding the portfolios of pooled consumer debt in their balance sheets and for securitising them. It is to finance the purchase of the original loans that SPVs issue ABSs and sell them to investors such as pension funds and insurance companies. Accordingly, SPVs use the proceeds of the original loans to finance the payments due to the holders of ABSs.

By allowing banks to move existing loans off their balance sheets, securitisation made it possible for them to expand the supply of credit without disrespecting the rules imposed by the Basel Capital Adequacy Accords (Kregel, 2013; Prates and Farhi, 2015). Yet, by establishing economic relations between borrowers and investors that are distant from one another both socially and geographically (Tooze, 2018), securitisation also made it difficult for potential ABS buyers to value assets derived from personal debt. First, the originate-to-distribute model creates a potentially perverse incentive structure: because their returns do not depend on debt repayments, originators have few incentives to spend resources on adequately screening prospective borrowers (Keys et al., 2010). Second, the creation of issues with tradeable float requires SPVs to structure securities that are worth at least US\$1 billion (Bhidé, 2017: 100). Creating a US\$1 billion float of securitized personal loans, however, is no trivial matter: personal

loans are as a rule much smaller than that. Hence, in order to issue floatable ABSs, banks are forced to pool together tens of thousands of personal loans (*ibidem*).

The extent to which ABS owners will be paid depends on losses on the underlying assets. Investors, however, rarely possess the information or expertise to confidently assess the likelihood that the underlying loans on which the performance of ABSs depend will be repaid (FCIC, 2011: 43–4). This problem became particularly pressing as ABSs started to be issued ‘as subordinated, negotiable contingent claims (“tranches”) with varying seniority and maturity’ (Jobst, 2006: 732).

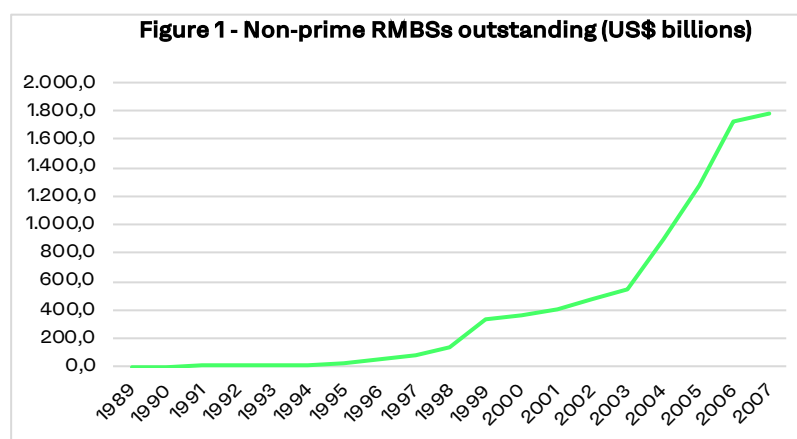
[T]he financial engineering behind these investments made them harder to understand and to price than individual loans. To determine likely returns, investors had to calculate the statistical probabilities that certain kinds of mortgages might default, and to estimate the revenues that would be lost because of those defaults. Then investors had to determine the effect of the losses on the payments to different tranches (FCIC, 2011: 43).

These difficulties, however, did not prevent investors from entering the market *en masse*, supporting credit expansion in the years that preceded the GFC. Indeed, they did so at an astonishing speed: whereas in 1985 there was US\$1,829.5 billion in total ABSs outstanding, in 2007 that number had already reached US\$9,137.6 billion.² The significance of this change becomes more evident once we consider that in 1985 agency RMBSs represented 92 percent of the total amount of ABSs outstanding, a share that fell to only 48 percent in 2007. Agency RMBSs are either guaranteed or issued by a government-sponsored enterprise (GSE), such as the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac), or by enterprises owned

² All the numbers in this section are derived from data provided by the Securities Industry and Financial Markets Association (SIFMA).

by the US government, such as the Government National Mortgage Association (Ginnie Mae). Accordingly, investors on these assets usually considered the risk of default to be negligible: as a trader told the FCIC (2011: 68), '[w]ith securitizations handled by Fannie and Freddie, the question was not "will you get the money back" but "when"'.

The same, however, did not apply to other kinds of ABS. As the same investor pointed out, 'with [the] new non-agency securities, investors had to worry about getting paid back' (FCIC, 2011: 68). Take the type of ABS whose market increased the most in the decade that preceded the GFC: the non-prime RMBSs derived from loans that do not meet the GSEs' underwriting criteria.³ The first non-prime RMBSs were issued in the late 1980s. In 1989, there were only US\$ 200 million in non-prime securities outstanding in the US financial markets. The holding of non-prime RMBSs grew slowly in the following years, only to skyrocket from the late-1990s onwards. In 1996, US\$ 33 billion in non-prime RMBSs were issued (8.8 percent of the issuance of agency RMBSs), and investors held a total of US\$ 48.4 billion in their portfolios. In 2006, by contrast, the market swallowed US\$ 933.6 billion in new RMBSs (103.3 percent of the issuance of agency RMBSs), and in 2007 the stock of these instruments outstanding reached US\$ 1,781.3 billion (Figure 1).



Source: Securities Industry and Financial Markets Association (SIFMA). Downloaded from <http://www.sifma.org/research/statistics.aspx>

³ The underlying assets of non-agency RMBSs are alternative-A and subprime mortgages. Alt-A mortgages are usually extended to borrowers with lower credit scores, higher loan-to-value and debt-to-income ratios than prime (i.e., agency-conforming) mortgagors. Subprime mortgages supply financing to borrowers that have low credit scores, often due to damaged or limited credit history, and low income and net worth.

That before the mid-1990s agents had been generally sceptic about non-prime RMBSs is not surprising. Valuing these assets was fairly complicated: not only the securities themselves, but the very loans from which the latter were derived (i.e. alternative-A and subprime mortgages) were by then relatively uncommon. Hence, contrary to agency RMBSs, there was almost no historical data on which potential investors in non-prime RMBSs could rely to estimate the distribution of payoffs. Even worse, investors usually did not have access to substantial information on the underlying assets. As Moody's former managing director told the FCIC (2011: 119-20): 'Subprime [RMBSs] and their offshoots offer[ed] little transparency around composition and characteristics of the loan collateral. ... Loan-by-loan data, the highest level of detail, [was] generally not available to investors'. Hence, investors 'had neither access to [complete data on the underlying assets] nor the capacity or analytical ability to assess the securities they were purchasing' (ibidem), which helps explain the low volume of non-prime RMBSs outstanding in the mid-1990s.

However, in the late 1990s, the attitude towards non-prime RMBSs suddenly changed. From around 1997 to 2007, investors acquired an enormous amount of these instruments. To understand this change of attitude, it is necessary to discuss the way investors form beliefs about future payoffs and how such beliefs affect their willingness to trade financial assets.

2. Beliefs and valuation in the absence of historical data: Keynes's contribution

As Keynes once pointed out, orthodox economists usually assume that '[t]he calculus of probability ... [is] capable of reducing uncertainty to the same calculable status as that of certainty itself' (Keynes, 1937: 213). In the real world, however, 'we have, as a rule, only the vaguest idea of any but the most direct consequences of our acts': more often than not, 'our knowledge of the future is fluctuating, vague and uncertain' (ibidem). According to Keynes's logical interpretation of probability (Keynes, 1921), such uncertainty makes it impossible

to reasonably assign numerical probabilities to all possible future events:⁴ ‘our existing knowledge’, he says, ‘does not provide a sufficient basis for a calculated mathematical expectation’ (Keynes, 1978: 152) of the outcomes of our choices. This means that, far from being rational, the decision-making method devised by orthodox economics is profoundly unreasonable: given that ‘[w]e simply do not know’ (Keynes, 1937: 213) – and *cannot* know – what the probabilities of most of the possible outcomes of our actions are, it would be senseless to base all of our choices on the present value of future payoffs.

Yet, agents still can – and often do – devise reasonable ways of evaluating the available courses of action. Aware that their ‘basis of knowledge for estimating the yield ... amounts to little and sometimes to nothing’, and conscious that it would ‘be foolish, in forming [their] expectations, to attach great weight to matters which are very uncertain’ (Keynes, 1978: 148–49), investors form their expectations by ‘ignor[ing] the prospect of future changes about the actual character of which we know nothing’ and by ‘assum[ing] that the existing state of opinion as expressed in prices and the character of existing output is based on a correct summing up of future prospects’. Most importantly, they also ‘endeavor to conform with the behavior of the majority or the average’, thus adopting what Keynes ‘term[s] a *conventional* judgement’ or a (1937: 214, emphasis in the original) or ‘conventional method of calculation’ (Keynes, 1978: 152).

Hence, far from rejecting the principle of rational behaviour as such, Keynes’s critique of the orthodox view offers ‘an account of economic agents’ *rational* response to conditions not just of risk but of gross uncertainty’ (Meeks, 2003: 18, emphasis in the original). To be sure, a decision-making process that is based on the method of conventional valuation – which, ‘in an absolute view of things’, is ‘so arbitrary’ – has clear ‘weak points’. Indeed, as Keynes acknowledges, the ‘precariousness’ (1978: 153) of this method is often at the root of disastrous outcomes at the macroeconomic level. From the perspective of the individual investor, however, adopting the conventional method of valuation is the rational

⁴ On Keynes’s theory of probability, see also Lawson (1985) and McCann (2003). On the links between his theory of probability and his economic theory, see Lawson (1988).

way to proceed in a world where the outcomes of investment decisions are radically uncertain (Mizuhara, 2003). The upshot is that, from Keynes's perspective, and contrary to the orthodox approach, asset prices arise not from the interaction of isolated individuals who seek to maximise their expected utilities, but rather as the outcome of valuating practices anchored on historically determined social norms of valuation.

3. Beliefs and valuation in the absence of historical data: the subjectivist perspective

Based on a logical interpretation of probability, Keynes developed a radical critique of the neoclassical theory of economic behaviour, one which – contrary to contemporary behavioural economics (Shiller, 2014) – does not conflate rational behaviour with *optimising* behaviour (Dow, 2003; Fitzgibbons, 2003; Mini, 2002). His view, however, was seemingly debunked by the subjective expected utility (SEU) theory developed by Frank Savage (1972 [1954]), according to which rational agents are always able to devise a set of probabilities on future states, and thus also to choose how to act in a manner that corresponds to the principle of expected-utility maximisation developed by von Neumann and Morgenstern (1955 [1947]).

Savage's framework is based on the subjectivist interpretation of probability developed by Frank Ramsey and Bruno de Finetti. Working independently from one another, these two authors came to a similar conclusion: that there is no such-thing as objective probability. In other words, 'probability is a degree of belief, and probability theory is the logic of partial belief' (Galavotti, 2005: 195–96). 'When I evaluate a probability', says de Finetti (1989: 193), 'I only express my state of mind'. In this sense, it is 'meaningless to think that my evaluation is wrong' (ibidem): being subjective, probabilities cannot be objectively correct or incorrect. It follows that the rules of formal logic cannot ground probability assessments: citing Wittgenstein approvingly, Ramsey (1991 [1923]: 296) contends that '[t]he process of induction ... has no logical foundation but only a psychological one'.

If ‘there are no “true” probability values, and consequently there cannot be any process of approximation to them’ (Galavotti, 1989: 249), then the capacity of a decision-maker to act rationally (i.e. to maximise her preferences) in uncertain situations cannot depend upon her capacity to estimate “correct” probabilities. However, criteria can still be devised to judge the rationality of the agent’s behaviour. True: the laws of probability ‘do not depend for their meaning on any degree of belief in a proposition being uniquely determined as the rational one’ (Ramsey, 2016 [1926]: 36). Yet, one can still ‘distinguish those sets of beliefs which obey [the laws of probability]’ (ibidem) from those which do not. ‘Having degrees of belief obeying the laws of probability’, says Ramsey (ibidem), ‘implies ... consistency’; and consistency requires both that the probabilities of future states sum to one, and that conjunctive and disjunctive events follow the product and addition rules.

According to subjectivism, therefore, consistency is ‘the only condition that degrees of belief should obey: insofar as a set of degrees of belief is [consistent], there is no further demand of rationality to be met’ (Galavotti, 2005: 199). Despite its modesty, such requirement is of tremendous importance. For it provides the foundation for the key idea of subjectivism: that a probability may not, in any case, ‘be unknown ... through lack of skill in arguing from given evidence’ (Ramsey, 1989 [1922]: 220). Indeed, rational agents can always devise a consistent set of degrees of belief expressing the probabilities that each member of the finite set of possible future events will occur.

The notion that rationality requires not the “correctness”, but merely the consistency of degrees of belief, entails that there exists no rational criteria to decide, in any given concrete situation, which of the infinite consistent sets of probabilities should be chosen: from a subjectivist perspective, they are all equally rational. To be sure, de Finetti does supplement ‘the “static” definition of subjective probability in terms of coherent degrees of belief with a “dynamic” dimension’ which adopts the Bayes’ rule to bridge ‘the gap between degrees of belief and observed frequencies’, thus indicating ‘how subjective probability can be applied to statistical inference’ (Galavotti, 2005: 200, 214). This does not mean,

however, that one can give a logical justification for induction. On the contrary, from a subjectivist perspective, 'one can only apply *practical* criteria to the choice of a probability function' (Galavotti, 1991: 247, emphasis added); in other words, the act of inferring probabilities from the existing evidence, can only find *pragmatic* justifications (Ramsey, 1991, p. 301).

By distinguishing the definition of probability from the estimation of numerical probabilities, subjectivism posits that, although the accuracy of any given method of probability inference does depend on the quantity and quality information, the agent's ability to devise a rational probability distribution is by no means contingent upon the latter. And this, as Savage (1972) showed, suffices to reinstate the general validity of the principle of expected-utility maximisation: regardless of the quantity and quality of information, rational decision-makers can always estimate expected utilities and choose the alternative with the highest value.

4. From the absence of historical data to the absence of markets

The subjectivist theory of probability adopted by contemporary orthodox economics⁵ embraces the view that rational agents can always evaluate assets by assessing the present value of future payoffs. This, however, does not entail that agents will always be able to trade such assets. Take the case of non-prime RMBSs, which are instruments by means of which investors purchase the rights over future, contingent payments from indebted households. Rational agents will only trade the rights over contingent cash flows if the subjectively assessed value of the latter is different from its market price. More formally, the trading of debt securities requires that there is at least one ratio of present money (M) to future income (y_{st}) such that the following two fundamental inequalities are simultaneously respected:

⁵ See McCann (1994, chapter VI).

$$U^A(M) \leq \sum_{t=0}^T \sum_{s \in S} \pi_{st}^A \left(\frac{1}{1+\delta} \right)^t U^A(y_{st}) \quad (i)$$

$$U^B(M) \geq \sum_{t=0}^T \sum_{s \in S} \pi_{st}^B \left(\frac{1}{1+\delta} \right)^t U^B(y_{st}) \quad (ii)$$

where $t = 0, 1, 2, \dots, T$; S is the space of all possible states s ; π_{st}^i is the probability of state s at time t , as expected by agent i ; y_{st} is the income flow that obtains at time t in the context of s ; and δ is the rate of time preference.

The subjectivist theory of probability contends, on the one hand, that rational agents can adopt different priors; and, on the other, that Bayesian updating tends to produce convergence – *but only when agents have access to historical data*. Now, when agents have different expectations about future payoffs, they may not be willing to sell and acquire securities at any price. Consider the following case:

- agents A and B have the same preferences, with $U' > 0$ and $U'' < 0$
- $T = 1$
- in $t = 0$, agent A plans to invest and agent B plans to borrow
- in $t = 1$, A intends to consume the proceeds of her investments and B plans to repay her debts
- there are two possible states of nature:
 - $s_1 \equiv B$ defaults
 - $s_2 \equiv B$ repays her debts

If $\pi_{11}^A \ll \pi_{11}^B$, then there will be no ratio of present money to future payments at which (i) and (ii) hold simultaneously, precluding the trading of the asset at hand. Notice that a no-trading situation is more likely to take place when A and B have no access to historical data; for, in such conditions, the agents cannot carry out the process of updating which would eventually promote the convergence of

subjective probability estimates.⁶ Hence, in the absence of historical data, agents A and B may be unwilling to trade debt securities, despite the fact that both are rational and follow the principle of expected-utility maximisation.

The refusal to trade debt-securities becomes even more likely when decision-makers follow principles other than that of expected-utility maximisation, such as those derived from recent extensions of the SEU framework based on the insights of Daniel Ellsberg (1961). As noted by Ellsberg, when information about the distribution of payoffs is vague, decision-makers tend to behave in ways that consistently violate the behavioural rules prescribed by SEU theory: they often prefer to bet on unambiguous rather than ambiguous events, which leads to choice patterns that are inconsistent with the expected-utility hypothesis. Strikingly, Ellsberg also found that agents ‘act in conflict with the axioms [of SEU] deliberately, without apology, because it seems to them the sensible way to behave’ (Ellsberg, 1961, p. 699), suggesting that the violations at hand cannot be dismissed as having a mere descriptive relevance; rather, they raise doubts about the general validity of expected-utility maximisation as a normative principle of agency. In other words, when information is vague, agents *rationally* choose to follow rules that contradict the principle of expected-utility maximisation (Zappia, 2018).⁷

Recent contributions have developed decision-making rules which account for the patterns described by Ellsberg. One of them, advanced by Gilboa and Schmeidler (2004), assumes that, when the agent has too little information, she adopts not a unique prior, but ‘a set of priors as possible’. It also assumes that, ‘being uncertainty averse, [the decision-maker] takes into account the *minimal* expected utility (over all priors in the set) while evaluating’ (Gilboa and Schmeidler,

⁶ That the amount and quality of information can have a non-negligible influence over the agents’ willingness to trade was acknowledged by none other than de Finetti himself. See Feduzi et al. (2014).

⁷ Savage himself was aware of this issue, although he did not envisage any solution to it. In his words (1972: 57-8): ‘There seem to be some probability relations about which we feel relatively “sure” as compared with others. ... The notion of “sure” and “unsure” introduced here is vague, and my complaint is precisely that neither the theory of personal probability, as it is developed in this book, nor any other device known to me renders the notion less vague’.

2004, p. 125, emphasis in the original) which of the available courses of action to follow.

When beliefs can be represented by multiple sets of priors and preferences expressed by the *maxmin* on the set of expected utilities, the quality and amount of information on payoffs have a strong influence on the agents' willingness to trade assets whose payoffs are uncertain. Indeed, if the perceived ambiguity is great enough, agents may rationally choose not to participate in the market. Consider the following situation:

- $U(x)^{A,B} = \ln(x)$
- $T = 1$ (only two periods)
- In $t = 0$, the investor can buy one of two assets:
 - a non-prime RMBS, which promises to pay y in $t = 1$,
 - or a treasury bond which pays r for certain.
- $P_{RMBS} = P_{T-Bond}$, and $y > r > 0$
- There are only two possible states:
 - $s_1 \equiv$ the borrowers default ($y_{st} = 0$)
 - $s_2 \equiv$ the borrowers repay their debts ($y_{st} = y$)

In the absence of historical data, the investor devises not a single, but two priors: I = $\{\pi_{11} = 1, \pi_{21} = 0\}$ and II = $\{\pi_{11} = 0, \pi_{21} = 1\}$. She thus faces two possible scenarios:

Scenario I:
 $EU(\text{T-Bond}) = \ln(r)$
 $EU(\text{RMBS}) = \ln(0)$

Scenario II:
 $EU(\text{T-Bond}) = \ln(r)$
 $EU(\text{RMBS}) = \ln(y)$

Here, $EU_{min}(\text{T-Bond}) = \ln(r)$, and $EU_{min}(\text{RMBS}) = \ln(0)$. Hence, if the agent follows the *maxmin* decision-rule, she will always pick the T-bond over the RMBS, regardless of the differences in their expected returns.

To summarise, the absence of historical data represents an important barrier to the development of asset markets. Either by inducing decision-makers to adopt multiple priors or by leading different individuals to adopt priors that are highly heterogeneous, ambiguous information promotes modes of valuation that are incompatible with trading. And this gives rise to a vicious circle: without a market, the asset is not produced, and the information that could allow agents to value cash flows in ways that are consistent with market participation is not generated.

5. Breaking the circle: the role of conventions

The scenario depicted above is similar to the one faced by prospective investors in non-prime RMBSs in the early 1990s. Such investors had no access to historical data on the basis of which they could form beliefs about payoffs (International Organization of Securities Commissions, 2008: 9–10); accordingly, they usually refrained from purchasing non-prime RMBSs. The absence of a market, in turn, hindered the production of reliable information, giving rise to a feedback loop like the one described above. In the late-1990s, however, agents eventually managed to break away from this vicious circle, giving rise to patterns of interaction that promoted the development and growth of the non-prime RMBSs market. How can this be explained?

A way out of the vicious circle described above is provided by the development of conventions anchoring the agents' estimates of the likelihoods of payoffs. By anchoring estimates, conventions can not only induce investors to adopt unique priors, but also promote some degree of convergence among the priors adopted by them. Conventions thus prompt agents to value future income in ways that are consistent with asset exchange, underpinning the constitution of markets for previously untraded assets.

This is exactly what happened in the case of the non-prime RMBSs market. In the late-1990s, investors started to anchor their expectations around the assessments of CRAs such as Moody's, Standard & Poor's and Fitch, transforming

the latter into ‘key players in the process [of securitisation], positioned between the issuers and the investors of securities’ (FCIC, 2011: 43). As an early player in the RMBS business told the FCIC, investors would only be able to value such novel and complicated financial instruments if the latter ‘had a rating’ (FCIC, 2011: 68). As another player pointed out, because ‘the people that we were selling these bonds to had never really had any history in the mortgage business ... [t]hey were looking for an independent party to develop an opinion’ (ibidem: 44). This, as he noted, is precisely what the rating agencies offered.

CRAAs were able to perform such role because they had already been acknowledged by market participants as capable evaluators of corporate and public bonds. In part, this was due to regulation (Poon, 2014): in the 1930s, when regulation prohibited banks from investing in speculative assets and defined the latter as those securities which CRAAs deemed below “investment grade”, the agencies’ ratings were given ‘*the force of law*’ (White, 2010: 213, emphasis in the original). In the 1970s, the Securities and Exchange Commission determined that the capital requirements for broker-dealers were contingent upon CRAAs’ assessments of the assets in their balance sheets (ibidem: 214). Later on, the second Basel Accord, which ‘uses ratings on the debt held by banks as one of three possible frameworks for determining those banks’ capital requirements’ (White, 2010: 213), helped cement the CRAAs’ role in the private agents’ estimation of the value of future, contingent cash flows.

Yet, these factors alone cannot explain how CRAAs became acknowledged as capable evaluators of RMBSs. It is one thing to evaluate ‘quite well understood’ (Hill, 2009: 589) assets such as commercial papers issued by a few hundred large corporations and public entities. It quite is another to evaluate complex securities derived from poorly understood (and usually lowly collateralised) subprime and alt-A mortgages (FCIC, 2011: 45). The sheer quantity and speed in which these securities were issued between the late 1990s and the GFC would have made it impossible for CRAAs – which until recently were relatively small companies (Rona-Tas and Hiss, 2010a) – to deploy the lengthy and highly qualitative methods adopted in the evaluation of corporate and public bonds. Moreover, RMBSs were

fundamentally different from other assets, which meant that CRAs could not simply apply their previous methods to the assessment of the new forms of securitised personal debt. Hence, in their way to become conventionally acknowledged assessors of the riskiness of non-prime RMBSs, CRAs had to develop ‘a new type of analysis’ (FCIC, 2011, p. 43), one that was both more formalised and more automated than the then existing rating procedures (Rona-Tas and Hiss, 2010a).

This is where factors beyond the CRAs’ control made their timely intervention. Like securities, individuals in the US are rated in terms of their probability of repaying debt. Their credit scores are issued by consumer credit reporting agencies. As in the case of securities, the market is dominated by three private credit bureaus: Experian, Equifax, and TransUnion (Rona-Tas and Hiss, 2010a, 2010b). In estimating credit scores, these bureaus commonly employ an analytic software developed by the same company: Fair, Isaac & Co. (FICO). For this reason, the most well-known credit score in the US is the FICO score.

Although FICO had been manufacturing scorecards since 1958, for around twenty years the company worked only with *client-specific* scorecards based on the datasets owned by each potential lender. In the late 1970s, however, FICO strove to develop a generic score, which it succeeded in doing in the early 1990s (Hyman, 2012: 267). With the generic FICO, the scores issued by different bureaus were turned into ‘virtually interchangeable pieces of information from the point of view of the end user’ (Poon, 2007: 299). This paved the way for the FICO’s transformation into the industry standard measure of individual riskiness in low collateral consumer credit, such as credit cards (Rona-Tas and Hiss, 2010a: 118). It took a few years, however, until the FICO came to perform the same role in mortgage lending.

By the mid-1990s, GSEs were looking for ways ‘to standardize underwriting practices in federally sanctioned, prime mortgage lending by introducing a consistent means of screening credit risk into its newly automated system’ (Poon, 2009: 656). They found that in the generic FICO. Indeed, already in 1995, Freddie Mac and Fannie Mae adopted the FICO as a key input in their screening processes

(ibidem, p. 663). The mortgage landscape followed suit, which led to a general move towards automated credit evaluations (Straka, 2000). In due time, both the prime and the non-prime RMBSs circuits relied on the FICO score.⁸ And so did the rating agencies: in 1996, Moody's developed its first system to rate tranches of mortgage-backed securities. Blending together information on 'loan-to-value ratios, borrower credit scores, originator quality, and loan terms and other information' (FCIC, 2011, p. 120), the model simulated the performance of each loan in alternative scenarios to derive the expected distribution of payoffs on the aggregate level of the RMBS.

The FICO's transformation into a conventional representation of individual creditworthiness made it possible for CRAs to evaluate debt-securities on the scale required by the expanding non-prime RMBS market. This, in turn, enabled the transformation of the agencies' ratings into the conventional representation of the riskiness of non-prime RMBSs. As the International Organization of Securities Commissions (2008: 5) noted in a report from 2008, 'many investors require[d] that a structured finance debt security be rated by a CRA before they will purchase it'. Indeed, '[w]ith respect of structured finance products' like non-prime RMBSs, 'investors appear[ed] to have relied heavily or solely on the credit ratings of the CRAs' (ibidem, p. 9). That this was indeed the case was shown by Ashcraft et al. (2011). On the basis of a dataset consisting of subprime and alt-A deals issued from 2001 to 2007, they found evidence that ratings were closely related with RMBSs' prices, even after controlling for bond seniority and data on the underlying mortgage pool. This suggests that ratings were causally related to yields; furthermore, it also suggests that 'MBS yields [were] *excessively* sensitive to ratings, relative to their informational content' (Ashcraft et al., 2011: 118), meaning that investors relied on the CRAs' judgements *even when the latter were not reliable*.

⁸ 'In 1998 ... only 50% of the Prime mortgages submitted for rating included a credit score on the tape and less than 30% of the Non-prime mortgages incorporated a credit score in their underwriting data file. By the end of 2003, virtually 100% of the newly originated mortgages submitted for ratings incorporated credit scores and in some cases mortgage scores' (Raiter and Parisi, 2004: 9).

The agencies' misjudgements were painfully discovered by investors in 2007-2008, when several triple-A RMBSs defaulted (Ashcraft et al., 2010). What is more important for our purposes, however, is that this type of attachment to the agencies' ratings attests that the latter had risen to the status of conventional representation of the riskiness of non-prime RMBSs. And this, in turn, supports our view that the formation of conventions regarding the distribution of payoffs constituted a key enabling condition of the development of a market for non-prime RMBSs.

6. Conclusion

This article investigated the role of conventions in the formation of markets for previously untraded financial assets. Building on Keynes's notion of conventional valuation and on recent extensions of the SEU theory, it argued that the absence of statistical historical data on the performance of assets may induce agents to form beliefs and make choices in ways that preclude the formation of certain asset markets; and that, in the absence of trading, the data from which agents could derive new beliefs will not be produced. As this article showed, this may give rise to a feedback loop that hinders the process of market formation.

After contending that such a feedback loop may be overcome by the emergence of conventions about the probabilities of future payoffs, the article investigated the role of conventions in the development of the market for non-prime RMBSs in the US. It showed that the emergence of the convention that the CRAs' ratings represented an adequate assessment of the likelihood of default of non-prime RMBSs was a key enabling condition of the development of a market for such assets. It also revealed that such convention relied on the emergence of yet another convention: the view that the FICO score adequately expressed the creditworthiness of individual borrowers.

In putting forward these arguments, the article uncovered important connections between the increasing importance of credit ratings and the development of the market for non-prime RMBSs, throwing light over some

previously unexplored mechanisms that contributed to the explosive growth of household indebtedness before the GFC. More broadly, it showed that, as argued by Keynes, conventions can have contradictory influences over a market economy. On the one hand, they play a key role in development and functioning of asset markets. Yet, by enabling the formation of markets for poorly understood assets such as non-prime RMBSs, conventions can give support to modes of behaviour which distort the process of wealth allocation and produce economic catastrophes like the GFC.

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