MEMORANDUM

TO: File No. S7-08-10

FROM: Lulu Cheng
     Special Counsel
     Office of Structured Finance
     Division of Corporation Finance
     U.S. Securities and Exchange Commission

RE: Meeting with Representatives of Intex Solutions, Inc.

DATE: April 15, 2015

    On April 14., 2015, Karen Garnett, Katherine Hsu, Lulu Cheng, Max Rumyantsev and Folake Ayoola of the Division of Corporation Finance met with Kevin McCarthy, George Jigarjian and Tony Hatoun of Intex Solutions, Inc., and Bradley J. Bondi of Cahill Gordon & Reindel LLP. The discussion included, among other things, the Commission's Proposed Rules for Asset-Backed Securities relating to the Waterfall Computer Program. Handouts are attached to this memorandum.

Attachments

The SEC's Waterfall Software Development Proposal:
A Case Study on the Need for Improved Cost-Benefit Analysis in Securities Regulation

Ryan Bubb[*]

January 30, 2015

The Securities and Exchange Commission (SEC) in 2010 proposed substantial reforms to the regulations governing the issuance of asset-backed securities (ABS).[1] The reforms were motivated by the SEC's judgment that the recent financial crisis revealed problems with the disclosures and business practices in the ABS market, in particular for residential mortgage-backed securities (RMBS) and collateralized debt obligations (CDOs), which played a central role in the crisis.[2] Included among the proposed reforms was an unprecedented type of securities regulation: a requirement that the issuer of each ABS develop, and make publicly available, software that models the cash flows from the pool of assets of the transaction as well as its flow of funds, or "waterfall."[3] As originally proposed, the software must be written in the Python programming language.[4] The waterfall software development proposal met with fierce opposition from ABS issuers,[5] other market participants,[6] and the American Bar Association,[7] and in August 2011 the SEC removed the requirement when it rereleased an amended package of ABS market reforms.[8] The SEC indicated, however, that it planned to re-propose the waterfall software development requirement in the future.[9]

The SEC's proposal arrived during a period in which the agency's regulatory practices, and in particular the quality of the cost-benefit analysis (CBA) in its rulemakings, came under increasing criticism. When the SEC is engaged in rulemaking, its organic statutes direct it to consider, in addition to investor protection, whether the action will promote

[1] Securities and Exchange Commission, Asset-Backed Securities Proposed Rule, 75 Fed. Reg. 23,328 (proposed May 3, 2010).
[2] *Id.* at 23,329-31.
[3] Asset-Backed Securities Proposed Rule, *supra* note 1, at 23,378.
[4] *Id.*
[5] *See, e.g.,* Vehicle ABS Sponsors, Comment Letter on ABS Proposed Rule (Aug. 2, 2010), available at http://www.sec.gov/comments/s7-08-10/s70810-136.pdf.
[6] *See, e.g.,* Trepp LLC, Comment Letter on ABS Proposed Rule (Aug. 2, 2010), available at http://www.sec.gov/comments/s7-08-10/s70810-73.pdf.
[7] American Bar Association Business Law Section, Comment Letter on ABS Proposed Rule (Aug. 17, 2010), available at http://www.sec.gov/comments/s7-08-10/s70810-150.pdf.
[8] Securities and Exchange Commission, Re-Proposal of Shelf Eligibility Conditions for Asset-Backed Securities, 76 Fed. Reg. 47,948 (proposed Aug. 5, 2011), at 47,971.
[9] *Id.*

efficiency, competition, and capital formation.[10] Recent court rulings have confirmed the SEC's statutory obligation to consider the economic implications of its proposed rules.[11] Despite this obligation, the SEC included little CBA of the waterfall software development requirement in its proposing release.[12]

Since the proposal was issued, deficiencies in the SEC's CBA in recent rulemakings have led to judicial invalidation of one rule[13] as well as to a critical report by the SEC Office of Inspector General faulting the SEC for, *inter alia*, failing to provide "clear, explicit explanations of the justification" for its regulatory actions.[14] In the wake of these developments, the SEC adopted new internal guidance for its rulewriting staff directing them to perform more robust CBA, including an analysis of the market failure or other justification for the rule, and to use that CBA to guide its regulatory actions.[15] Moreover, the current SEC Chair Mary Jo White publicly embraced the use of CBA in SEC rulemaking at her confirmation hearings in 2013.[16]

In this report I analyze the waterfall software development proposal to illustrate the value of requiring the SEC staff to perform more rigorous CBA before the agency imposes new rules on the securities markets. Put simply, had the SEC staff been required to identify a coherent market failure that justifies the waterfall software development requirement, the requirement would never have been proposed. The requirement would produce little benefit because there is no underlying market failure to which it is a useful response. Moreover, it would impose substantial costs by requiring ABS issuers to develop new technologies to replace existing waterfall modeling software from third-party providers that is widely used in the industry. Those direct compliance costs in turn would produce broader social costs by inhibiting capital formation. Facilitating capital formation is of course a key element of the agency's mission.[17] Perhaps most importantly, the requirement would hinder the restart of the private-label RMBS market, resulting in less private capital available to finance mortgage credit to households.

Whether the SEC's recent reforms to its CBA practices take root and become institutionalized in its rulemaking approach remains to be seen.[18] The fate of the

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[10] *See* 15 U.S.C. 77b(b), 78c(f).

[11] *See* Chamber of Commerce v. SEC, 412 F. 3d 133 (D.C. Cir. 2005); Bus. Roundtable v. SEC, 647 F.3d 1144 (D.C. Cir. 2011).

[12] *See infra*, section II.

[13] Bus. Roundtable v. SEC, 647 F.3d 1144 (D.C. Cir. 2011).

[14] SEC Office of Inspector General, *Follow-Up Review of Cost-Benefit Analyses in Select SEC Dodd-Frank act Rulemakings*, Report No. 499 (Jan. 27, 2012) ("SEC OIG Report"), at 31.

[15] SEC, Current Guidance on Economic Analysis in SEC Rulemakings (March 16, 2012) ("SEC CBA Guidance").

[16] *See Nominations Hearing Before the S. Comm. on Banking, Hous., and Urban Affairs*, 113th Cong. (2013) (statement of Mary Jo White) ([I]n my view, the SEC should seek to assess, from the outset, the economic impacts of its contemplated rulemaking. Such transparent and robust analysis, including consideration of the costs and benefits, will help ensure that effective and optimal solutions are achieved without unnecessary burdens or competitive harm.")

[17] *See* Securities and Exchange Commission, *Agency Financial Report, Fiscal Year 2014*, at 6 ("The mission of the SEC is to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation.").

[18] For an argument that reforms are needed to better institutionalize CBA at the financial regulators like the SEC, see Ryan Bubb, *The OIRA Model for Institutionalizing CBA of Financial Regulation*, L. & CONTEMP. PROBS. (forthcoming)

agency's waterfall software development proposal will be a useful gauge of how deep those reforms go. If the SEC ultimately declines to re-propose the requirement, the result would not only be a good policy outcome but also, perhaps more importantly, a sign that those reforms are having their intended effect by filtering out misguided policy ideas.

I.   Background on the Waterfall Software Development Proposal.

The SEC's waterfall software development proposal would require ABS issuers to develop and provide to investors software written in the Python programming language that models the provisions in the ABS that dictate the flow of funds to the security holders (the "waterfall"). The securities issued in any given ABS transaction typically are grouped into several classes, or "tranches," which have specific defined rights to the cash flows produced by the pool of assets underlying the securities. For example, there is often a subordination structure to the tranches such that the more senior tranches receive their promised principal and interest payments prior to the junior tranches. These payment rules are designed to allocate different risks across the securities issued in the deal in a particular way, for example by creating a set of low risk senior bonds.

The SEC's proposal would require ABS issuers to develop and provide publicly their own software for each ABS that could be used to model the transaction's cash flows and payment rules. The software must be coded to give effect to the waterfall provisions of the transaction.[19] Moreover, the software must accept as inputs asset-level data files describing the pool assets, which the SEC has required issuers to disclose.[20] The mandated software must also provide an interface for the user to input his or her own assumptions regarding the cash flows produced by the pool of assets underlying the ABS, "including but not limited to assumptions about the future interest rates, default rates, prepayment speeds, [and] loss-given-default rates..."[21] Accordingly, in addition to modeling the payment rules governing which class of securities in the deal receives which cash flows, the required waterfall software would also have to model the cash flows produced by the pool of assets based on some set of user-defined assumptions.[22]

II.   The SEC's Justification for the Waterfall Software Development Proposal.

A crucial first step in analyzing the costs and benefits of a potential regulation is to identify the problem that the regulation aims to address.[23] Typically that problem involves some form of *market failure*—a reason that private markets on their own fail to

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[19] Asset-Backed Securities Proposed Rule, *supra* note 1, at 23,429.

[20] *Id.*

[21] *Id.*

[22] *Id.*

[23] *See* Office of Management and Budget, Circular A-4 (Sept. 7, 2003), at 4. *See also* SEC CBA Guidance at 4 ("It is widely recognized that the basic elements of a good regulatory economic analysis are: (1) a statement of the need for the proposed action...").

produce an efficient outcome.[24] Familiar types of market failure include externalities, market power, and asymmetric information. In the absence of a market failure, regulation will generally produce costs in excess of its benefits. Thus the practice of identifying a market failure before proposing government intervention can be thought of as a way to filter out regulatory ideas that would produce *negative* net benefits (i.e., net social costs).

In its recent report on the SEC's CBA in selected Dodd-Frank rulemakings, the agency's Office of Inspector General concluded that the SEC failed to identify a market failure or other justification for its rules, finding:

> The SEC's Dodd-Frank Act rulemakings lack clear, explicit explanations of the justification for regulatory action. Some of the rulemakings for which market failure is a justification allude to market failure but do not explicitly cite it as a justification or fully discuss it. Other rulemakings include language that erroneously suggests a market failure justification and contain no compelling alternative rationale in support of the action.[25]

Accordingly, the SEC's new guidance on CBA now requires as its first step in a CBA that the staff "clearly identify the justification for the proposed rule."[26] However, as this section of the report explains, the SEC's CBA of the waterfall software development proposal exhibits the same lack of a properly identified market failure or other justification as the Office of Inspector General found in the agency's other rulemakings in the same period.

A. The SEC's Rationale.

The SEC's proposing release explains that the rationale for the entire package of its proposed reforms to the ABS market was based on the agency's view that in the recent financial crisis, "investors and other participants in the securitization market did not have the necessary tools to be able to fully understand the risk underlying those securities and did not value those securities properly or accurately."[27] In addition to the waterfall software development requirement, the package of proposed reforms included a range of other reforms, including a new requirement that ABS issuers disclose asset-level data for the pool of assets underlying the ABS[28] and new disclosures of the financial condition of parties subject to a repurchase obligation in the event of a breach of the representations and warranties about pool assets.[29]

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[24] *See* Office of Management and Budget, Circular A-4 (Sept. 7, 2003), at 4. Other potential justifications for regulation "include improving the functioning of government, removing distributional unfairness, or promoting privacy and personal freedom." *Id.*

[25] SEC OIG Report, *supra* note 14, at 31.

[26] SEC CBA Guidance, *supra* note 15, at 5.

[27] Asset-Backed Securities Proposed Rule, *supra* note 1, at 23,329.

[28] *See* Regulation AB, Item 1111(h), 17 C.F.R. 229.1111(h).

[29] *See* Regulation AB, Items 1104 and 1110, 17 C.F.R. 229.11104, 229.1110.

In its CBA of the waterfall software development requirement specifically in the proposing release, the SEC conceptualizes the requirement as providing "information" to remedy an "information asymmetry" between the sponsor of the ABS and investors. The rationale for the requirement provided by the SEC in its CBA is succinct enough to quote in full:

> [The waterfall software development requirement] is intended to benefit investors by facilitating their ability to run simulations of expected cash flows under different prepayment, loss and loss-given-default assumptions, while obtaining the full benefit of the loan-level data that we are proposing to require. Requiring the filing of a programming language representation of the waterfall will provide information about the terms of the securities to investors in a form they can readily use for computerized valuation methods of ABS. This will make more relevant information available to investors and allow them to make better-informed investment choices. The proposal should eliminate the transaction costs for single institutional investors individually to script the waterfall provisions into a programming language representation. This should reduce some of the *information asymmetry* between the sponsor and prospective investors that arises because the sponsor, as the person creating the contractual cash flows, has access to a programming language representation of the waterfall, a necessary element of ABS valuation using computer simulations of security performance, at the time of the initial public offering, and the investor does not.[30]

B. Problems with the SEC's Rationale.

Information asymmetry is indeed a textbook source of market failure. But while the SEC incants the term "information asymmetry" in its CBA of the proposed requirement, it fails to identify any asymmetry that is properly understood as an information asymmetry that leads to any market failure, much less a market failure to which the waterfall software development proposal is a useful regulatory response.

1. The market failure concept of "asymmetric information" is inapposite.

The standard account of information asymmetry in the securities markets entails the seller of a security knowing more about its value than the buyer. A classic lemons problem can result. Potential issuers with high-quality securities would be unwilling to issue them because investors cannot determine which securities are high quality and hence would offer a price below the value of the high-quality securities. The result can be a downward spiral in the quality of securities being offered, and a general reduction in securities issuance in the market.[31]

However, in its justification for the waterfall software development requirement, the SEC does not point to any *information* that ABS issuers have but investors lack. The SEC already requires issuers to disclose all of the information they have that is needed to

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[30] Asset-Backed Securities Proposed Rule, *supra* note 1, at 23,410 (emphasis added).

[31] *See* George A. Akerlof, *The Market for "Lemons": Quality Uncertainty and the Market Mechanism*, 84 Q. J. ECON. 488 (1970).

create software to model the ABS, including both the asset-level information about the pool of assets[32] and the contractual terms of the waterfall.[33] Rather, the relevant issue is simply what market participants will develop the modeling software used by investors to model the ABS.

To evaluate ABS, many investors choose to model the securities by running different scenarios of the cash flows produced by the deal's pool of assets and evaluating the resulting payments made to the deal's bondholders under the relevant waterfall provisions. The modeling software used to perform these types of analyses is highly technical and costly to develop. The question is, who should develop the software? One natural possibility is for investors to develop the modeling software. After all, they are the ones who would like to use it to value the bonds being issued in the ABS transaction. Another possibility is that issuers or underwriters could develop the software. Still another possibility is that third-party firms that specialize in writing ABS-modeling software could provide it. But in any case, there is a private market for not only the ABS but also for the software used by investors to model ABS. As in other software markets (and markets more generally), we generally expect that the lowest-cost providers of software will indeed provide it. For example, if it is cheapest for ABS issuers to develop the software, then the market outcome will generally entail them providing it. In contrast, if third-party software firms are better positioned to write the software and provide it to investors, then that is what the market will deliver.

In order for the SEC's proposed requirement that *ABS issuers* provide this software to be justified, there has to be some incentive problem that results in the software market not producing the efficient outcome. The SEC does not identify any such incentive problem, and I am not aware of any. The economic theory of the incentive problems produced by "asymmetric information," cited by the SEC as its rationale, is simply inapposite with respect to the operation of the ABS software market.

> 2. Third-party software developers provide ABS modeling software to investors.

Moreover, the actual performance of the ABS modeling software market belies the SEC's perceived need for regulating the software market. Many market participants—including issuers, underwriters, investors, and credit rating agencies—already employ software tools to model the cash flows received by each class of securities in ABS transactions in order to determine the degree of credit risk of each such class. A company called Intex Solutions provides one widely used modeling software package. For example, for the RMBS market, Intex maintains a library of "CMO descriptor indicator" (CDI) files that describe the pool of assets and the cash flow waterfall for each publicly issued private-

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[32] *See* Regulation AB, Item 1111(h), 17 C.F.R. 229.1111(h).
[33] *See* Regulation AB, Item 1113, 17 C.F.R. 229.1113.

label RMBS.[34] The underwriter or issuer of the securities typically creates these CDI files using a software application called Intex Dealmaker, or contracts with Intex to create the CDI file.[35] Intex also provides investors and other market participants with software that can read those CDI files and model the performance of the securities being issued in the transaction. These Intex software tools serve as the industry standard for modeling RMBS,[36] and are also used for many other classes of structured finance securities. A robust ecosystem has been developed around the Intex tools; market participants know how to use these tools to structure and model ABS, and many other third-party ABS analytic software and data tools are designed to interoperate with the Intex system.[37]

There are also ABS modeling software packages that compete with the Intex system, including tools provided by Bloomberg L.P., Trepp LLC, and Moody's Analytics.[38] Indeed, subsequent to the waterfall software development proposal, Bloomberg added additional ABS modeling capability to its Bloomberg Professional software coded using the Python programming language.[39] This is a nice illustration of the lack of a market failure in the ABS modeling software market. If Bloomberg's Python-based tools work better than competing tools, then the ABS modeling software market will shift toward Bloomberg. Bloomberg has also filed comments in support of the SEC's waterfall software development proposal.[40]

As a result of this vibrant market in ABS modeling software, any investor that wants to do this sort of analysis can license software to do so, and many do. Moreover, many ABS issuers provide sets of cash flow scenarios for the bonds (sometimes created using the Intex Dealmaker software) to investors during the marketing period for the deal.

This market outcome in the ABS software market, with third-party specialist software firms developing modeling tools and providing them to issuers and investors, makes economic sense. If individual investors each developed their own software tools, the result would be an inefficient duplication of effort. A similar inefficiency would result if

[34] *See* Larry Cordell et al., *Collateral Damage: Sizing and Assessing the Subprime CDO Crisis* (Fed. Res. Bank of Philadelphia Working Paper No. 11-30, May 2012).

[35] *See* Bank of America, Comment Letter on ABS Proposed Rule (Aug. 2, 2010), available at http://www.sec.gov/comments/s7-08-10/s70810-108.pdf, at 48.

[36] *See* Fitch Ratings, Press Release, *Fitch Updates Cash Flow Modeling & NIMs Criteria for U.S. RMBS* (Sept. 5, 2006) (describing Intex software as the "industry standard deal modeling tool").

[37] *See, e.g.,* Numerix, Press Release, *NumeriX Strengthens Analytics Platform with Intex Integration* (Dec. 18, 2007); Principia Partners, Press Release, *Principia upgrades ABS/MBS product to provide enhanced operational processing and analytics; Partnership with Intex adds unique functionality to enhance accounting and position keeping* (Nov. 9, 2005); CoreLogic, Inc., Press Release, *CoreLogic Announces Agreement with Intex Solutions and Vichara Technologies* (Sept. 17, 2010).

[38] *See* Vehicle ABS Sponsors, Comment Letter on ABS Proposed Rule (Aug. 2, 2010), available at http://www.sec.gov/comments/s7-08-10/s70810-136.pdf, at 42 ("[A]n active third party, investor-oriented ABS modeling industry has developed over the past 25 years. Companies such as Intex, Bloomberg, and Interactive Data provide ABS investors with state of the art ABS modeling capabilities.").

[39] Bloomberg L.P., Comment Letter on ABS Proposed Rule (April 28, 2014), available at http://www.sec.gov/comments/s7-08-10/s70810-290.pdf.

[40] *Id.*

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ABS issuers each developed their own software tools to structure and model their ABS. Moreover, ABS issuers and investors are not generally in the business of writing software. They generally lack the expertise in-house to develop, support, and maintain analytic software. Third-party software firms avoid costly duplication of effort and capture gains from specialization in producing ABS modeling software.

In its justification for the requirement, the SEC argues that "[t]he proposal should eliminate the transaction costs for single institutional investors individually to script the waterfall provisions into a programming language representation." But as should be clear from the discussion above, the market outcome does not entail each investor individually developing waterfall software. Moreover, while investors do have to transact with third-party software providers, this would remain true under the SEC's proposed requirement. As the SEC acknowledges, making use of the waterfall software mandated by the Rule would still require an investor to build or, more likely, acquire from a vendor other complicated software components necessary to use the mandated waterfall model to analyze ABS.[41]

In sum, the ABS modeling software market is functioning well, with no sign of a market failure that could warrant government intervention.

> 3. "Asymmetry" between investors and ABS issuers in access to modeling software had nothing to do with investors' losses on ABS during the financial crisis.

Recall that investors' losses on ABS during the crisis are what motivated the SEC to propose its package of ABS market reforms, including the waterfall software development requirement. However, the fact that investors had ready access to ABS modeling software discussed above implies that "asymmetry" between investors and ABS issuers in access to such software cannot explain investors' losses.

Moreover, basic facts about the financial crisis refute any such "asymmetry" theory. In particular, the ABS issuers themselves, which under the SEC's theory had privileged access to waterfall software, retained hundreds of billions of dollars in RMBS and CDOs and suffered massive losses as a result. Table 1 below provides the RMBS holdings as of 2007 of the top twenty securitizers of RMBS, both in absolute terms and as a percentage of the RMBS issued by the securitizer and still outstanding. The vast majority had large gross exposures to RMBS. Moreover, the final column provides actual losses on mortgage-related assets as of May 2008 net of financial hedges. The losses were large, both in absolute terms and as a fraction of their actual RMBS holdings. RMBS issuers' access to ABS modeling software evidently did not enable them to avoid suffering crippling losses from holding the very securities they had issued.

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[41] Asset-Backed Securities Proposed Rule, *supra* note 1, at 23,378 ("The waterfall computer program is a necessary but not a sufficient tool for carrying out quantitative analysis of an ABS. We recognize that investors will still have to build or acquire from a vendor other elements of a complete cash flow and valuation model.").

Table 1. Top 20 Sponsors of Non-agency RMBS 2000-2007

Issuer	Issued RMBS outstanding 2007	Non-agency RMBS holdings 2007	Non-agency RMBS holdings / Issued RMBS outstanding	Losses on mortgage-related assets as of May 2008
Countrywide	$280,577	$6,640	2.4%	$6,953
Lehman	$143,776	$41,488	29%	$3,300
Washington Mutual	$119,531	$25,912	22%	$9,100
GMAC	$115,075	$27,400	24%	$10,000
Bear Sterns	$114,613	$30,313	26%	$3,200
Wells Fargo	$104,966	$19,882	19%	$3,300
Ameriquest	$73,021	Missing	Missing	Missing
JPMorgan Chase	$70,161	$12,356	18%	$9,700
Goldman Sachs	$66,577	$46,436	70%	$3,000
Credit Suisse	$66,118	Missing	Missing	$9,500
IndyMac	$63,198	$7,108	11%	$1,264
Bank of America	$56,428	$24,013	43%	$14,900
Morgan Stanley	$56,242	$13,150	23%	$12,600
Option One	$49,241	$197	0.4%	Missing
New Century	$48,530	$234	0.5%	Missing
RBS	$48,143	$102,453	213%	$15,200
Merrill Lynch	$47,884	$43,556	91%	$37,000
Deutsche Bank	$44,335	Missing	Missing	$7,700
UBS	$38,836	Missing	Missing	$38,200
Citigroup	$38,403	$40,878	106%	$42,900

Notes: All dollar figures in $ millions. Sources: Issued RMBS outstanding and non-agency RMBS holdings from author's calculations from figures in SEC filings and in the Mortgage Market Statistical Annual, published by Inside Mortgage Finance; Except where otherwise noted, losses from Bloomberg, "Subprime Losses Top $379 Billion on Balance-Sheet Marks," May 19, 2008. Issued RMBS Outstanding 2007 calculated by averaging the firm's market share in non-agency RMBS in years 2004-2007 and multiplying by total non-agency RMBS outstanding in 2007. RMBS Holdings is gross and does not include any hedges. Losses are net of financial hedges. *2006 data. **Countrywide losses calculated by totaling pre-tax losses from 2007 – 2008Q2 in mortgage banking and banking business segments from SEC filings. ***GMAC losses as of December 2008, from SIG-TARP, "Taxpayers Continue to Own 74% of GMAC (rebranded Ally Financial) from the TARP Bailouts," Jan. 30, 2013. † IndyMac losses calculated by totaling pre-tax losses from 2007-2008Q1 from SEC filings. Table originally appeared in Ryan Bubb & Prasad Krishnamurthy, *Regulating Against Bubbles: How Mortgage Regulation Can Keep Main Street and Wall Street Safe – from Themselves*, U. PENN. L. REV. (forthcoming).

What then does explain investors' (and issuers') losses in the RMBS and CDO markets during the recent financial crisis? Why didn't more ABS market participants anticipate the coming wave of mortgage foreclosures and take steps to protect themselves?

The best explanation for the failure of ABS investors and issuers to protect themselves is that they were caught up in the housing bubble and discounted the possibility that house prices would fall.[42] A group of economists at the Federal Reserve document that analysts at the major banks generally understood that RMBS would suffer huge losses in value if house prices fell but assigned low probability to that outcome.[43] For example, they uncovered a report issued by Lehman Brothers in 2005, reproduced in Table 2 below, that provided forecasts of losses on subprime RMBS for a set of house price appreciation (HPA) scenarios as well as assigned probabilities to each of those scenarios. The analysts put just 5% probability on the only scenario involving a fall in house prices. Actual HPA was substantially worse than that most pessimistic scenario considered. In contrast, as Kristopher Gerardi and his coauthors at the Fed emphasize, the report shows that the Lehman analysts understood that a fall in house prices would lead to disastrous performance for subprime RMBS.[44] They find further evidence that Lehman's optimistic views on the housing market were widely shared on Wall Street.[45]

Table 2. Lehman Brothers Subprime RMBS Loss Scenarios

Scenario	Probability	Cumulative Loss
11 percent HPA over the life of the pool (aggressive)	15%	1.4%
8 percent HPA for life	15%	3.2%
HPA slows to 5 percent by end of 2005 (base)	50%	5.6%
0 percent HPA for the next three years, 5 percent thereafter (pessimistic)	15%	11.1%
-5 percent for the next three years, 5 percent thereafter	5%	17.1%

Notes: Source: Akhil Mago and Sihan Shu, *HEL Bond Profile Across HPA Scenarios*, U.S. ABS Weekly Outlook (Lehman Brothers Fixed-Income Research), Aug. 15, 2005.

To put this in the context of the ABS modeling software at issue in the SEC's proposed rule, the mistake made by investors had nothing to do with not having access to waterfall models. Rather, their mistake was in assuming that the pools of mortgages backing the RMBS would produce far more cash than they did, a mistake that stemmed from rosy assumptions about future house prices.

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[42] *See generally* Christopher L. Foote, Kristopher Gerardi & Paul Willen, *Why Did So Many People Make So Many Ex Post Bad Decisions? The Causes of the Foreclosure Crisis*, *in* RETHINKING THE FINANCIAL CRISIS 136 (Alan S. Blinder et al. eds., 2012); Ryan Bubb & Prasad Krishnamurthy, *Regulating Against Bubbles: How Mortgage Regulation Can Keep Main Street and Wall Street Safe – from Themselves*, U. PENN. L. REV. (forthcoming).

[43] *See* Kristopher Gerardi et al., *Making Sense of the Subprime Crisis*, BROOKINGS PAPERS ON ECON. ACTIVITY, Fall 2008, at 69, 127-41.

[44] *Id.* at 139.

[45] *Id.* at 139-40.

The Chief Risk Officer at Citigroup during the relevant period corroborates this view. In testimony to the Financial Crisis Inquiry Commission explaining why Citigroup had accumulated a $43 billion position in AAA tranches of its own securitizations, he explained:

> These risk models [employed by Citigroup], like those of most major financial institutions, tested for what were believed to be extreme loss scenarios for residential real estate. We now know that even the most pessimistic assumptions in these models did not foresee the severity of the downturn. Clearly, Citi and virtually all other market participants failed to anticipate the dramatic and unprecedented decline in the housing market that occurred in 2007 and 2008. Risk models, which primarily use history as their guide, assumed that any annual decline in real estate values would not exceed the worse case historical precedent. And since the beginning of World War II, nominal home prices in the United States had never decreased by more than five percent in any given year. The actual decline had never decreased by more than five percent in any given year. The actual decline proved to be many orders of magnitude greater than any other yearly decline in the post-war period.[46]

ABS modeling software is only as good as the assumptions fed into it and cannot, on its own, correct for the overoptimism about house prices that caused so many market participants to make disastrous investment decisions.

III.   Costs of the Waterfall Software Development Proposal.

The lack of a coherent market failure that could justify the waterfall software development requirement means that the requirement would produce little in terms of social benefits. Moreover, the requirement would also entail substantial costs, both in terms of direct compliance costs and broader social costs by inhibiting capital formation.

A. Direct Compliance Costs.

Under the proposed rule, every ABS issuer would have to write software, or contract with outside developers to write software, to model the cash flows and payment waterfall for each ABS issued. As discussed above, currently ABS issuers (and investors) use existing specialized software to structure and model ABS. For example, for RMBS, the industry standard software package is called Intex Dealmaker. The application provides a point-and-click interface to create waterfall models as well as a scripting language used in its CDI files that is specialized for describing structured finance securities. The rule would force issuers to instead develop new modeling tools. Moreover, as originally proposed, issuers would have to use a specific programming language—Python—that few in the industry use.[47]

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[46] Testimony of David C. Bushnell, Chief Risk Officer of Citigroup Inc., Financial Crisis Inquiry Commission, 2 (April 7, 2010), *available at* http://fcic-static.law.stanford.edu/cdn_media/fcic-testimony/2010-0407-Bushnell.pdf.

[47] *See* Comment Letter, Vehicle ABS Sponsors, *supra* note 5, at 47 ("The problems begin with the idea of using Python, which is a programming language used by no one in the ABS industry.").

The SEC included some estimates of these direct compliance costs in its proposing release,[48] but its numbers are implausibly low. For example, the SEC assumes that after expending some one-time setup costs adopting Python scripting technology, the additional costs in writing the required software would be only two hours of labor per securitization.[49] It is hard to understand how such complex software for each ABS could be coded, tested, and debugged in just two hours.[50]

B. Broader Social Costs through Inhibiting Capital Formation.

While ABS issuers' direct compliance costs would likely be substantial, even more significant would be the resulting broader social costs caused by inhibiting capital formation. By mandating that ABS issuers engage in costly software development, the proposal would act as an inefficient "tax" on securitization. I put tax in quotes because unlike an explicit tax, here the added cost to ABS issuers will not produce a countervailing increase in government revenue. Rather, it is a pure social cost. The added costs of the rule will make securitization a less competitive form of financing and therefore reduce overall capital formation. For mortgage credit specifically, currently the private-label RMBS market is close to non-existent.[51] The RMBS market will likely not restart in earnest until Congress completes broader reforms to the housing finance system, most importantly by reforming the role of Fannie Mae and Freddie Mac. If the SEC adopts its proposed waterfall software development requirement, it will make it even more difficult to shift from the current system in which government guarantees support the vast bulk of mortgage lending to a system based on a healthier balance between private capital and public support.

IV.   Conclusion.

In its proposal to regulate the ABS modeling software market by requiring ABS issuers to develop and provide such software, the SEC fails to provide any discussion of a market failure that could justify its regulatory intervention. Instead it erroneously claims that the requirement is justified based on asymmetric information between ABS issuers and investors. The lack of a properly identified market failure or other coherent justification for the regulation is of a piece with other contemporaneous SEC rulemakings. The SEC's waterfall software development proposal was a product of a period in which CBA was an

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[48] Asset-Backed Securities Proposed Rule, *supra* note 1, at 23,413.

[49] *Id.*

[50] *See* Comment Letter, Vehicle ABS Sponsors, *supra* note 5, at 46 ("We suspect the Commission's estimate is not even within an order of magnitude of the correct level. Even if an issuer can acquire some kind of existing technology, which will be far from costless, it will then need to add in the incremental precision demanded by the Waterfall Program Proposal and convert the program to Python. On an ongoing basis, the need for significant due diligence efforts by underwriters, lawyers, auditors and programmers to verify the accuracy of the programs for each new issuance will add significant additional costs.").

[51] *See* Statement of Commissioner Michael S. Piwowar, Statement on the Re-Opening of the Comment Period for Asset-Backed Securities Disclosure and Registration (Feb. 25, 2014), available at http://www.sec.gov/News/PublicStmt/Detail/PublicStmt/1370540851698#.VKNeUcbIbGi.

afterthought in the agency's policy formation process. But under new leadership, there are signs of changes afoot in the agency's regulatory practices. The simple practice of requiring the rulewriting staff to articulate the underlying market failure that justifies the rule under development provides a powerful analytic device for sorting policy ideas between those that are socially beneficial and those for which the costs outweigh the benefits. As the analysis in this report demonstrates, the waterfall software development requirement is decidedly in the latter category. The SEC should abandon it.

WHICH IS MORE TRANSPARENT?

THIS SECTION OF A WATERFALL FROM A PROSPECTUS ...

(iii) to pay principal to the Class A, Class M-1, Class M-2,
Class B-1 and Class B-2 Notes, sequentially, in that order, in
an aggregate amount equal to the Principal Payment Amount
for such Payment Date, and in each case until the respective
Note Principal Balance of such Class has been reduced to
zero;

"Principal Payment Amount" means, with respect to any Payment Date, the portion of the Available
Payment Amount for such Payment Date that is allocable to principal collections on the Contracts
received during the related Remittance Period.

... OR ITS EQUIVALENT PYTHON COMPUTER PROGRAM?

```python
def calc_pda_amounts( distrib_amt, tranche_cfs, period ) :

  pda_amounts = {}

  pda_amounts['A']  = min( distrib_amt, tranche_cfs['A','balance',period-1] )

  pda_amounts['M1'] = min( distrib_amt - pda_amounts['A'], tranche_cfs['M1','balance',period-1] )

  pda_amounts['M2'] = min( distrib_amt - pda_amounts['A'] - pda_amounts['M1'], tranche_cfs['M2','balance',period-1] )

  pda_amounts['B1'] = min( distrib_amt - pda_amounts['A'] - pda_amounts['M1'] - pda_amounts['M2'], tranche_cfs['B1','balance',period-1] )

  pda_amounts['B2'] = min( distrib_amt - pda_amounts['A'] - pda_amounts['M1'] - pda_amounts['M2'] - pda_amounts['B1'], tranche_cfs['B2','balance',period-1] )

  return ( pda_amounts )
```

```python
def pay_principal ( bucket_bal, tranche_cfs, tranche_name, period, pda_amounts ) :

  pay_princ_amt = min( bucket_bal, pda_amounts[tranche_name] )

  tranche_cfs[tranche_name,'princ_paid',period] = pay_princ_amt

  tranche_cfs[tranche_name,'princ_short',period] = max( 0, pda_amounts[tranche_name] - tranche_cfs[tranche_name,'princ_paid',period] )

  bucket_bal = max( 0, bucket_bal - pay_princ_amt )

  tranche_cfs[tranche_name,'balance',period] = tranche_cfs[tranche_name,'balance',period-1] - pay_princ_amt

  return ( bucket_bal, tranche_cfs )
```

```python
MAIN SECTION

pda_amounts = calc_pda_amounts( distrib_amt, tranche_cfs, period )

( root_cash, tranche_cfs ) = pay_principal( root_cash, tranche_cfs, 'A', period, pda_amounts )

( root_cash, tranche_cfs ) = pay_principal( root_cash, tranche_cfs, 'M1', period, pda_amounts )

( root_cash, tranche_cfs ) = pay_principal( root_cash, tranche_cfs, 'M2', period, pda_amounts )

( root_cash, tranche_cfs ) = pay_principal( root_cash, tranche_cfs, 'B1', period, pda_amounts )

( root_cash, tranche_cfs ) = pay_principal( root_cash, tranche_cfs, 'B2', period, pda_amounts )
```