



WHITEPAPER:
COLLATERAL OPTIMIZATION -
BEYOND CHEAPEST TO DELIVER
AND THE BIG RED BUTTON

Introduction

[Collateral management](#) and [collateral optimization](#) are moving rapidly due to regulatory change, increasing collateral costs and healthy competition between technology vendors to meet market demand for more sophisticated algorithms.

Initially, optimization started out as the ability to centralise the collateral function across business lines and assign a cost to collateral assets. Collateral optimization technology systems could then give out the cheapest to deliver assets for each margin call across securities lending, repo, and OTC/exchange traded derivatives business lines.

This helps financial institutions to manage collateral supply and demand across the firm in an integrated way. It offers considerable cost savings and improves liquidity management by helping firms to hold onto high quality assets rather than pledging them out. Optimization also enables users to extract maximum economic value from collateral assets that were previously sitting idle on the balance sheet.

However, collateral optimization is now taking another leap forward. Optimization is no longer just about pledging 'cheapest to deliver' collateral. It now also involves collateral allocation decisions across the portfolio, based on 'hardest (collateral) to place' and 'hardest (counterparty) to please'.

Furthermore, it must take into account the ability to dynamically substitute and reallocate pledged collateral in real time throughout the trade lifecycle, in line with cheapest to deliver methodology.

This paper gives an overview of the latest techniques used to optimize collateral and discusses some of the limitations of collateral optimization. It also provides a list of questions financial firms should ask when implementing a collateral optimization project.



Cheapest to Deliver

Cheapest to deliver collateral allocation involves assigning a collateral cost to different asset types. Each firm's collateral cost matrix is unique to that firm and is based on factors such as the firm's cost of funding from Treasury. As a starting point however, assets may only really need to be assigned a relative cost. This enables collateral to be sorted in order of how expensive it is.

For example, you may not need to know the exact collateral cost of an AAA government bond to perform basic optimization. You just need to know that it is more expensive to pledge it out relative to a BBB corporate bond. This simple ordering of assets by relative cost can provide many of the benefits of optimization.

However, to perform more advanced optimization and to factor collateral costs into P&L, it is useful to know the actual funding cost of a collateral asset.

Hardest to Place

Hardest to place collateral assets are those that appear least often in eligibility schedules. For example, a given asset may not appear regularly in the eligibility schedules of your counterparties. However, you have some of it sitting idle in your inventory and it is not much use for Repo/Securities Lending because there is not a great demand for it or it is illiquid.

This then means that it is 'Hard to Place' from a collateral usage perspective. By this rationale, if there is a schedule that will accept it, it makes sense to identify it and to pledge it out.

Hardest to Please

Each firm has a range of counterparties. These counterparties naturally accept different collateral types across the liquidity spectrum. Some may only take highly rated government bonds. Some may have eligibility criteria that accept less highly rated bonds, equities or other asset types, although this would usually involve an increasingly larger haircut.*

It goes without saying that it is best to avoid giving out your AAA bonds to the counterparty that will accept the less liquid securities if you can avoid it. Collateral optimization solutions are now allowing users to match the hardest to deliver assets with 'easiest to please' counterparties and vice versa.

Optimization can therefore allocate collateral efficiently across the full range of counterparties and can provide a useful liquidity management tool. It can help to make the best use of all available assets across the firm to meet margin calls. In addition, it can help to retain liquid assets in line with Basel III liquidity coverage ratios.

* It is worth noting that when an institution accepts less liquid or apparently more risky assets as collateral, it is often driven by specific trading strategies, enabled because the institution has the tools and experience to effectively manage its collateral risk profile.

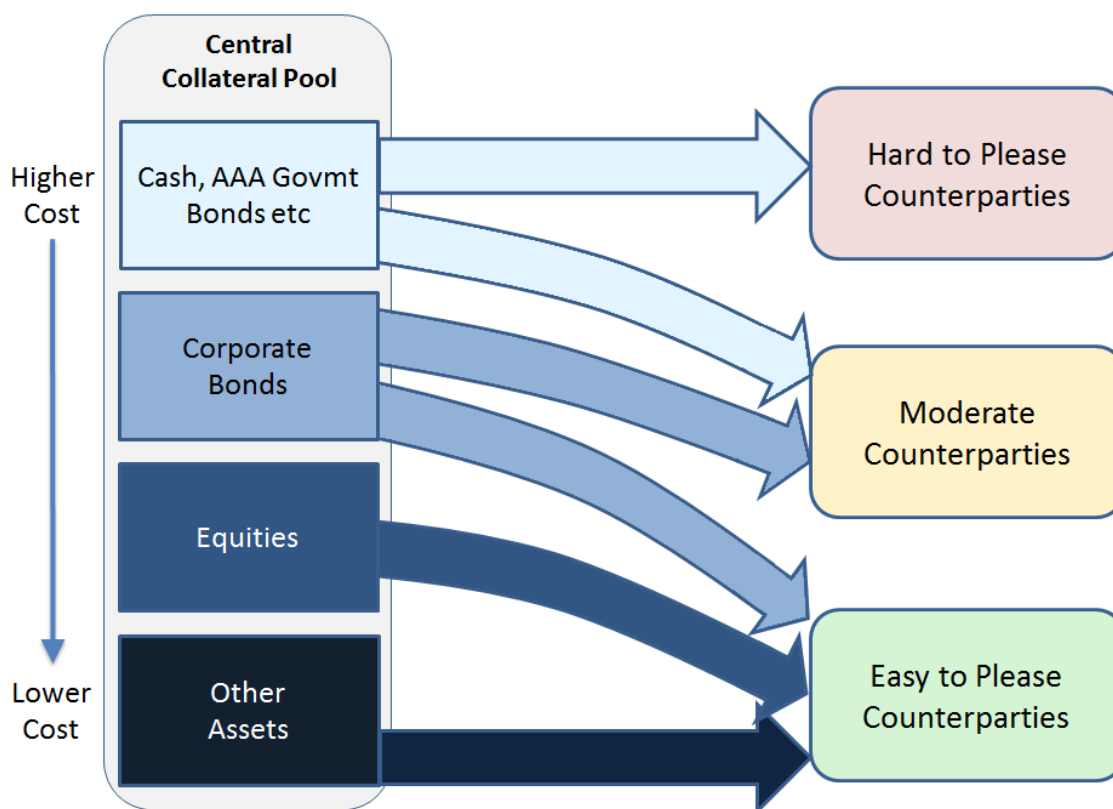


Efficient allocation of assets across all counterparties

The diagram below shows how collateral optimization algorithms can help to allocate collateral efficiently across all counterparties. This combines cheapest to deliver and hardest to please allocation methodologies.

The diagram is of course somewhat simplified. It does not fully capture the complete range of collateral assets and counterparty types available. However, it illustrates the basic concept of cheapest to deliver vs hardest to please collateral allocation.

Simplified multi-client collateral optimization using cheapest to deliver vs hardest to please methodology



Collateral in the pledge pool is ordered by how expensive it is to deliver. It is preferable to pledge the cheapest to deliver collateral whenever possible. On the other side of the equation, the firm's counterparties are ranked by how hard they are to please. This is based on their collateral eligibility, concentration and haircut criteria.

Wherever possible, the collateral optimization system ensures the hardest to please counterparties who will only accept the high quality collateral are satisfied before moving down the list.

The system will then match the cheapest to deliver collateral with the easiest to please counterparties. Initially of course, the firm could seek to retain enough liquid assets to maintain its Basel III liquidity coverage ratio before pledging collateral out to market counterparties.

Haircut Weighted Optimization

As well as allocating collateral based on cheapest to deliver methodology, optimization algorithms must also take other factors such as haircuts into account.

Example:

- Security A has a collateral cost of 0.20 basis points and a haircut of 15%
- Security B has a collateral cost of 0.22 bps and a haircut of 5%

Security	Haircut	Collateral Type and Net (%)	Exposure Amount	Pledged Amount	Collateral Costs
Asset A	15%	Band 1 (0.20bps)	\$1,000,000	1,176,471	\$2352.94
Asset B	5%	Band 2 (0.22bps)	\$1,000,000	1,052,632	\$2315.79

While Asset A has a lower collateral cost, when taking the haircut into account, Asset B is actually cheaper to deliver.

To gain a true collateral cost, it is therefore important to calculate a haircut-weighted cost for the collateral. So when adding this cost into the equation, it is possible to rank assets by a more rounded view of their true cost and then allocate them accordingly.

All institutions, as a bare minimum should realistically be able to achieve the basic collateral optimization described up to this point. It is possible to realize many of the benefits of optimization by performing these initial activities.

Dynamic Substitution

Collateral optimization can now also include dynamic collateral substitution and reallocation. This allows the collateral management system to respond in an automated way, in real time to changes in optimum collateral allocations.

Collateral management systems can receive automated data feeds of pending corporate actions, instrument ratings and counterparty/CCP collateral eligibility schedules. This allows the system to automatically process mandatory recalls and returns of collateral caused by:

- Corporate actions
- A rating downgrade on the collateral asset causes it to become ineligible
- Changes to the counterparty's/CCP's eligibility schedules
- Your underlying source of collateral asks for a return, creating a short position

These types of substitutions are often one of the biggest operational headaches in collateral management. Automation around this process can make life a lot easier for collateral managers and operations staff.



Dynamic Substitution (Continued)

As part of the start of day process, the system can show the collateral manager all mandatory recalls, based on the four criteria listed above.

Once all of these unavoidable recalls have been actioned and the pledged collateral moved back to inventory, the collateral system now has an up to date view of available inventory. It is then possible for the collateral system to propose substitutions and reallocate using a cheapest to deliver methodology across the collateral portfolio.

For example, the collateral system can receive a real-time data feed from the counterparty or CCP/FCM/Clearing Broker to update its schedules. If the counterparty's collateral eligibility criteria changes, it can then alert the collateral manager and automatically recall the ineligible securities.

The system will then propose new, eligible securities using cheapest to deliver methodology. This automated substitution and reallocation can significantly reduce the manual effort involved in collateral management and can help to ease the strain of more frequent collateral movements caused by CCP margining.

Collateral substitution can also offer cost savings when trading via CCPs. A CCP will usually require cash collateral for the start of day margin call. However, some CCPs may allow clearing members and clearing brokers/FCMs to substitute cash for cheaper to deliver bonds or other eligible assets.

The rate of return on cash at some CCPs in the current interest rate environment may actually be negative, making delivery of bonds to cover Initial Margin a better economic case.

Other Costs

As well as the factors discussed above, there are also many different types of transaction costs associated with optimising/substituting collateral. There are - for instance- settlement, custody, transactional, and triparty costs of collateral movements. There is also operational risk associated with moving collateral. Optimization systems must account for these costs when allocating assets.

Furthermore, there is a relationship with the counterparty or client to consider. If you keep switching assets, their operations teams could become frustrated with high volumes of collateral movements that require monitoring and settlement. This has a subjective 'annoy people' cost that is important and needs to be taken into account.

With CCPs, this may not be so relevant. CCPs may have the scale in their collateral infrastructure and the operational flexibility to perform substitutions more easily.



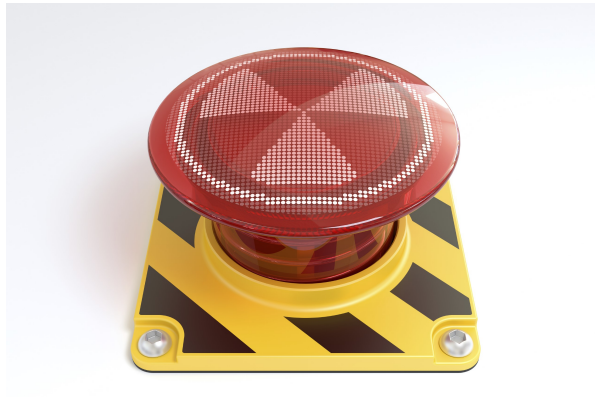
The Big Red Button Concept

Many customers and prospects we speak with in the market tend to have a view of optimization as a big red button. When pressed, the big red button can perfectly allocate all collateral assets in real time on an intraday basis.

This process incorporates all of the multivariate factors discussed above to give the most perfect possible allocation of collateral across all counterparties and asset classes in real time. As you can imagine, the cost savings could be enormous.

At 4sight, we like the idea of this.

However, it is also important to note that, while tempting, in reality this 'nuclear option' in optimization would rarely be used and could cause chaos.



When pressed, the big red optimization button can perfectly allocate all collateral assets in real time on an intraday basis.

Limitations to Optimization

The multi-client, multi-factor optimization discussed above is not easy to do. There are a great many factors and costs influencing efficient allocation. It is difficult from an operational point of view.

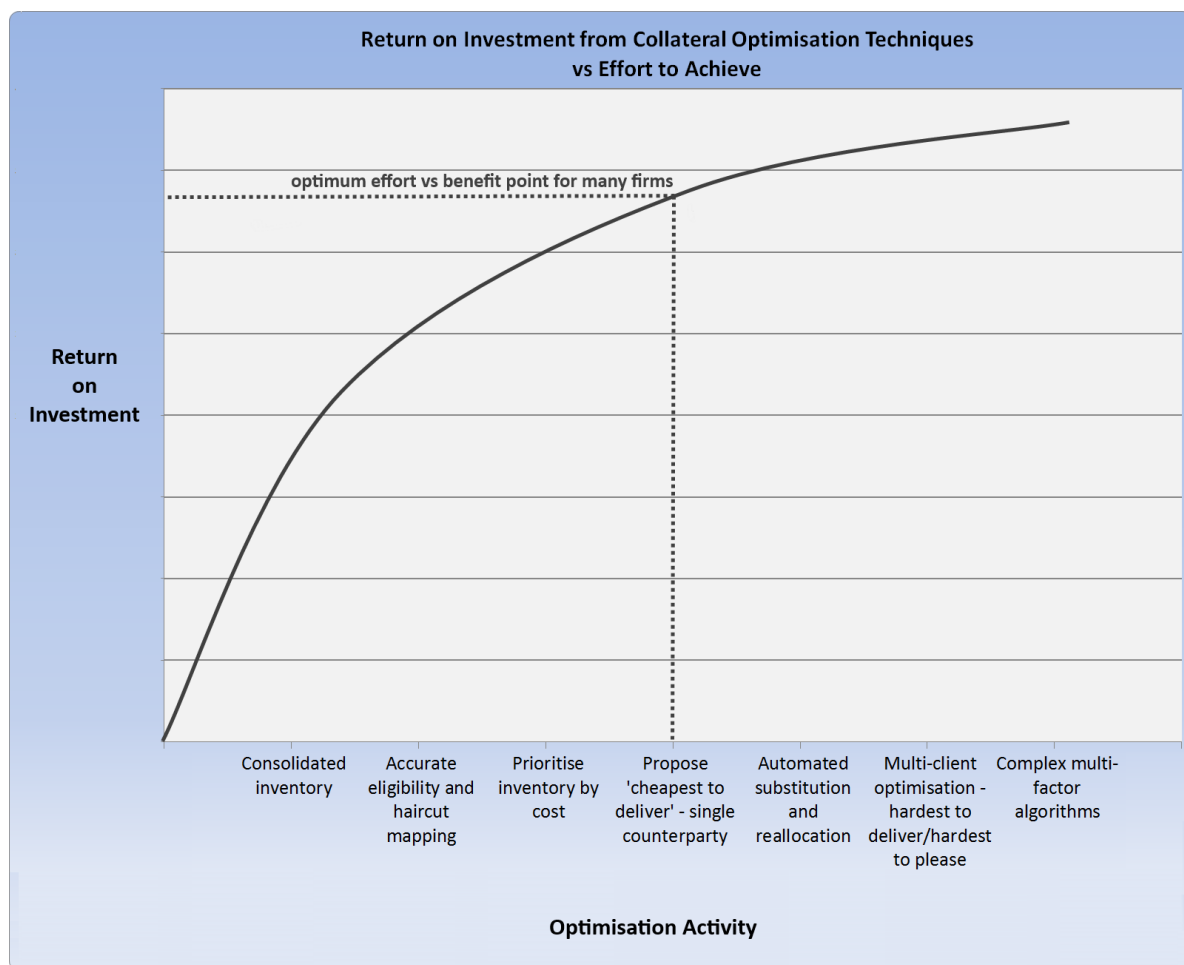
It is also a constantly moving target due to increasingly frequent changes in asset ratings and counterparty eligibility criteria. It requires significant investment in technology, data mapping and development of complex algorithms that are unique to each firm. There are also constraints around how fast collateral allocation data can be processed to support pre-trade decision making.

As with most activities, there is an 80/20 rule in play. The added effort required to achieve the hardest to obtain cost savings is often not worth the diminishing returns. Optimization is based on the best *practical* allocation of collateral, rather than the best *possible* allocation.

A good analogy is buying a car with a top speed of 200 mph. In practice, while it would be fun to drive at this speed, you are constrained by the harsh realities of motorway speed limits.

Limitations to Optimization (continued)

For many firms, performing the basic optimisation tasks can provide many of the key cost saving benefits of optimisation. The degree of effort vs return on investment should be carefully considered and is specific to each firm, the size and make up of its collateral portfolio, and its IT footprint.



What is a pragmatic starting point?

Below is a list of questions to ask that can help you to determine how ready your firm is to optimize collateral usage. It covers the basic first steps you should take. It also highlights the easy wins that can generate the biggest cost savings for the least effort. Finally, it helps you to think about where optimization can go from there.

First Steps

Can you:

1. View and maintain your inventory, globally and accurately in real-time? If yes, does this include your fixed income, equity and money market:

- Outright trading positions
- Derivatives positions
- Repo
- Securities lending
- Collateral pledges

2. View and maintain your repo trading positions?

3. View and maintain your stock lending positions?

If the answer is categorically yes to these three questions, then you can start optimising. If not, you are not able to optimize in any real way. However, if the restriction is that your data is only updated manually or at start of day, you at least have a chance.

Moving on, can you:

4. View, modify and use the suite of collateral schedules relating to these repo, securities lending, derivatives and other trading activities?

5. Accurately define and automate your haircuts?

6. Model your concentration limits, both upper and lower?

7. Apply these collateral schedules to your inventory to propose correct movements?

If the answer to all of the above questions is still yes, you have basic operational controls to ensure that everything you book is, at least, eligible and within concentration guidelines.

It is also booked at the correct haircut and you are in control of your exposures. Automating these processes can save hours of time-consuming manual tasks. But you're still not optimizing...



Next: Can you:

8. Operationally return all mandatory Corporate Action/Non-eligible/Short positions at start of day?
9. Update (or 'reset') all exposures as a result of these?

If the answer is yes, you have advanced, automated control of your exposures and collateral inventory. You also have a solid margin requirement basis for the day's activity and are saving more hours in avoiding extra manual operational tasks. But you're *still* not optimising...

Next Steps

Now you are starting to optimize. Next, can you:

10. Prioritize your inventory assets by order, based on relative costs? Note; at this stage, you don't necessarily need to know the *true* costs...

However, if you can, you are able, at least, to propose movements based on the relative value of one asset to another. This ensures that you don't pledge out the valuable stuff if you don't need to.

Now, can you:

11. Value your collateral accurately?
12. Apply your price, haircut-weighted to your inventory?
13. Propose collateral movements per counterparty/agent?

If you can, you are able to propose movements based on real relative value costs to individual exposures. This provides you with the first stage of optimization.

Given the steps to get here, you have to work out how much further you want to go. You need to consider how many extra basis points you can squeeze out of your collateral portfolio vs. how much technical effort must go into any further stages.

Further stages:

14. Can you define which groups of counterparties/asset classes need optimizing on a multi-client basis?
15. Can you define algorithms for *how* you wish to apply optimization on a multi-client macro basis?
16. Can you define a cost-benefit for the effort vs. reward for implementing this next stage?

These, in our experience tend to have a common theme. However, in practice they also have quite considerable per-client variation.

Think about it.....



Conclusion

When starting an optimization project it is important to first identify achievable milestones. Even the basic optimization techniques can generate a significant return on investment. For example, an average financial institution will have 6+ systems that control global fixed income and equity inventory.

Replacing these multiple solutions with a single front to back office system that makes efficient use of collateral inventory across products can save a lot of money and reduce the firm's IT footprint.

Once the system is running in production, it is then possible to evaluate the returns from optimizing collateral. From there, you can make a decision on how far it is suitable for your firm to go in its optimization from a cost-benefit point of view.

It is important to make a pragmatic choice based on whether the extra few basis points saved in collateral costs from the more advanced techniques are worth the financial investment as well as time and IT resources. For some firms, this complex multi-factor optimization is worthwhile, for others the basic techniques offer the optimum cost-benefit trade-off.

Further Reading

4sight Future Trends in Optimisation Whitepaper

How can firms optimise collateral, regulatory capital and counterparty/CCP selection and how are they related:

<http://www.4sight.com/products/4sight-collateral-management/collateral-optimization/future-trends-in-optimisation-whitepaper>

Collateral Optimisation in a Centrally Cleared World

This paper discusses what collateral optimisation actually is, what is driving it, and techniques that can be used to optimise collateral. It also describes how these techniques are helping firms adapt to regulatory change:

<http://www.4sight.com/products/4sight-collateral-management/collateral-optimization/collateral-optimisation-whitepaper-download>

Collateral Optimisation Case Studies—Buy and sell Side

Read case studies on recent projects where 4sight implemented the Xpose solution for centralised collateral management and optimisation across derivatives, securities lending and repo for both buy side and sell side customers:

<http://www.4sight.com/resources/case-studies>





About 4sight Financial Software

4sight Financial Software is an independent software solutions provider with seventeen years of experience and offices and clients worldwide. 4sight's customer base includes a full spectrum of buy and sell side market participants, from smaller banks and asset managers through to global broker dealers.

Clients in sixteen countries on four continents use 4sight's software to meet their business needs and 4sight offers the reliability and experience of a company with a proven track-record.

The 4sight Xpose Collateral Management system provides an enterprise-wide, cross-product collateral management and optimization solution for securities lending, repo, OTC/exchange-traded derivatives and CCP collateral. 4sight's product range also includes solutions for settlement and market connectivity.

In addition to software development, 4sight provides project management, consultancy services and customer support through its global network of offices.

For further details, please visit: www.4sight.com

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