



Structured finance perspectives
Trends in ABS, MBS & CDO
Cashflow and Waterfall Models

PRINCIPIA

Executive summary

In Principia's Q2 2013 Survey, 100 structured finance investors answered our questions about their use of cashflow and waterfall models in the management of ABS, MBS and Structured Credit securities.

This report explores the ways and means investors are (or are not) modeling the cashflows for their ABS/MBS portfolios. It highlights the methods and sources used, the priorities and key challenges, as well as prevailing opinions about regulator's attempts to make models freely available to the market.

The information presented here is based on an industry survey conducted in June 2013 and is part of a series of surveys focused on different aspects of ABS, MBS and CDO investor due diligence.

Key findings

The choices available to investors for cashflows and waterfall modeling are not simply an either-or decision. When they model them in-house, they often take on board grueling infrastructure and quality assurance challenges. And, when they obtain them from 3rd parties, they often face integration issues and give up a certain amount of control.

- **It's hard to find a one-stop shop.** Over 50% used two or more methods for obtaining or modeling cashflows and over 66% used two or more commercially available models.
- **It's really tough to do it on your own.** 75% of investors used commercial models.
- **The devil is still in the detail.** Investors rank accuracy and the ability to adjust assumptions as critical for any cashflow model although they only ranked model transparency 4th.
- **The model is only as good as its inputs.** On average, only 35% used a commercial supplier for prepayment and loss predictions, with this breaking down to 25% for European investors and 45% for US investors, where loan level detail is more available.

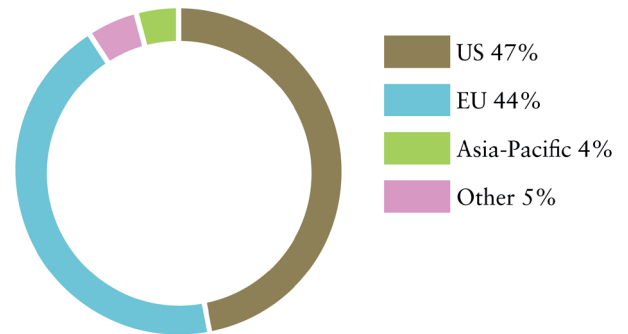
With these parameters in mind, investors continue to imagine the benefits of a centralized and standardized way of presenting the waterfall structure so they can more easily and confidently integrate the models into their existing systems. This aspiration is tempered by plenty of doubt about how possible it really is and, with little common ground on regulatory efforts, no clear sense of how to successfully aid investor due diligence.

It's not just a matter of whether the regulators can manage the task at hand but more fundamentally, to whom the responsibility of providing these models should belong.

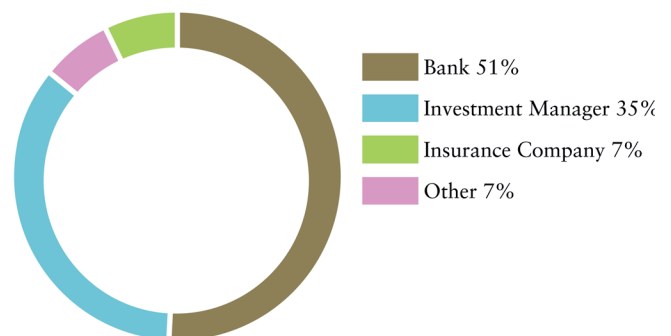
Firstly, it is a task that requires significant investment: it is not simply data collection and provision but requires interpretation and sometimes complex structuring, while it is undoubtedly an easier chore for some asset classes than for others. That said, the standardization of reporting and loan level initiatives, such as ASF RESTART in the US and the European DataWarehouse initiative by the ECB, will be vital to providing the raw data that will support the further evolution of commercially provided cashflow models.

Investor Focus

Investor breakdown by geography



Investor breakdown by type



Secondly, it is critically important that models be complete enough for investors to truly understand their investments – if issuers are responsible for this, it is unlikely that they will provide the breadth of requirements than an investor needs. In those circumstances, will the model offer investors the flexibility to apply different forecasting assumptions, perform stress tests, and integrate them into their operational systems? Investors surveyed indicated they do not believe this is likely and it is not something they are willing to sacrifice. Furthermore, many pointed out it is also not addressing the issues which the regulatory efforts are intended to resolve.

This report covers the key findings from the survey and follows Principia's earlier surveys: "Investor Due Diligence Comes into Focus" (2010), "Trends in ABS, MBS & CDO Market Pricing" (2012), and "Trends in ABS, MBS & CDO Loan Level & Collateral Performance Data" (2013).¹

¹ Full reports can be found at http://www.ppllc.com/ABS_Investor_Research.htm

Cashflow Modeling Methods

Is there a method to the madness?

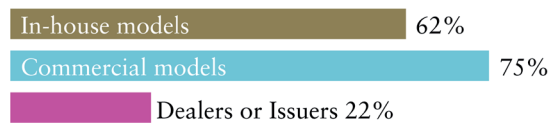
Currently, it is possible for investors to either buy the waterfall models from one or more 3rd party providers, model it for themselves or to forgo modeling altogether.

The investors surveyed were asked which methods they employed to model the asset cashflow generation and liability structure waterfall of their structured finance assets:

- in-house proprietary models
- purchased models from a commercial provider
- models from a dealer or issuer

While it is clear from the survey that commercial models are the most popular method, it is worth noting where this is not the case: EU CMBS investments are more often modeled with in-house methods and US investors do not rely as much on commercial models for their EU investments.

Methods used to model the asset cashflow generation and liability structure waterfall of structured finance assets

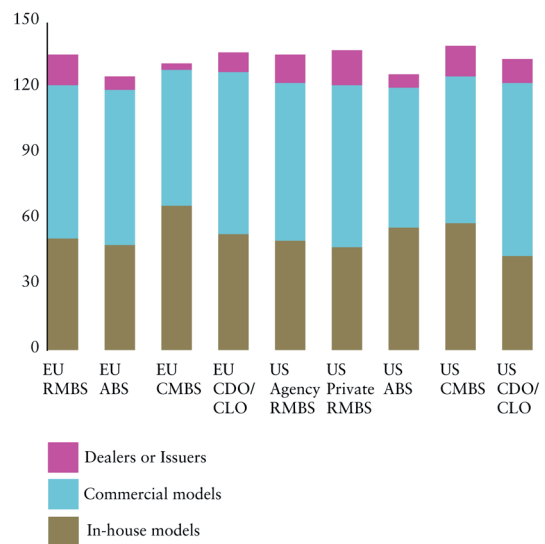


Also, of all investors, even those using commercial providers, 62% still have their own in-house models (either as their sole method or as a method for particular asset classes). The amount of effort involved in the development, maintenance and system integration of these models has no small impact on resources and demonstrates the difficult trade-offs involved.

75%

of all investors surveyed use cashflow and waterfall models by commercial providers.

Methods of cashflow generation by asset class
% Using each method



Components of a Cashflow and Waterfall Model

Asset Collateral Cashflow Engine

This generates cashflows based on the underlying collateral that supports a given securitization. The engine is used to generate projected collateral cashflows under a particular prepayment, loss and delinquency scenario.

Loan level data can be used by the engine to determine how the collateral is and has performed, and along with macro-economic factors, it can support the generation of these forecasting assumptions.

Liability Waterfall Model

However the asset cashflows have been determined, they will then need to be pushed through the waterfall structure of the deal to see how the payments trickle down through to the individual liabilities or tranches of the securitization. This process involves determining all the rules and events associated with the cashflow distribution as detailed in the deal prospectus (the waterfall).

What would make the biggest positive impact to our cashflow modeling requirements? "Transparency in models and the ability to integrate with other systems."

Investor, US Insurance Company

Cashflow Modeling Sources

Controlling chaos

In two of our previous surveys for trends in ABS, MBS and CDO investment practices (Market Pricing and Loan Level & Collateral Performance Data²), we noticed the growing standardization and accessibility of data providers for pricing, collateral performance measures, and loan level detail. The market has been commoditizing these data points and, while the job is not complete, the benefits of those efforts are becoming evident.

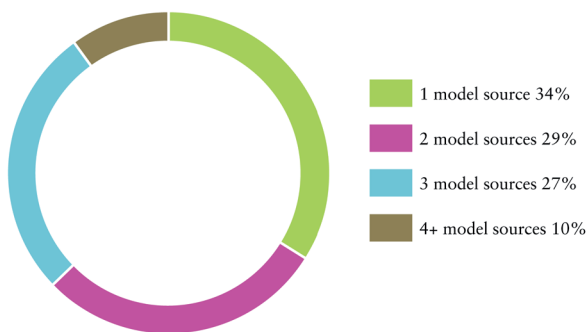
The picture emerging from this survey is different. If anything, we are seeing some degree of consolidation across the market. The last two years have seen the exit of S&P's ABSXchange and Moody's Analytics' acquisition of Markit's Structured Finance and Cashflow business. It's worth noting that, the remaining vendors in this market have invested significantly in expanding coverage and leveraging the new reporting standards.

66%

of investors are using at least one additional cashflow provider.

Furthermore, the business of modeling and providing cashflows is a difficult space to enter with the heavy infrastructure and experience it takes to compete with the two dominant players: Intex (used by 59% of surveyed investors) and Bloomberg (used by 54% of surveyed investors).

Number of commercial sources used per site



Nevertheless, the survey highlighted that despite this dominance, over 65% of investors were using at least one additional cashflow provider. These providers were typically vendors who dedicate themselves to a particular niche asset class, such as Trepp for US CMBS (the one class where Intex was not the leading choice for US investors), or as a competitive alternative, like ABSNet Lewtan and Moody's Analytics.

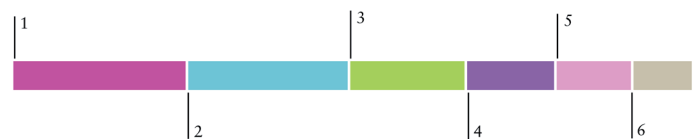
This highlights how a diverse portfolio leads to the requirement for a multitude of models which, in turn, can result in several different integration points and stresses to the integrity of system processes.

The vendors identified were:

- ABSNet Lewtan
- Bloomberg
- Deloitte ABS Suite
- Interactive Data BondEdge
- Intex
- Moody's Analytics
- Thompson Reuters
- Trepp
- Yield Book

Commercial sources of cashflow models

Relative market share of third party data vendors



1. Intex
2. Bloomberg
3. Moody's Analytics
4. Trepp
5. ABSNet Lewtan
6. Other (see vendor list)

“You get what you pay for.”

Investor, US Bank

² Full reports can be found at http://www.ppllc.com/ABS_Investor_Research.htm

Prepayment and Loss Forecasting

Predicting the future

Survey respondents were asked to identify, by asset class, the methods they used for prepayment and loss forecasting in their asset cashflow generation:

On average, 86% used a vector method and this was the dominant method across all asset classes. However, constant assumptions were used more than twice as often for EU investments when compared to US investments. Although when the investors were isolated by region, this was almost wholly attributed to European based investors (US investors still used vectors for these asset classes).

86%

of investors surveyed used a vector method for modeling prepayment and loss forecasts.

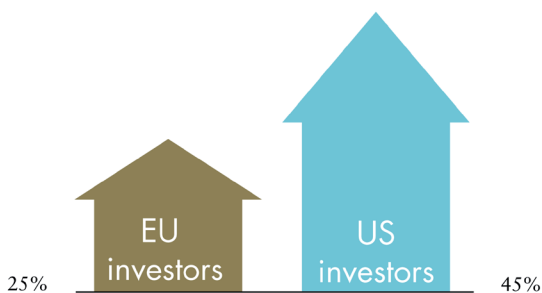
Unlike the reported use of waterfall models (where 72% of investors used at least one commercially available model), the survey shows investors rely less (only 35%) on commercial prepayment and loss models.

35%

of investors surveyed used at least one commercially available model for prepay & loss forecasting.

But this reliance tells a more interesting story when comparing EU to US investors. In the EU, they rely on commercial vendors almost half as often as in the US (on average 25% in EU and 45% for US). This indicates the importance that accessibility to loan level data makes to the development of these prepayment and loss models. In the US, the more mature market, there has been greater access to the loan level data used for building these models than in the EU.

% Use on average of commercial prepay/loss models by region
EU vs US



This challenge for the EU markets was highlighted in one of our previous surveys: Trends in ABS, MBS and CDOs Loan Level & Collateral Performance Data³:

Access to pre-crisis, loan level data ranked as the fourth most important issue for EU investors but was described as not easy by over 80% of them.

For EU investors however, usage is driven more by the demands from the regulators, central banks, clients and internal management to demonstrate a real understanding of underlying loan performance. Even so, loan level data is less integrated into investor's ongoing calculations and valuations.

With the European DataWarehouse, the ECB loan level data initiative, we expect the EU markets to have more commercially available options for prepayment and loss modeling and indeed, to see the reliance on those steadily climbing as in the US.

Connecting the dots...

In our initial Investor Due Diligence survey, we found that 57% of investors said they were less than effective at performing deal cashflow forecasting or stress testing based on performance assumptions. These include for example, future delinquency, default, prepayment, interest or recovery rates and other dynamic performance measurements and triggers that drive collateral cashflows.

Without strong cashflow models and accurate timely performance data, it is impossible to make informed assumptions about the future behavior of assets. While assessing historical and current performance is crucial to investment analysis, it is insufficient in the determination of future value.

The projected cashflow analysis is fundamental to establishing independent valuations.

Strong forecasting and valuation practices are key to making well informed investment decisions, effectively weighing up risks and for accounting purposes. Investors need to have the integrated cashflow models, performance data and analytical tools to forecast future performance for all the securities they hold, as well as for any potential investment.

Investor Due Diligence Comes into Focus, Principia conducted survey Summer 2010. Full report can be found at: http://www.ppllc.com/ABS_Investor_Research.htm

3 Full reports can be found at http://www.ppllc.com/ABS_Investor_Research.htm

Components of Cashflow Engines

“Health & Safety” for models

Regardless of method and source, what actually matters most about a cashflow model to investors? Respondents were asked to rank the criticality of the following components to a cashflow model:

- Coverage of asset classes
- Accuracy of modeling
- Transparency of the model
- Ease of integration into internal systems
- Ability to adjust assumptions/triggers
- Ability to perform stress analysis
- Availability of other analytics (price, yield, OAS, etc.)
- Ability to run models utilizing loan level data

On average, accuracy and the ability to adjust assumptions were ranked as critical components most often and coverage and additional analytics least often. The rankings were nearly the same between the EU and the US, with the anticipated difference for utilizing loan level data as discussed in the previous section.

We think that this ranking suggests more about the priorities investors have in terms of how the cashflow models develop than it does about what they are willing to forgo. For example, as one respondent put it:

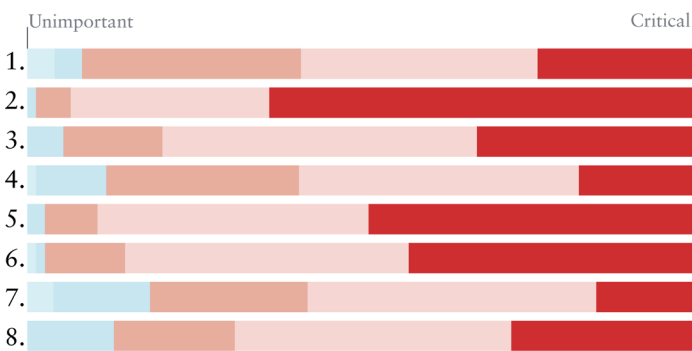
Efficiency and accuracy are primary concerns...[but] models must have appropriate modeling inputs/assumptions to be accurate...responsiveness of modeling service also key, as many modeling questions/corrections often arise.

65%

of survey respondents ranked accuracy as a critical component of cashflow generation compared to 49% who ranked the ability to adjust assumptions as critical.

We summarize the responses to this part of the survey as investors primarily wanting to be able to plug in assumptions and triggers. In order to do this, they need to have confidence in the accuracy of the models. If they manage to achieve that, they’ll endeavor to better integrate and streamline systems. Although, if push comes to shove (e.g. integration becomes too burdensome) investors will obviously prioritize accuracy first. For now, it is still fundamentally a struggle for investors to ensure accuracy.

Cashflow and waterfall model attributes
Ranked by importance



1. Coverage of asset classes
2. Accuracy of modeling
3. Transparency of the model
4. Ease of integration into internal systems
5. Ability to adjust assumptions/triggers
6. Ability to perform stress analysis
7. Availability of other analytics (price,yield, OAS, etc.)
8. Ability to run models utilizing loan level data

Challenges & Priorities

Are we just ticking regulatory boxes?

Standardization of cashflow models sounds great in theory, but is it even remotely possible? There seems to be a great deal of variation in the opinions expressed on this issue and no shortage of doubt. Consistency would build confidence, but it seems to take a lot more than open-sourced code or standardized spreadsheets to make that helpful. How, for example, will an investor integrate 200 different spreadsheets? How will data changes be disseminated?

“Our main challenges are related to the timeliness of updates and integration with our third-party API.”

Investor, US Investment Manager

Even with standardized and uploadable models, how will different forecast assumptions and stresses be applied? The proposed SEC Reg AB II does state this as a market participant requirement (see side bar) but many believe that issuers will only do the minimum required and that they will effectively have too limited of a view to do the kind of deep analysis investors now demand.

(Another important challenge we face is) “...data, interfaces to systems, consistency of information and regularity of data points.”

Investor, EU Advisory

Respondents expressed frustration with the amount of integration they face and the stresses of ensuring the accuracy of the models they use. In the post-crisis world, it's clear how much more diligent they need to be and, inevitably, this puts pressure on all the parts of the process. However, cashflow modeling is not data per se, it's a structured process often involving complicated sets of decision points, triggers and flow of funds to determine the payments due for each tranche of a deal. This takes a level of specialized knowledge and skill as much as it takes time and effort. This is possibly the strongest argument for commercial providers: it allows the market to have dedicated experts in the programmatic interpretation of the waterfall structure and the cost benefits from the economies of scale. This simply is not the case if the burden is placed on the issuers or the investors as it will always detract from their core business activity. However, such issuer provisions or investor efforts around waterfall models would still be a helpful addition to the suite of tools and analytics available to investment managers.

“One of our biggest challenges is getting one platform to price our entire structured finance portfolio.”

Investor, EU Bank

Current State of Regulation



The EU's focus has been to apply indirect pressure on issuers to ensure transparency in loan level data (through the European DataWarehouse).



The Bank of England now requires waterfall models to be available in order to be eligible for the Discount Window Facility and has created a template for loan level details.



The Reserve Bank of Australia has introduced standardized loan level and liability waterfall templates to be eligible for repo with the Bank.



The SEC has proposed “significant revisions” to Regulation AB with regards to issuer loan-level disclosure and has deferred rulemaking for cashflow models.

Tying it All Together

Now what?

Without a doubt, cashflow modeling and forecasting assumptions through these models is one of the more challenging and complicated aspects of ABS/MBS and CDO investor analysis and due diligence. Standardization would be a tremendous relief but the heavy burden of that endeavor is not something issuers are eager to take on board nor is it something investors can easily bear. Commercial providers fulfill this gap to various degrees already. Standardization of issuer reporting, collateral performance and loan level data will greatly aid the ability for vendors to develop offerings that provide investors with the tools and infrastructure to satisfy their due diligence requirements.

As noticed in our initial survey, Investor Due Diligence,⁴ investors described gaps in their infrastructure at every stage of the deal lifecycle – from pre-investment analysis, initial investment, ongoing risk oversight and compliance, to accurate valuation and accounting. We believe the ongoing development and use of commercially available cashflow models is one of the more important aspects of addressing these gaps because we do not believe it is sustainable to do so in-house for a growing and well-diversified portfolio of ABS.

Regulatory efforts could help this development, but there is still uncertainty about what they will actually do and how well it will work. We believe that the industry and regulatory initiatives to increase transparency of loan level and reporting data will have a positive impact on the accuracy of cashflow models and the availability of prepayment and loss models.

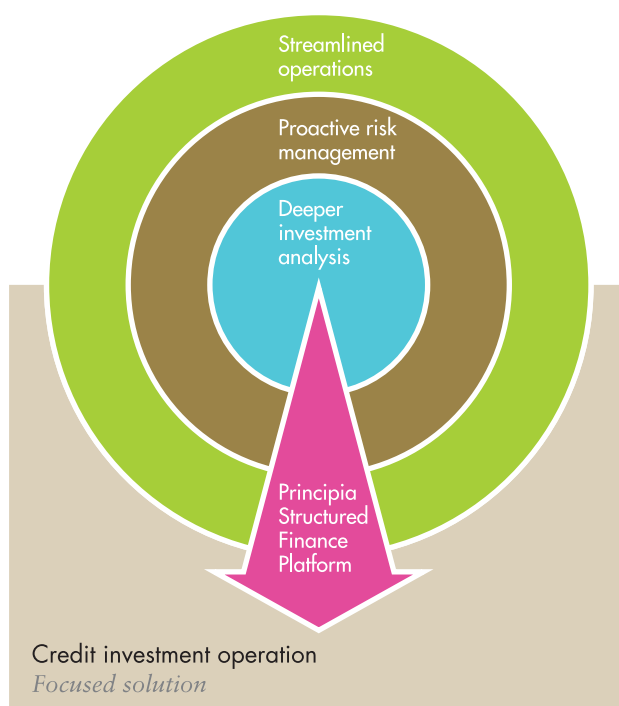
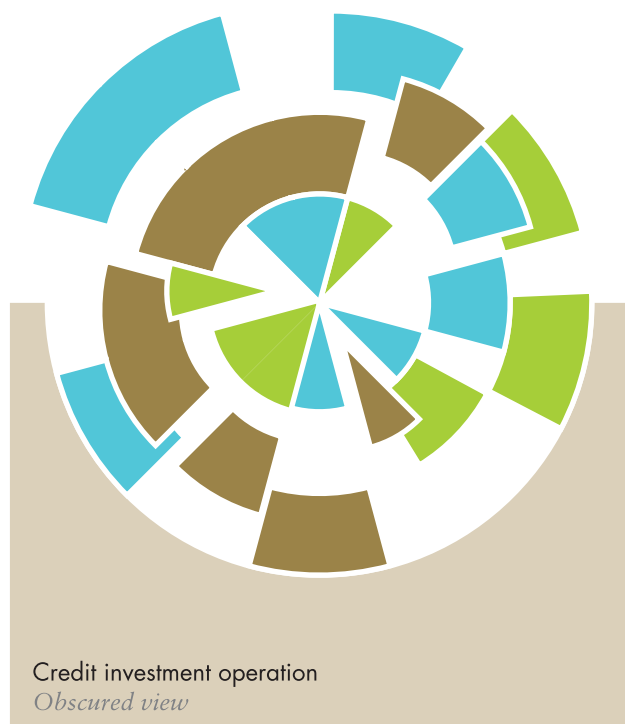
Cashflow models are at the very heart of understanding the future behavior of structured finance transactions. When investors are able to apply assumptions, set triggers and stress these flows, they truly begin to be able to make value-added management decisions regarding their portfolios. Pricing and collateral performance, along with loan level detail, support these activities but without the underlying cashflows they tend to be more preventative measures than proactive ones.

Bringing all of them together in a way that is consistent, reliable and automated is, in our opinion, the only means by which a large portfolio can be successfully managed. With a single dedicated infrastructure, investors can enhance end-to-end investment analysis to better inform investment decisions. Integrated risk management allows organizations to process and disseminate risk information for any stratification of the business as well as identify risk factors, evaluate future cashflows and maintain internal, investor and regulatory compliance. Unifying these activities concentrates attention where it belongs, investment management and due diligence, as opposed to data and system management. The result is a reliable and adaptive framework for structured finance that is in step with the entire investment business.

⁴ Full reports can be found at http://www.ppllc.com/ABS_Investor_Research.htm

Know your investments

Visibility, analysis and control



● Deeper investment analysis

- **Knowledge:** unify pricing, performance and deal data for on demand analysis
- **Confidence:** more accurately assess future performance
- **Breadth:** manage all assets, hedges and liabilities in one place
- **Visibility:** slice and dice by collateral, deal or portfolio characteristics for better informed decisions

● Proactive risk management

- **Compliance:** accurately define, manage and report on risk parameters across deals and portfolios
- **Surveillance:** track and analyze any deal, tranche or collateral performance measure to identify and signal risks
- **Foresight:** stress test default, delinquency or prepayment rates
- **Disclosure:** report risk information for any stratification of the business on request

● Streamlined operations

- **Consolidate:** centrally manage multiple portfolios for increased transparency and efficiency
- **Streamline:** integrate portfolio management, risk control and accounting
- **Integrate:** eliminate redundant systems and processes
- **Control:** avoid inconsistencies from front to back office with audit and workflow control

About Principia

Contact us

Principia Partners LLC (Principia) provides a comprehensive single platform solution for the end-to-end management of structured finance investments. Global financial institutions and independent asset managers have used the award winning Principia Structured Finance Platform since 1995 to unify investment analysis, portfolio management, risk surveillance, accounting and operational control across the breadth of structured credit assets, fixed income investments and complex derivatives.

For over 15 years Principia's mission has been to help investors independently address the deal specific investment and cashflow analysis, valuation, risk management, reporting and due diligence requirements of structured credit investments and portfolios.

Its dedicated support and continued development of functionality for structured finance instruments is accompanied by a proven and fully integrated derivative valuation framework. This consolidated credit investment and market risk solution delivers the backbone necessary to unify and perform deeper investment analysis, proactive risk surveillance and ensure operational control across the credit investment business.

Principia is based in New York, with an office in London and a technology center in Conshohocken, Pennsylvania. Principia SFP was awarded the Credit Technology Innovation award by Credit magazine in 2008, 2009 and 2010.

For more information please visit: www.ppllc.com

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