

# **Knowledge Production in Financial Markets: Credit Default Swaps, the ABX and the Subprime Crisis**

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### **Abstract**

In 2008, the solvency of many of the world's leading banks came to hinge on valuations of portfolios of subprime mortgage-backed securities. This article examines the ABX, a crucial new market (set up in January 2006) widely used as a guide to these valuations.

The article outlines the origins of the ABX, discusses the sometimes fiercely contested process of the standardization of the credit default swaps that underlay it, and outlines how the ABX rendered the subprime crisis visible to financial markets. Credit default swaps and the ABX are traded in a specific form of market that I call 'the canonical mechanism'. Because canonical-mechanism markets are well-regarded, it is easy when analyzing them to slip into functionalism. Accordingly, this article emphasizes the contested and sometimes precarious nature of canonical-mechanism markets, discussing disputes over how to standardize financial instruments, over the 'fairness' of prices, and over the dependability of those prices as indicators of the economic value of financial instruments. Canonical-mechanism markets, the clashes of interests they can involve, the material ways in which prices are generated and circulated within them, and their limits as generators of knowledge all need to be researched in depth.

**Key words:** economic sociology; canonical mechanism; subprime crisis; credit default swap; ABX

How did the financial markets know, in 2007-8, that there was a subprime mortgage crisis and that it threatened the solvency of some of the world's leading banks? As Gorton (2010, p. 64) and Zuckerman (2010, p. 369-70) note, a crucial part of the answer is a new set of financial instruments, launched only in January 2006: the ABX. Sharp declines in the levels of the ABX were the most visible markers of the gathering storm.

Despite the consequent huge importance of the ABX, there has been no social-science research on it, and only limited work on the underlying instruments, credit default swaps (the most interesting contribution is the analysis by Morgan 2010 of the post-crisis reconstruction of the legitimacy of these swaps).<sup>1</sup> My aim in this article is to examine the development of the ABX and the instruments on which it is based – credit default swaps on asset-backed securities – from the viewpoint of their role as generators of knowledge. (I use the term 'knowledge' in the sociology-of-knowledge sense to mean shared belief: only at the end of the article do I turn to the question – central to the topic of this special issue, the limits of knowledge – of whether shared belief is justified belief.)

Analytically, the article builds on Carruthers and Stinchcombe (1999), which lays out the particular connection between the sociology of knowledge and economic sociology that is most relevant here. They investigate how credible, impersonal, public knowledge of the properties of goods can be created, and how its creation gives

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<sup>1</sup> Also useful, although more general, is the analysis of the development of credit derivatives in Huault and Rainelli-Le Montagner (2009).

rise to a liquid market, in other words a market in which the commodity being traded can readily be bought and sold at or close to a single publicly-known 'market price'.

Three sets of arrangements and activities 'underpin the creation of liquidity', argue Carruthers and Stinchcombe:

- (i) Standardized and homogeneous products, such as financial instruments that are 'equal claims on an income stream' (1999, p. 353);
- (ii) Continuous auctions of those standardized products;
- (iii) 'Market making', which makes possible a continuous auction, traditionally through the activities of market makers or dealers who continuously quote a price at which they will buy and a price at which they will sell the products in question (a good example is the New York Stock Exchange 'specialists' examined by Abolafia, 1996).

The three features identified by Carruthers and Stinchcombe are widely regarded, especially in finance, as necessary to a properly-functioning market, so let me refer to a market with these three features as a 'canonical-mechanism' market. 'The idea', write Carruthers and Stinchcombe (1999, p. 353), 'is that everyone can know at all times what the price is, and only one price obtains in the market'. In an idealized canonical-mechanism market, market participants are 'willing to take the going price in an auction as all they can, and all they need to, know about commodified claims on income streams' (Carruthers and Stinchcombe, 1999, p. 354). To the extent that market participants are right so to do, a canonical-mechanism market is in the terminology of financial economics 'efficient': market prices reflect, effectively instantaneously, all

available information about the instruments being traded (see, especially, Fama, 1970).

However, the high regard in which the canonical mechanism is held means that there is a risk that canonical-mechanism markets are understood in a functionalist way as always solving the problem of generating knowledge that is public enough and robust enough to permit liquidity, and coming into being *because* they solve that problem.<sup>2</sup> It is, therefore, important also to emphasize that while the three features identified by Carruthers and Stinchcombe may be necessary for a liquid, transparent market they are certainly not sufficient. Canonical-mechanism markets can be illiquid, contested, incomplete and precarious, and that is this article's focus. I examine:

1. **Conflict over how to standardize financial instruments**, with different groups of market participants preferring different forms of standardization.
2. **The intricate sociotechnical 'pragmatics of price'** (Muniesa, 2007) that can be found even in canonical-mechanism markets. Such markets are frequently characterized by a systematic clash of interests between dealers and other market participants. Dealers make money above all from the 'spread' (the difference) between the 'bid' price at which they will buy the instrument in question and the 'ask' price at which they will sell it, while other participants normally desire the

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<sup>2</sup> Carruthers and Stinchcombe (1999, p. 355), identify the risk that – contrary to their intentions – their argument can be read as functionalist.

smallest possible bid-ask spread. This clash of interests often plays out in conflict over the ‘quality’ (Muniesa, 2007) of prices – in particular, their ‘fairness’ – and over exactly which prices are made known by what material means to exactly whom at precisely what points in time.

3. **Precarious abstraction.** The standardization of financial claims has the effect of making them more abstract (e.g. in the words of what remains the best study of this standardization, a grain future was ‘an abstract claim on the golden stream flowing through [Chicago’s] elevators’: Cronon, 1991, p. 120), but abstraction can nevertheless potentially be reversed. The ABX indices were and are a guide to the economic value of US subprime mortgage-backed securities. As well, however, as being in that sense abstract, they are also concretely a set of contracts on a relatively small number of specific securities and refer ultimately to a large (but finite) set of specific mortgages. As we shall see, there was an episode in which influential market participants came to fear that the concrete specificity of the ABX could be exploited to override its role as abstract reflection of value.

Furthermore, at times the number of people directly involved in frequent, large-scale trading of the ABX was quite small (in the narrowest sense, at times fewer than a dozen specific people), raising the question of the relationship between the concrete specifics of the trading interactions amongst them and the role of the ABX as a wider guide to the value of subprime securities.

4. **Contestation.** For all the cultural sway of the canonical mechanism, it is not all-powerful cognitively. Modern accounting practices, which

reflect this cultural sway, frequently require assets (such as banks' portfolios of mortgage-backed securities) to be 'marked to market', in other words to be revalued as prices – ideally prices in a canonical-mechanism market – change. The extent to which it was appropriate to use the ABX in this role was fiercely disputed, with even a central figure in the administration of the ABX warning against over-use of it in this role. The issue was critical, because it was largely 'writedowns' (mark-to-market downwards revaluations of banks' portfolios) that led the subprime crisis to threaten banks' solvency.

The most important data drawn on is a set of 15 interviews conducted by the author, mainly in New York, with market participants involved in the ABX and/or in the underlying instruments, credit default swaps on asset-backed securities. (I also draw more tangentially on a further 74 interviews with participants in the wider 'credit derivatives' market of which the ABX forms part, and in the final two paragraphs of the conclusion on a new study that I am beginning of the automated trading of shares.) The interviews took a broadly oral-history form, in which interviewees were led through their careers in relation to the instruments in question, with a particular focus on understanding the main developments in those markets, how trading was and is conducted, and the role of knowledge-generating processes such as standard indices and mathematical models. Another extremely useful source was a set of daily price levels of six ABX indices kindly provided to me by Markit, the ABX's administrators (see figure 1 below). Unless otherwise indicated, price data mentioned in this article are taken from that dataset. Further information was drawn from the (limited) technical literature on the ABX and on credit default swaps on

asset-backed securities, and from the more extensive coverage in trade magazines and the financial press (especially the *Financial Times*, whose coverage in this area has often been more insightful than that of the *Wall Street Journal*). Amongst the burgeoning, variable-quality literature on the credit crisis, two books based on extensive first-hand research (Zuckerman, 2009 and Lewis, 2010) are particularly useful in relation to the topic of this article, and I draw on them too.

This article has seven sections. After this introduction comes a brief section on credit default swaps and tradable indices based on corporate debt, which were the crucial antecedents to the instruments discussed here. That section also describes the structure of the ‘over-the-counter’ markets within which these instruments are traded. The third section examines the standardization of credit default swaps on asset-backed securities (in particular, mortgage-backed securities), focussing on disputes that took place over that standardization and on the availability to market participants of prices in that market. The fourth section discusses the creation of the ABX, and the fifth section describes how it rendered the subprime crisis visible. The sixth section turns to the issues of precarious abstraction and contestation, and the seventh section is the article’s conclusion.

### **The Model: Over-the-Counter Trading of Standardized Corporate Credit Default Swaps and Tradable Credit Indices**

The developments discussed in this article were informed not just by a general sense of the desirability of canonical-mechanism markets but by a specific model: the trading of standardized credit default swaps on corporate debt and of tradable indices referencing the debts of multiple corporations. A credit default swap is a bilateral

contract in which one party buys and the other sells ‘protection’ on the debt of a corporation or other entity (which is called the ‘name’ and is not a party to the contract). In return for a regular, set, premium, the buyer of protection has the right, if the ‘name’ defaults, to deliver its bonds or loans to the seller of protection and receive their full face value.

Such contracts began to be traded in the early 1990s, with first Banker’s Trust and then J.P. Morgan amongst their key early proponents (Tett, 2009). The standardization of them by the main trade body, ISDA (the International Swaps and Derivatives Association, for which see Flanagan, 2001 and Morgan, 2008), was a fiercely contested process (the crucial, hotly debated, issue was whether a corporation’s restructuring of its debt should count as a ‘credit event’ that triggers a default swap, and if so how ‘restructuring’ should be treated), but it was sufficiently successful to permit liquid markets in swaps on the debt of several hundred corporations to emerge by the start of the 2000s. Slightly later (in around 2003-2004) even more liquid markets were created in standardized credit indices. These are like credit default swaps, but instead of referencing a single ‘name’ they reference a large, standard set (typically numbering 125) of corporations, and unlike single-name default swaps these contracts do not terminate after the first credit event. A protection buyer can purchase protection against all defaults by the corporations making up the index, and the most influential indices are ‘tranching’: it is also possible to purchase protection against specific levels of loss (for example, the first 3 percent of credit-event-induced losses on the index; losses greater than 3 percent but no greater than 7 percent; etc.).

The structure of the trading of standardized credit default swaps and credit indices is worth spelling out, because it is typical of large swathes of the financial markets and also to be found in the instruments discussed below. Trading is ‘over-the-counter’: it does not take place on an organized exchange such as the New York Stock Exchange, but by bilateral agreement. The market-making role at the centre of canonical-mechanism markets is here played by a limited number of large banks (seldom more than a dozen, and in no instrument I know of more than 20; in the wake of the crisis, numbers have in many cases fallen below six), which operate as dealers, buying and selling the instruments in question. These dealers (collectively called the ‘sell side’) disseminate indicative prices of the instruments being traded – in the case of the markets discussed here, most commonly by electronic mail messages, frequently using Bloomberg’s system – to the other market participants, who are known as the ‘buy side’: more minor banks, hedge funds, insurance companies, pension funds and the like. If a buy-side participant wishes to transact, he or she must directly contact the dealer in question, normally by telephone, and after receiving a definite bid or ask price, the deal is agreed verbally, and exchange of paperwork or electronic confirmation follows subsequently.

The big sell-side banks that act as dealers also transact amongst themselves, often with the goal of hedging the positions resulting from their transactions with sell-side clients. (A dealer might ideally want immediately to sell to one client what he or she has just bought from another client, or vice versa, but this is often not possible.) Transactions between dealers are usually mediated by specialist inter-dealer brokers, either via exchange-like electronic trading systems or ‘voice broking’: each dealer has

on his or her desk a ‘voice box’ or ‘squawk box’, with a microphone, loudspeaker and set of switches for contacting specific brokers.

Acting as market makers in standardized corporate credit default swaps and credit indices enabled the main dealing banks to earn money via the ‘bid-ask spread’ and to hedge the risks involved in selling more profitable bespoke products such as collateralized debt obligations (CDOs), which involve the creation of a special-purpose legal vehicle that constructs a pool of assets, either by buying them or selling protection on them via credit default swaps. The vehicle sells investors securities that are tranching claims on the cash flow generated by the assets or by the sale of protection. The pooling in CDOs’ asset pools of the debt of a hundred or more diverse corporations persuaded the credit rating agencies to award their highest ratings (AAA) to the securities that enjoyed the most senior claims on the cash flow, and even more junior (‘mezzanine’) tranches typically were given investment-grade ratings such as BBB. In consequence, such securities could be sold at prices that were in aggregate considerably greater than the cost of assembling the pool, and the bank creating the CDO could capture the difference (net of fees paid to the managers of the special-purpose vehicle, rating agencies etc.) as arbitrage profit. (‘Arbitrage’ is trading that makes a no-risk or low-risk profit without requiring net outlay of capital.) These profits could be large: one interviewee told me that it was quite common in bespoke deals in the early 2000s for sell-side banks to enjoy profit rates of over 40 percent.

## **From Corporations to Pools of Mortgages**

Given the success and the profitability of this ensemble of standardized default swaps, tradable credit indices and CDOs based on corporate debt, it is not surprising that many market participants (mainly in the sell-side banks) saw the attractiveness of extending this apparatus to debt instruments of other kinds, such as asset-backed securities (ABSs), especially mortgage-backed securities. A mortgage-backed security 'deal' again involves creating a special-purpose legal vehicle that buys a pool of mortgages and issues securities that are claims on the interest payments and principal repayments from the mortgages in the pool. Typically, each subprime deal is tranching: several different classes of security are issued, with the more senior AAA-rated classes suffering a loss only if defaults on the mortgages in the pool reach very high levels, and lower classes (rated, e.g., BBB) more exposed to losses. A credit default swap on one of those securities would again involve the protection buyer paying a regular premium to a protection seller, with the latter having to pay out if the security suffered a credit event such as a failure to make a required payment to investors in it.

Ad hoc credit default swaps on asset-backed securities were entered into from the late 1990s onward, but an ad hoc swap is expensive and time-consuming to set up, because both parties' lawyers need to come to an agreement on its precise terms. Efforts to standardize began in New York in 2004-5, and at their core were five leading dealers: Bear Stearns, Citigroup, Deutsche Bank, Goldman Sachs and J.P Morgan Chase. The task was difficult and again at times divisive. Although it began informally – 'We called up the guys we felt like we knew and could work with', said one participant quoted by Pittman (2007) – standardization could not be completed entirely informally: the trade body, ISDA, needed to be involved. Those sell-side

banks that had not been part of the initial discussions were unhappy at what they perceived as their exclusion. ISDA counsel Edward Murray told Bloomberg News: ‘the dealers that were not in the group of five were not happy that there was a group of five’ (Pittman, 2007).

In the larger negotiations that then took place, quite different and sometimes clashing sets of preferences were expressed. One was the preference of those traders, particularly in Europe, who came to credit default swaps on asset-backed securities with a background in trading those swaps on corporate debt. Their desire was for a form of standardization that would closely resemble that with which they were already familiar. U.S. participants, in contrast, tended to seek a form of standardization that in their view more closely mirrored what might happen to the asset-backed security referenced by the swap. There is, for example, no real equivalent for an ABS of a corporation’s bankruptcy. (The special purpose legal vehicle created for an ABS deal is set up in such a way that in effect it cannot become bankrupt, because losses on the assets in its pool are simply passed on to investors in the securities it has issued.) ABS credit events are diverse and sometimes explicitly reversible: for example, an ‘interest shortfall’ (failure to make the full interest payment due on a security) might later be made good.<sup>3</sup> The preference of most U.S. participants, therefore, was for what became known as a ‘pay-as-you-go’ swap. In this, a transfer of funds from the protection seller to the protection buyer after, for

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<sup>3</sup> Other ‘pay-as-you-go’ credit events include a ‘writedown’ (a reduction of an ABS’s principal, following a procedure laid down in the ABS’s legal documentation), an ‘implied writedown’ (an economically equivalent reduction in the principal of an ABS that does not have a formal writedown procedure), a ‘principal shortfall’ (failure to make the full principal payment when it falls due), and a ‘rating downgrade’. See, e.g., Whetten (n.d., pp. 3-4).

example, an interest shortfall would be reversed if that shortfall was subsequently made good. Amongst the consequences was that, unlike in the corporate case, the swap would not terminate after a credit event but remain in force.

Even with general agreement amongst U.S. participants on the virtues of a ‘pay-as-you-go’ format, there was sharp disagreement over the precise credit events that would trigger a swap, disagreement that seems to have been structured mainly by whether participants envisaged themselves as being primarily or exclusively protection sellers (the main such case was the specialist bond insurers known as ‘monolines’) or likely to be large-scale protection buyers (a category into which the dealers, the big sell-side banks, seem largely to have fallen). The dealers, for example, preferred a swap that could be triggered by an extensive set of credit events, and wanted the protection buyer to have the right to end the contract early by delivering the security in question to the protection seller. In contrast, the monolines did not want the protection buyer to enjoy the latter right, and preferred a narrower set of credit events. Such divides meant that full standardization was elusive, and instead of a single template two separate pay-as-you-go templates were created. The first, agreed in June 2005, became known as the ‘dealer template’ because of how it reflected dealers’ preferences (see, e.g., Goodman et al., 2008, pp.139-40). The second, put forward in September 2005 by the monolines and other dissenters, was the ‘end-user template’.<sup>4</sup>

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<sup>4</sup> The ‘end-user template’ does not include ‘implied writedown’ and ‘rating downgrade’ as credit events (see the previous note, and also Whetten, n.d, p. 3), and does not give the protection buyer the right to end the contract early.

Despite these conflicting forms of standardization, ABS credit default swaps – as far as I can tell, mainly using the dealer template – proved extremely popular, with contracts totalling around \$100 billion entered into by December 2005, some 60 percent of which was made up of swaps on subprime mortgage-backed securities (Whetten, n.d, p. 2). These swaps made it possible, effectively for the first time, to ‘short’ mortgages, in other words to position oneself to profit from mortgage defaults. As documented vividly by Zuckerman (2009) and Lewis (2010), a number of hedge funds were already seeking to do this. There was no direct way that they could profit from falling house prices: factors such as the stubborn materiality of houses and the difficulty of constructing credible house-price indices have made the abstraction necessary for successful housing derivatives very difficult (Smith 2009), and such derivatives were only nascent in 2005-2006. Nor was there an equivalent of the short selling of shares: unlike shares, mortgage-backed securities normally could not be borrowed for short sale. However, buying protection on these securities via a credit default swap *did* position these hedge funds to profit from the payments protection sellers would have to make if mortgage-backed securities ran into serious difficulties. They did not need to own those securities in order to receive the payments: all they had to do was pay the relatively modest premiums – even in the case of an ABS rated only BBB, these were often no more than around 2 percent (per year) of the amount of protection bought – demanded by protection sellers.

The key sellers of protection in default swaps on asset-backed securities were not, as anticipated, the monolines but the special purpose vehicles of CDOs.<sup>5</sup> While

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<sup>5</sup> The monolines did sell a great deal of protection, but more of it was on CDOs, especially their super-senior (i.e. highest) tranches, than on the underlying asset-backed securities (see MacKenzie 2011).

many buyers of protection had a ‘directional’ view of the underlying mortgage markets (they expected high levels of default), CDO managers who sold protection did not necessarily expect low levels: their motivation was often simply the ratings arbitrage sketched above. By 2005, the demand for subprime mortgage-backed securities was so great that CDO managers were often frustrated in their attempted purchases, and this was especially the case for the category of CDO that was most attractive from the viewpoint of arbitrage profits: the ‘mezzanine ABS CDO’, in which the asset pool was predominantly the mezzanine (next-to-lowest) tranches of mortgage-backed securities. Using credit default swaps to sell protection on those securities circumvented the problems caused by their short supply, typically made the deal more attractive financially from its creators’ viewpoint, and allowed those creators the maximum flexibility in choosing mortgage-backed securities. Some managers of mezzanine ABS CDOs used this flexibility to choose securities that they felt were least likely to default, but in other cases (as was revealed by the legal action by the SEC against Goldman Sachs in 2010), protection buyers were allowed an input into the selection, and it was of course in their interest to choose securities they believed likely to default. In total, around 75% of the mezzanine ABS risk in the ABS CDOs that were at the core of the credit crisis – around half the total investment-banking losses incurred by the world’s leading banks were in ABS CDOs<sup>6</sup> – was ‘synthetic’, in other words created by selling protection (Goodman et al., 2008, p.141).

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<sup>6</sup> See the categorization of the direct and counterparty losses of the ‘investment banking operations of major international banks operating in the UK’ (where all global banks have operations) by the Financial Service Authority (2010, p. 41 and table 5.1, p. 42). On ABS CDOs, see MacKenzie (2011).

The structural components of a canonical-mechanism market in credit default swaps on asset-backed securities were thus in place: those swaps were standardized (especially using the ‘dealer template’), and up to a dozen dealers were prepared at any time to quote prices at which they would buy and sell protection. There were, in addition, both willing buyers and eager sellers of protection. Two aspects of this market, however, stood in the way of it becoming a knowledge-generating mechanism of the kind envisaged by Carruthers and Stinchcombe. First, though the legal form of the swap instrument had successfully been standardized, the underlying instruments, mortgage-backed securities, remained heterogeneous. Their structures often tended to be similar, but there were differences both in the composition of those pools and in the perceived reliability of those who assembled the pools and who subsequently acted as ‘servicers’ (collecting money from mortgagors and taking action if they missed payments). The result of this heterogeneity was a market that remained fragmented: despite large overall volumes in credit default swaps on ABSs, liquidity in the swaps that referenced any *particular* security was limited.

Second, knowledge of prevailing prices remained to a degree private to the dealers. A client (for example, a hedge fund buying protection in anticipation of the housing bubble bursting) would of course know the price it was paying for that protection. It would not, however, necessarily learn the prices that others, previously or subsequently, had agreed to pay for protection on the same underlying security. This mattered, because the ‘market price’ of a swap continues to play a crucial role even after it has been entered into. First, hedge funds need to ‘mark’ (value) their portfolios at least monthly, because such valuations have to be reported to their investors and form the basis on which hedge fund managers are remunerated.

Second, transactions between dealers and clients, and also amongst dealers, are usually ‘collateralized’: as market prices fluctuate, cash or other forms of collateral is transferred from the party whose position has lost value to the party whose position has gained. (Having possession of this collateral helps insulate the latter party from the effects of the former defaulting on its obligations.) Third, the major dealers often also act as ‘prime brokers’, for example lending clients such as hedge funds the capital they need to create and maintain their positions. Again, such lending is usually collateralized, and if market prices have moved against a hedge fund its prime broker will typically require increased collateral.

A common complaint of buy-side participants (such as hedge funds) in over-the-counter markets is of being ‘marked against’ by dealers: they often claim that when dealers select the price at which to mark a financial instrument they choose a price that favours their interests at the expense of their client. (I first heard these complaints over a decade ago from partners in the hedge fund Long-Term Capital Management, which blew up spectacularly in September 1998.) In particular, hedge funds that had bought protection in 2005-6 via credit default swaps on mortgage-backed securities (in anticipation of profiting when these securities defaulted) often seem to have believed they were being marked against: the ‘market price’ of the protection they had bought (as reported to them by their dealers) was not rising even as the mortgage market deteriorated.<sup>7</sup> Such complaints are hard to assess (rather than being the result of adverse marking, the low prices quite possibly were the result of the continuing willingness of CDOs, even on the very eve of the crisis, to sell protection), but that is precisely the point: with no publicly-available ‘market prices’

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<sup>7</sup> For examples of the complaints, see Zuckerman (2009, pp. 161-63) and Lewis (2010, pp. 184-89).

that enjoyed widespread credibility, there was no clear-cut benchmark against which to judge whether a particular price was ‘fair’ or not.<sup>8</sup> The ‘quality’ of prices (Muniesa 2007) remained contestable.

## **Creating the ABX**

The ABX, in contrast, offered further standardization and more public prices. Its creation was initiated by the same group of dealers who had pushed the standardization of credit default swaps on ABSs, and they saw its creation as part of the same effort to take products and trading mechanisms from the corporate market and apply them to asset-backed securities. The model used for the development of the ABX was the eventual resolution of what participants called the ‘index wars’, which had taken place when different groups of banks had launched different tradable corporate credit indices. That resolution involved the creation of a ‘shell company’ (CDS IndexCo, owned by sixteen major sell-side banks), the merging of the

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<sup>8</sup> Typically, whilst dealers have the right to issue marks, clients have the right to contest them, and contracts often specify that such disputes are to be resolved by gathering price quotations from dealers who are not parties to the contract. We ‘spend half our time contesting the marks’, said the senior manager of one hedge fund active in credit derivatives. However, he told me, formal procedures such as polling other dealers can be less than useful: ‘I mean, that’s [nonsense], you know, you see this written [into] so many contracts, oh, “go to the market and get five bids” ... I go to J.P. Morgan and say, “listen, I did this deal with Goldman Sachs”, they’re not interested to start with, and you’re sitting there saying, “I did this deal with Goldman Sachs, I am having trouble with my valuation, right? Can you go and provide a valuation for me?” ... Only so that you [J.P. Morgan] can then piss off Goldman Sachs! Well, why am I going to do that because then, I [J.P. Morgan] do a huge amount of business with Goldman Sachs?’

competing indices under its aegis, and the appointment of Markit, a company specializing in the provision of data for asset valuations, as the administrator and ‘calculation agent’. (A ‘calculation agent’ is an independent firm appointed by parties to a contract to calculate the payments from one to the other required under the contract. In late 2007, CDS IndexCo was acquired by Markit.)

The success of this resolution meant consensus amongst the ABX’s initiators to create a single set of indices, administered by Markit, under the aegis of CDS IndexCo. However, there were again disagreements over the precise form that standardization should take. One concerned how many components the index should have (in other words, how many mortgage-backed securities it should be based upon). The more sophisticated banks involved in the creation of the ABX wanted an index with a large number of components, and envisaged a tranching version.<sup>9</sup> Other banks, however, ‘wanted it [the ABX] to be simpler’, an interviewee told me: ‘A large number of banks didn’t have the capability to properly analyze this and model it on a daily basis, so they wanted it to be as small as possible’. Their preferences won out, and each ‘series’ of the ABX is based upon only twenty subprime mortgage-backed deals (while, as noted above, the main corporate indices each involved 125 names). Markit provided each of the fifteen licensed ABX dealers with a list of two recent deals from each of the twenty-five biggest issuers of subprime mortgage-backed securities. Each dealer told Markit its preference between the two deals, and Markit created the list of twenty from those preferences and from rules limiting the numbers

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<sup>9</sup> A tranching version of the ABX, the TABX, was eventually launched in February 2007, but trading of it effectively ceased after a few months because of the growing credit crisis. For reasons of space I cannot discuss the TABX in this article.

of deals that could have the same originator or same servicer. As with the corporate indices, the selection procedure was repeated twice a year, and a new set of deals issued during the previous six months became the basis of a new 'series' of the ABX. There are thus four series of the ABX, two from 2006 (06-1 and 06-2) and two from 2007 (07-1 and 07-2). No new series was created in 2008 or subsequently (after the onset of the credit crisis in Summer 2007, there were too few new subprime mortgage-backed securities to base it on), but all the four series still remain tradable.

To my knowledge there was no dispute amongst the founders of the ABX over the form of credit default swap contract to employ: a pay-as-you-go swap with three categories of credit event that trigger payments from the protection seller – an interest shortfall, principal shortfall or writedown (see note 3) on any of the twenty underlying ABSs. However, the extent of the protection seller's obligation in the event of an interest shortfall became a second area of debate. Sometimes, a shortfall is caused simply by interest-rate rises, because payments due to investors are usually set as a fixed 'spread' over a benchmark interest rate but there is often a limit in the underlying mortgage contracts on how fast borrowers' payments can rise. Protection sellers may thus have to pay out even in the absence of defaults on the underlying mortgages. Here, the interconnections between the ABX, credit default swaps, collateralized debt obligations and ratings were the crucial consideration. The investors in a synthetic collateralized debt obligation are protection sellers, and the rating agencies – whose ratings were utterly crucial to the CDO business – were unhappy with a situation in which net payments by those sellers would be triggered simply by interest-rate changes. The agencies had long experience of analyzing default (they considered that their core competence), and appear not to have wanted

that analytical task complicated by the need for additional analysis of potential losses caused purely by interest-rate changes. It was this concern that seems to have been the dominant factor in resolving the debate amongst the ABX's founders on this issue. A fixed cap was placed upon interest-shortfall payments by the protection seller: they could never exceed the amount of the credit default swap premiums received from the protection buyer.

The resolution of these two issues made it possible to define the ABX and what it means to trade it. Five securities issued by each of the twenty selected subprime mortgage-backed deals (securities with ratings, at the point of selection, of BBB-, BBB, A and AA, along with the lowest of the securities rated AAA) were selected to form the basis of five ABX indices. To 'invest' in or 'go long' the BBB index, for example, is to earn income by selling protection, via a pay-as-you-go credit default swap with the 'fixed cap' feature, on the twenty BBB-rated securities: the seller receives monthly payments of premium from the protection buyer based on an annual 'coupon' rate that was fixed at the launch of the series of the ABX in question.<sup>10</sup> Should any of the twenty securities suffer an interest shortfall, loss of

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<sup>10</sup> For example, the coupon rate on the 06-1 BBB ABX is 154 basis points (i.e. 1.54%). In the absence of credit events the protection seller would thus receive from the protection buyer an annual payment of:

$$1.54\% \times (\textit{Notional}) \times (\textit{Current Factor})$$

where *Notional* is the agreed amount of protection purchased, and *Current Factor* (which at the launch of an ABX series was always 1.00) represents the extent to which the principal of the twenty underlying tranches is reduced, either by amortization (being paid off) or by writedowns. So, for example, the annual payment for protection of \$10,000,000 (with no credit events, amortization or writedown) is \$154,000.

principal or other relevant credit event, either those payments are reduced or (if the loss is big enough) the protection seller has to make a payment to the protection buyer. The protection buyer is therefore described as being ‘short’: he or she will benefit from defaults in the underlying mortgage-backed securities.

Because the coupon rate is fixed at the launch of the series, changing beliefs about the likelihood of shortfalls, principal losses and writedowns on the twenty securities have to be reflected by another mechanism: an initial sum paid by the buyer of protection to the seller (or vice versa) when a deal is struck. If, for example, at that point confidence in the underlying securities has grown since the series was launched, the protection seller will have to make an initial up-front payment to the buyer; if it has fallen, the protection buyer has to pay the seller (there is an example in note 11 of this payment).<sup>11</sup> The size and direction of these initial payments in turn determine the ‘price’ or level of the ABX index in question (increased confidence and therefore an initial payment from the protection seller to the buyer are reflected in a level above 100; decreased confidence and thus an initial payment from the protection buyer to the seller mean a level below 100). After the close of trading every business day, Markit gathers estimates from the ABX dealers of the closing midprice of each index (the midprice is determined by the mean of the up-front payment levels at which a dealer will buy and will sell protection). Markit then applies a ‘trimmed-mean’

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<sup>11</sup> For example, on 24 February 2006, five weeks after the launch of the ABX, the ‘price’ of the 06-1 BBB index was 100.82 (Whetten, n.d., p.8). That it had risen above 100 represented an increase in confidence in the underlying securities. A protection seller entering into a contract with a protection buyer at this ‘price’ would have to make an initial payment to the buyer of

$$0.82\% \times (\textit{Notional}) \times (\textit{Current Factor})$$

where *Notional* and *Current Factor* are defined as in the previous note.

algorithm that closely resembles the one used to construct Libor (London Inter-Bank Offered Rate): before the mean Libor input is calculated, the highest and lowest quartiles are eliminated, so making it impossible for a single deviant or manipulative input to alter the result other than marginally. ABX closing prices produced by the trimmed-mean algorithm are then published on Markit's website. Prior to the credit crisis, they were of interest only to aficionados; from summer 2007 on, they became amongst the most closely-watched numbers in the world – the most credible publicly-available guides to the value of the subprime securities whose troubles increasingly threatened the solvency of the global banking system.

The launch of the ABX on 19 January 2006 provoked little press attention, even amongst the financial press – which may have considered it a technical development of little wider importance – but huge interest from market participants. (The New York office of the ABX's administrators, Markit, was swamped by telephone and e-mail enquiries: 'the phones were ringing off the hook. We had to bring in extra people, we had to get people from London working overnight and early in the morning to help try and process some of the requests for website logins, send the information...') With the credit frenzy approaching its peak, those who wished to 'go long' subprime mortgages had been encountering practical difficulties: it was perfectly common for all the tranches of a new mortgage-backed deal to sell out within less than four hours, leaving many prospective purchasers badly disappointed in the small proportion of their intended purchases that they actually had been able to make. The smaller number of market participants who were anticipating the bursting of the housing bubble had also faced difficulties in going short (such as the marking problems outlined above). The new index offered a new way of going long or short

subprime mortgages, and also pricing that was far more public than in the credit default swap market. On the first day of trading, so one informant told me, some \$5 billion of protection was bought and sold, far more than had been expected. A single, quick telephone call to a dealer could achieve the purchase or sale of \$100 million of protection. The spread between the prices at which dealers would buy and would sell protection was reasonably tight – in October 2006 the trade magazine *Creditflux* reported it to be between 0.125 and 0.1875 percentage points – and ‘buy-side traders appear reasonably happy with the market making’ (Hagger 2006).

### **Rendering the Subprime Crisis Visible**

For the first six months after their January 2006 launch, the ABX indices remained very close to their initial level of 100, or rose modestly above it (see figure 1). CDO managers and other market participants wanting to go long the index seem to have outnumbered those who wanted to go short in order to hedge their mortgage positions or to bet on a mortgage bust, with the consequence that dealers seeking to accommodate client business ended up with large short positions: ‘everyone came in and bid long and they [the dealers] had to take the other side of the trade. It’s not really what they wanted... They kept moving the price up to try and find some people who’d go short’. The second half of 2006, however, saw the ABX starting for the first time to demonstrate what in retrospect were warning signs of the coming storm. First to be affected were the lower (BBB and BBB-) tranches of the second series of the ABX, 06-2, which moved downwards in September 2006, only two months after trading in them began. The falls were very modest (for example, the 06-2 BBB- index fell only by around a percentage point in September 2006, to just over 99), but

contrasted sharply with the ABX's behaviour earlier in the year. The financial press, which hitherto had, as noted, shown little interest in the ABX, began to monitor it.

On 28 September 2006, for example, the *Financial Times* noted the fall and attributed it to hedge fund activity:

Growing numbers of hedge funds have placed bets on a slump in the US housing sector in recent weeks...the lowest-rated tranche of the [ABX] index has been most affected. (Scholtes and Mackenzie, 2006)

— FIGURE ONE AROUND HERE —

Early 2007 saw far sharper declines in the ABX, with the 06-2 BBB- index falling below 70 in late February. This meant that by then someone wanting to start buying protection had, in addition to making the set monthly coupon payments, to make an up-front payment to the seller of more than 30 percent of the amount of protection bought. The falls in the ABX thus in effect made public that there were market participants who were prepared to make these huge payments in order to buy protection, and so made known the depth of the desire to hedge mortgage-related positions against defaults, or to profit from those defaults or from further growth in the fear of default (this last would increase the value of any protection that had been bought). Although it was not entirely clear to outsiders at the time, the wish to do these things had by early 2007 spread from hedge funds to some of the big sell-side banks, notably Deutsche and Goldman Sachs.

A temporary rally in spring 2007 was followed by even larger declines. All the series of the ABX fell markedly, with the more recent series (reflecting subprime mortgage lending undertaken just as the bubble was bursting) falling more sharply than the original 06-1 series. From mid-2007 onwards, substantial declines were experienced in even the index that market participants judged safest, the 06-1 AAA. It touched 95 in August 2007, 85 in March 2008, 70 in December 2008, and 60 in March 2009. Lower tranches and later series fell catastrophically. For example, by late 2007 the 06-2 BBB- was below 20, and it fell to single figures in April 2008. Very low levels such as this meant that the up-front cost of starting to buy protection against losses was now almost as big as the amount of protection purchased, implying the perceived certainty or near-certainty of eventual complete loss on all or nearly all the underlying securities.

In the second half of 2009 and in 2010, however, the ABX indices recovered somewhat from their lowest points. The 06-1 AAA, for example, ended August 2010 at 87, a level that indicated some confidence that losses on the underlying AAA securities will be relatively limited. Nevertheless, the levels of the lowest ABX tranches such as the BBB- still implied eventual complete losses on BBB- securities, although the modest increases in these levels are consistent with the perception that such losses will not be incurred immediately.<sup>12</sup>

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<sup>12</sup> Even with certainty of eventual complete loss, the index will not necessarily fall immediately to zero, because the protection seller will continue to receive coupon payments until the complete loss occurs. However, the lowest ABX tranches are now illiquid, so the quoted levels of them need to be interpreted with caution.

With subprime mortgage-backed securities at the heart of the credit crisis, and with the ABX ‘the only transparent and publicly available pricing for many of these mortgage instruments’ (Michael Boyle of UBS, as quoted in Scholtes 2008b), the ABX was precipitated into a role that was wholly unanticipated when it was planned in 2005. Its falling levels in 2007-8 became the most visible numerical marker of the growing crisis and an important determinant of the solvency of many of the world’s leading banks. As noted above, modern accounting practices require banks to ‘mark to market’ their portfolios of securities, at least if these are held in their ‘trading books’, which many of them were because of the lower regulatory capital requirements of holding them there by comparison with putting them in the longer-term ‘banking books’. With trading in many of those securities never having been very liquid, and with it in many cases drying up completely after the onset of the crisis, the levels of the ABX were often the only ‘market prices’ available to accountants and auditors. The huge sizes of banks’ holdings of subprime mortgage-backed securities and CDOs based on them meant that how those portfolios were valued could indeed mean the difference between survival and insolvency (in other words, the value of a banks’ assets falling below that of its liabilities). If the ABX could be taken as an accurate guide to the value of these portfolios, the falls in its levels in 2007-8 meant that large parts of the portfolios were close to worthless and even their AAA portions were seriously impaired.

### **Precarious Abstraction and Contestation**

To use the ABX to ‘mark’ broader subprime portfolios in this way was, however, to treat it as an abstraction, as a guide to economic value more generally. In two quite

distinct senses, that abstraction was potentially precarious. First, the ABX was the product of the trading interactions amongst the specific people who traded it. As the crisis deepened, volumes of trading varied considerably. Early in 2008, for example, those volumes were as high as at the index's launch, with several billion dollars of protection bought and sold every day. By April 2008, however, 'trading volumes have now dwindled to a few hundred million dollars a day', one trader told the *Financial Times*. 'Liquidity is terrible and client inquiries have virtually ground to a halt' (Scholtes 2008b). That left the bulk of trading taking place amongst the dealers themselves, and not all the fifteen licensed dealers were in practice active market makers. Each dealer typically had a single lead trader for the ABX (with back-up available when that trader was on holiday or otherwise unavailable). The result was striking, indeed vertigo-inducing. At times, the most important single guide to the solvency of the world's banks rested in an immediate sense primarily upon trading interactions amongst fewer than a dozen people. As the trader quoted above put it, 'Trading is mostly happening on interdealer screens between eight to 10 guys, and this means that prices can move wildly on very light volume'. Relatively small trades between dealers – of the order of \$25-\$50 million – could move the ABX by 'a couple of [percentage] points', another trader told the *Financial Times* (Scholtes 2008b).

Trading interactions amongst that small core group of ABX dealers were, unsurprisingly, sometimes strategic. They 'play all kinds of games', one interdealer broker told me: 'it's a poker game'. Dealers could choose whether or not to 'post' their trades, in other words whether or not to permit the interdealer broker who had mediated the trade to make it and its details available to other dealers by having them

‘flash’ on the screens that brokers provide to dealers. ‘I was amazed’, this broker told me, ‘by how hard people would work to make the screens look a particular way’, in other words to influence the portrayal of the market that the dealers’ screens provided.

In most derivatives markets, the potential effects of this kind of interaction amongst derivatives traders are limited by the arbitrage relations that exist between the derivative and its underlying asset: if the price of the former drifts too far away from the value implied by the level of the latter, an opportunity for low-risk or zero-risk profit making opens up, and its exploitation reduces or entirely closes the discrepancy. In principle, that is also the case with the ABX. Its level is interconnected with the prices of credit default swaps on the underlying asset-backed securities, and the price of those swaps is in turn connected to the yields offered by the actual securities (the ‘cash bonds’). As the crisis deepened, however, arbitrage of price discrepancies between the ABX, the swaps and the cash bonds – which had never been complete – largely broke down (see Goodman, Li, Lucas, Zimmerman and Fabozzi 2008), as trading in the swaps and bonds, which had never been high-volume, became very sporadic. Apparently attractive arbitrage opportunities were left on the table, with market participants unwilling or unable to exploit them. Amongst the difficulties was that arbitrageurs normally fund their bond purchases by ‘repo’ transactions, in which the bond is used as collateral for a loan in order to buy it. After the crisis began, the terms on which subprime mortgage-backed securities could be repoed became hugely unattractive (if repo was available at all). Amongst the effects of the breakdown of arbitrage was that the levels of the ABX at times moved in a direction opposite to that of such valuations as were available for subprime bonds, which could impose unexpected losses on those using the ABX to hedge.

With ABX dealers sometimes behaving strategically, and with the breakdown of the arbitrage relationship between the ABX and the underlying markets, the question arises whether the knowledge of the value of portfolios of subprime mortgage-backed securities that the ABX provided was distorted by that strategic behaviour. One interviewee in particular suggested to me that it was, claiming that one specific named dealer ‘leant on’ the ABX by buying ever more protection as the levels of the ABX fell (thus pushing those levels lower), because that dealer knew that there were buy-side sellers of protection who – because, for example, of demands from their counterparties or prime brokers for extra collateral – would have no alternative but to liquidate their positions at a loss as prices moved against them. Such claims are inherently hard to assess, but after hearing them I quizzed other interviewees familiar with ABX trading (but not connected to the dealer in question) about their plausibility. While agreeing that the index could at times be leant on, they suggested that its prolonged, large falls could not be explained in this way. ‘You could try’ to push the ABX, the broker quoted above told me, but could not push it that much: it ‘wasn’t as if a big bully came in and pushed [the ABX] down’. Said another interviewee: ‘you could lean on it’, but ‘only for a day or two’.

The falls in the lowest tranches of the ABX to single-digit levels reflected, as noted above, the prospect of almost complete losses on the underlying securities, and that still seems the likely outcome. However, the falls in the AAA indices were greater than justified by all but the most pessimistic prognoses for those tranches. The picture of the future painted by the AAA indices was contested at the time, most prominently by the Bank of England (2008), which argued that eventual credit losses

on the AAA tranches of subprime mortgage-backed securities would be much lower than implied by the levels of the ABX, and that ‘using a mark-to-market approach to value illiquid securities’ could therefore significantly ‘exaggerate the scale of losses that financial institutions might ultimately incur’ (2008, p. 20). Indeed Markit, the ABX administrator, itself warned at the time against over-reliance on the ABX in marking, with its head of structured finance telling *The Economist* early in 2008: ‘Two years ago we had to tout [the ABX’s] virtues. Now people consider it to be more relevant than it should be. They are panicking, over-reacting’ (Anon., 2008, p. 95).

That the levels of the AAA indices at that point were over-pessimistic is also suggested by the fact that those indices subsequently recovered considerably, as shown in figure 1. Note, however, that in assessing the levels of the AAA ABX indices in 2008 from the viewpoint of what we now know we are making use of information not then available to market participants: without the large scale, concerted government interventions that followed the autumn 2008 banking crisis, a worldwide depression – not simply a recession – could easily have been sparked, with consequences for the housing market that could fully have justified those levels. Furthermore, one does not need to invoke strategic behaviour by dealers to explain those levels. The ABX broker quoted above told me that as the crisis deepened, a ‘lot of people’ were ‘trying to get through the one door’, in other words desperately seeking to use the ABX as a way of hedging mortgage-market positions that they could not liquidate at any other than extremely distressed prices. By the spring of 2008, the prospect of almost complete losses on the securities underpinning the lower tranches of the ABX was ‘now a certain conclusion’, an ABX trader told the

*Financial Times*: ‘There are no more bets to make there’ (Scholtes 2008a). Those who wanted to hedge had, therefore, no alternative but to use the higher tranches, especially AAA, to do so, and it is therefore unsurprising that the effect of those becoming the ‘single door’ was levels that now seem over-pessimistic.

The second way in which the ABX’s role as an abstraction – as a guide to the value of subprime mortgage-backed securities – was precarious never materialized, but is of interest nonetheless. The concrete reality of each series of the ABX was a set of contracts the outcome of each of which depended on the performance of twenty pools of mortgages containing in aggregate around 100,000 mortgages. The four series of the ABX thus involved in total around 400,000 loans. That was a large number, but – when set against the huge amounts of protection bought and sold on those mortgages – not an overwhelmingly large one. In around April 2007, hedge-fund manager John Paulson – who was the most prominent among those buying protection on the ABX so as to ‘short’ the mortgage market – started to worry that if the large Wall Street ‘sell-side’ banks had, collectively, sold large amounts of protection on the ABX, it might be cheaper for them to buy the non-performing loans from the mortgage pools underpinning the ABX than to pay out massively on this protection. As an interviewee put it to me, ‘there were only twenty deals in each [series of the] ABX, and [Paulson feared] it would make massive sense for them [the sell-side dealers] to band together and just go and buy the loans at par, take whatever hit they needed to on the loans’. If they did that, there would then be no further losses on the securities underpinning the ABX, so protection buyers such as Paulson would

receive nothing, even though they had correctly diagnosed the deteriorating conditions in the mortgage market.<sup>13</sup>

It is difficult to gauge the reality of the threat to the interests of John Paulson and the other ‘shorts’ because there was no effort to implement it.<sup>14</sup> Paulson’s concerns seem to have been triggered by reported comments pointing out the possibility of the manoeuvre by Bear Stearns traders at a January 2007 industry conference in Las Vegas. One allegedly said: ‘A servicer can just buy mortgages out of a pool, so you guys [the buy-side shorts] never will be able to collect’ on the contracts via which they had bought protection (Zuckerman, 2009, p. 202). Paulson’s firm’s sense of danger was increased by a fax it received from Bear Stearns, in which the bank reportedly said that Bear, which owned a mortgage servicer, EMC Mortgage Corporation, ‘was reserving the right to work with EMC to adjust mortgages’

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<sup>13</sup> A related concern was with the loan modification programmes that mortgage servicers, with government encouragement, had begun, in order to help mortgage borrowers who were in arrears restart payments and avoid foreclosure. The buy-side concern here was that servicers owned by large sell-side firms would manipulate those programmes in such a way that the interests of those who had bought protection on subprime mortgage securities would be damaged. In particular, loans on which modifications had been agreed would no longer be classed as non-performing, and this could avoid (or at least delay) writedowns of securities whose pools included those loans, thus avoiding payments to those who had bought protection (Scholtes, 2007b).

<sup>14</sup> The only case of such a manoeuvre that I had reported to me concerned single-name credit default swaps rather than the ABX, and was initiated by a buy-side firm, not a Wall Street sell-side institution. The firm bought a badly troubled bond, persuaded three dealers to buy protection on it via credit default swaps, and then bought the outstanding balance of the underlying loans, thus pocketing the large up-front sums that the dealers had paid for protection with no risk of having to pay out on that protection.

(Zuckerman, 2009, p. 203). Paulson's firm pulled together a coalition of more than twenty buy-side firms (and also Deutsche Bank, which had a large short position), hired a leading law firm and a prominent Washington figure (Harvey Pitt, former Chair of the Securities and Exchange Commission), and lobbied hard to stop what they feared coming to pass. As an interviewee told me: 'they were all on the phone... They were very savvy... they got the right law firm involved, they got the right politicians aware, they did organize a bunch of the buy side to threaten dealers, and they kept the trade open... so that they could make their money'. If the threat was real (and, as noted, it is unclear whether it was), it is of analytical interest in demonstrating political action being taken that had the effect of preventing the concrete specificities of the underlying contracts overwhelming the ABX's role as a knowledge-generating market.

### **Conclusion: The Canonical Mechanism and the Limits of Knowledge**

The preeminence of the ABX as the means by which knowledge of the subprime crisis was generated shows that Carruthers and Stinchcombe (1999) are right to focus on the canonical mechanism as the single most important set of knowledge-generating devices in financial markets. What this article has also shown, though, is the need to investigate canonical-mechanism markets in depth and to acknowledge their limits. The three features of such markets focussed on by Carruthers and Stinchcombe do not, on their own, guarantee credible public knowledge. In particular, the materiality of prices is always a subtle but crucial matter, in which questions of apparent detail, concerning who gets to know exactly what prices exactly when, can be of crucial importance. In over-the-counter canonical-mechanism markets such as those

discussed here, there is the persistent possibility of conflicts of interest between sell-side dealers and their buy-side clients, conflicts that often play out in clashes over the material semiotics of pricing.

For example, consider the question of exactly which prices a sell-side bank will quote to its clients. At any particular point in time, the midprice it will quote (in other words, the mean of the price at which it will buy and the price at which it will sell) will most likely be the same – for the bank to do otherwise may be illegal – but the clients with whom the sell-side bank conducts the most business may well be offered tighter spreads (smaller differences between the price at which the firm will buy and will sell). From the viewpoint of the sell-side bank, there is a clear economic justification for this, but to buy-side participants it can appear a violation of the central virtue of a transparent market, quoted above: ‘that everyone can know at all times what the price is, and only one price obtains in the market’ (Carruthers and Stinchcombe, 1999, p. 353). One supplier, CMA, has found a niche in selling buy-side firms a system that captures the incoming e-mail messages from dealers containing price quotations, extracts the prices they contain and forwards those prices to CMA’s central computer system, which compiles and circulates to its clients records of the prices offered to others as well as to themselves. (The materiality of prices is evident here, because dealers have started to send those prices out in e-mail messages that are non-forwardable. CMA, however, has circumvented this by developing a system that in effect electronically ‘scans’ these non-forwardable e-mails.)

While this article has concentrated on the role of canonical-mechanism markets during the credit crisis, from the viewpoint of the topic of this special issue, the limits of knowledge, it is also worth pondering the two years prior to the crisis. As noted in previous sections, even as evidence of the deteriorating quality of mortgage origination, increasing levels of fraud and the peaking of the U.S. housing bubble accumulated in late 2005 and 2006, the price of protection on subprime mortgage-backed securities did not generally increase, and when the ABX was introduced in January 2006 its levels initially remained steady or rose. Knowledge of the deepening problems was dispersed, for example amongst those with first-hand experience of the realities of street-level lending, but if canonical-mechanism markets had been performing their Hayekian role of aggregating dispersed, local knowledge (see Hayek 1945), one would have expected the price of protection to rise, and the levels of the ABX to fall, well before they did. If a canonical-mechanism market reflects ‘the wisdom of crowds’ (Surowiecki 2004), the crowd in this case was far from wise. The ‘shorts’ described by Zuckerman (2009) and Lewis (2010) were initially a small minority, and – more than one interviewee suggested to me – not as clear-cut in their pessimistic views as they were later presented as being.

As Surowiecki himself points out, mechanisms for aggregating dispersed information and opinion can work effectively only under conditions of cognitive independence, in which participants’ influence on each other is small or non-existent. In bubbles, such as that evident in the last decade in the U.S. housing market and in the market for mortgage-backed securities, this independence condition breaks down. Given what we know now, it is hard to recapture the extent of the confidence of mortgage-market participants that no serious trouble would be encountered. The most

vivid demonstration of it in my interviews concerns a bet made by a trader (who later was to become a prominent sceptic and ‘short’) that the subprime securities underpinning the ABX would not encounter even the most minor credit event, an interest shortfall, in the first year of its operation. ‘In front of everyone’, an interviewee told me, this trader offered one of the people involved in setting up the ABX odds of 100-1 that there would be no interest shortfall. What is striking is not so much the size of the bet (the trader’s offer was taken up for \$1,000, so he went on to lose \$100,000, but that is not a large sum for a successful trader) but the astonishing odds.

As well as bubble-induced confidence, canonical-mechanism mortgage derivatives markets in 2005-6 were also buoyed by the pervasive influence of a market process that one might call ‘the ratings system’. At its core is the way in which credit ratings are not simply opinions on the creditworthiness of financial instruments, but govern investment managers (who are, for example, frequently constrained to buy only instruments with investment-grade ratings) and determine crucial regulatory matters such as the size of the capital reserves that banks need to hold in relation to their portfolios of securities (with much smaller reserves being needed for instruments with higher ratings). The ratings system produced powerful incentives to package debt of only modest credit quality in such a way that large proportions of the resultant securities could achieve AAA ratings: as noted above, those doing this could reap large arbitrage profits.

The existence of this crucial source of profit-making decoupled much of the operations of the mortgage market from any need to reach an informed view on the

risks of lending, because those risks were being passed on through a long chain, the ends of which were at many removes from mortgage origination. This process – most evident in the seemingly insatiable demand by CDOs for mortgage-backed securities of only modest creditworthiness and their great appetite for selling protection on such securities – at times overwhelmed all other influences on the market, in particular more than counterbalancing the growing but still small band of ‘shorts’. Those caught up in the process did not have to believe that prospects for the mortgage market were good (though some seem to have believed that): what mattered, rather, was that the process gave them huge incentives to act as if they believed. To put it another way, the existence of the ratings system, a governance structure with a logic quite different from that of an information-aggregating canonical-mechanism market, overwhelmed the latter until the final months before the eruption of the crisis. The ABX did give early warning of the coming storm, and those (such as Goldman Sachs) who attended quickly enough to warnings of this kind were able to escape largely unscathed, but those warnings came quite late, and were hardly to be seen at all in the market for single-name credit default swaps.

How much of the findings of this study are to do with the fact that even the ABX was traded in an ‘over-the-counter’ market, rather than on an organized exchange, and to do with the strong influence of the ratings system? Certainly, this article has shown deleterious effects of both over-the-counter trading and of the ratings system, and in the wake of the crisis there have been prominent regulatory initiatives to shift trading from over-the-counter markets to exchanges or exchange-like trading venues. However, it should not be concluded that exchange-based trading,

superior as it may be from the viewpoint of knowledge generation, avoids all the limits of this generation.

Consider, for example, the European or U.S. markets for shares, markets which are widely regarded as exemplary in terms of liquidity and transparency. While even in its most liquid period, putting on a trade on the ABX would require a minute or two of telephone conversation, automated share trading can be conducted in milliseconds, all trades have to be 'posted' (so that all market participants can tell they have taken place), and there is no equivalent for shares of the ratings system that had such a strong effect on the evaluation of mortgage-backed securities. Even in share trading, however, there are important ways in which the canonical-mechanism ideal of a single universally-knowable market price has not been achieved (and may not be achievable). The very speed and liquidity of share trading has brought to the forefront ineluctable materialities such as the way in which even the tiny delays involved in fibre-optic transmission mean that traders who are geographically separated cannot all 'know' a unique market price simultaneously. (Even at the speed of light in free space, which is not achievable in fibre-optic cables, a signal would take four milliseconds to travel from New York to Chicago. While that tiny delay would be of no significance in trading the ABX, automated share trading is now so fast that a delay of four milliseconds can easily be the difference between profitability and losses caused by one's 'stale' price quotations being 'picked off' by faster traders.) In consequence, as Natan Tiefenbrun, the commercial director of one of the leading European electronic share-trading venues, puts it: 'we have to abandon this idea that there is a universal truth for the best currently available price' (quoted by

O'Hara 2010). And, of course, the dotcom boom is a reminder that not even the most liquid and transparent markets are immune from bubbles.

Canonical-mechanism markets have their virtues, but viewed (as they must be) in their full sociality and materiality they are far more complex than simple idealizations of them suggest, and they are not panaceas that allow us to escape the limits of knowledge generation in markets. Perhaps, indeed, the problems of high-speed trading indicate that they may even have self-undermining features: the more they are reformed to increase 'liquidity' and 'transparency', the more sharply their inherent limits become apparent.

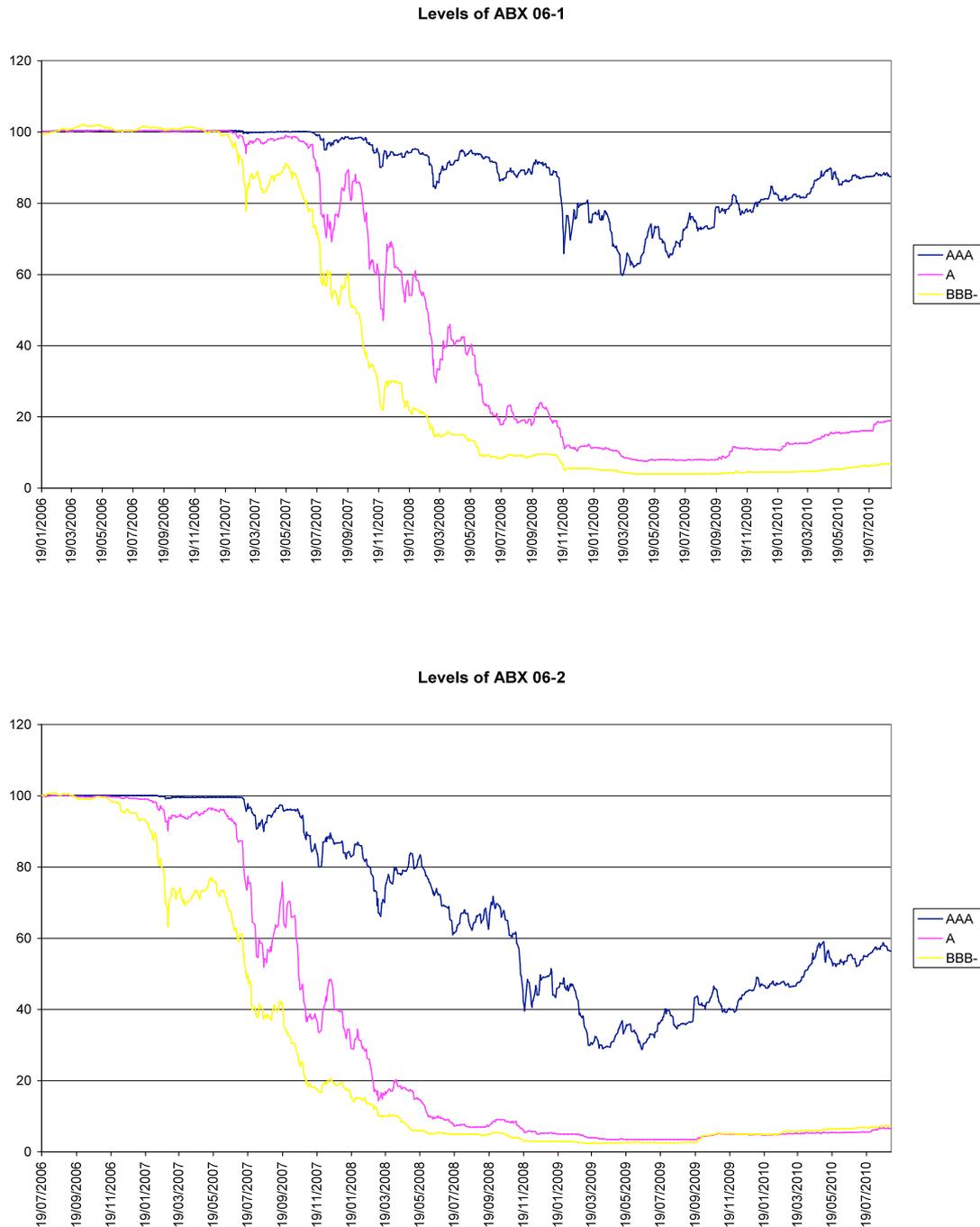
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**Figure 1** Levels of the ABX 06-01 and 06-2.

Source: based on data set of daily closing levels (trimmed means of dealers' mid-price quotes), provided by Markit.

Note to readers: I am currently experiencing difficulties in finding a satisfactory way of displaying this figure in black and white, so please view it in colour.