Web Based Collateral Management System

Gaurav Karemore
Computer Science & Engg Dept.
G. H. Raisoni
College of Engg., Nagpur

Arshad Husain
Asst. Professor,
Dept. of Computer Science & Engg.
G. H. Raisoni
College of Engg., Nagpur

Arshiya Khan
Human Resources
Experts Logic Pvt. Ltd.
Nagpur, India

Abstract— **The concept of collateral has been practiced for hundreds of years. Simply, collateral implies offering safety against the possibility of a loan not being paid back in a transaction by the opposing party. In the 1980s, two US financial institutions started collateral management, though it was practiced in a crude form. In the following decade, collateral management grew considerably. In 2008, the financial crisis in the US and collapse of Lehman Brothers vaulted collateral management to the forefront, because the introduction of regulations and a whole set of new compliances had rendered banking operations extremely complex. The need to find a better way to manage collaterals was keenly felt and financial entities were compelled to seriously find automated solutions to manage their collaterals. And thus were born technologically-based Collateral Management Systems. In this paper, the authors have introduced their own-devised CMS, which began as a project but now is a market product. This paper describes in brief the prominent features of their system, showing how it covers and handles the various major aspects of collateral management. Finally, the paper, through a demonstrative example, shows systematic steps of the calculation of security required margin as related to the market price of the security. The conclusion establishes that the newly designed system is at par with the existing platforms in the market.**

Keywords—***collateral management, security, credit risk, margin, loan, derivatives, property, lien, contract, By-party agreement***

I. INTRODUCTION

The origin of the concept of collateral goes hundreds of years back. Collateral has been in vogue for centuries. Collateral, in simple terms, means offering safety against the possibility of a loan not being paid back in a transaction by the opposing party.

In modern times, the management of collateral was started by two US financial institutions in the 1980s. They took collateral against the risk of credit advanced. But this type of collateral management was in a crude form. No legal norms were in place then, and some staff accountant performed the calculations on a paper. In the next decade and thereafter, however, collateral management grew rapidly. What, though, drastically changed the management of collateral was the economic crisis of 2008 in America and the collapse of Lehman Brothers, a famous global financial company[1]. Millions of dollars were lost, the credit markets were frozen, markets' instability worsened and with the subsequent introduction of new regulations and compliances, banking operations became extremely complex and intractable.

These market fluctuations and emergence of new regulations and compliances exerted tremendous pressure on banks and financial entities to alter the ways they had been handling collaterals. An urgent need to manage collaterals better arose and emerged as the top priority. Financial institutions, including in USA, Europe as well as in countries with Stock Exchanges, had to focus on myriad financial aspects, such as derivatives, counterparty credit risk, margin and collateral requirements stemming from tricky derivatives[2]. And the specter of worldwide laws and regulations clearly spelt out the need for collateral management systems (CMS) to be automated, so they could be handled efficiently. Because it was believed that the lessening of risk and increasing of transparency in all manner of trades could only be achieved through an automated CMS[3].

Thereafter, once the markets stabilized and the economies started their slow recovery, the capital market industry, viewing collateral management as a crucial function, started investing in technology and fully incorporated their CMSs as part of their organizations[4]. Thus, the parts that made up the process of creating and setting up CMS were: IT infrastructure, risk management analytics and organization[5].

Since then, scores of technology based systems and applications have been created to automate the process of collateral management.

This paper presents a web-based CMS created by the authors. Initially, it started out as a project which since then has morphed into a product. This CMS is a web based solution that smoothly facilitates all of your regularity and strategic collateral management requirements, no matter your time zoneor location. Its powerful features, such as configurable collateral optimization, transaction monitoring and centralized collateral inventory updates help clients save plenty of security and cash.

This CMS is designed to be functionally feature-rich. To briefly describe this web-based CMS, it basically comprises 5 main tabs, each of which has many sub-tabs.

The first main tab is INTERFACE, which is the place where CSV files are uploaded into various sub-tabs such as Trade, Inventory, Bond, Equity, Commodity, Cash, Previous Margin and Legal Entity Inventories.

The second main tab is MASTERS, which includes 17 sub-tabs, like Bond, Book, Cash, Clearing Eligibility, Commodity, Concentration, Data Filter, Eligibility, Equity, HairCut, Holiday Generation, Legal Entity, Liability, Optimization, Optimization Sorting, Quote and Rating.

The third main tab is CONTRACT, which is the heart of the system. The data from the various MASTERS is used in CONTRACT. This includes sub-tabs like Parties, Details, Dates and interest calculation, Collateral eligibility, Optimization & Concentration and Rating,

The fourth main tab is CONTRACT MANAGER, which needs a contract whose status is complete. One contract can have multiple fund groups

The fifth main tab is REPORTS, which are used to show the detailed data of every record being executed in the application. This tab contains 9 categories of reports, including about Underlying Trades, Allocation, Interest, Change, Dispute, Rating Inventory, Transaction Message, Transaction and Margin Call Entry. Each report has its own purpose.

And lastly, there is the Dashboard.

This CMS confers many benefits: it deploys fast, it has great levels of flexibility, and it is robust and highly scalable. It displays a unique ability to automate the process of collateral management. You simply set the parameters and norms, and it shows disputes, meaningful differences and advanced analytics behind their causes and many other aspects of the collateral.

As is generally known, to get a loan a borrower offers a lender property or an asset, which is called collateral. The lender can possess the collateral in the event of the borrower failing to make his pledged loan payment. This collateral gives the lender security against a bad loan.

The essence of collateral management, therefore, is an agreement or a contract between the borrower and lender.

Of such agreements or contracts, the most ubiquitous are;

Bi-party Collateral Agreement, where two entities forge a collateral agreement. These are generally over-the-counter contracts dictated by their needs[6].

And Tri-party Collateral Agreement, which include outside agents who act as links and safe-keep the collateral and set down terms, procedures and conditions and other aspects of the contract[7].

As a demonstration, in this paper we are going to maintain a contract in it between the two organizations i.e. processor and the legal entity. Processor will be that organization handling the project and legal entity is the other organization or there may be multiple organizations with whom we are going to do the contract. Now the contract may be in the form of security and cash. Security may be in the form of bond, equity or commodity. It will generate final exposure (FE) which will conclude that whether the processor will pay the transaction or the legal entity will pay the transaction. If contract contains a concentration which is security with cash, then processor will pay in the form of security plus cash. If contract contains only security type concentration, then processor will pay only in the form of security. For example, two of the organizations i.e. WestPac and NAB will have the contract between them, wherein WestPac is the processor because they are handling the project and the National Australia Bank (NAB) is the legal entity with whom processor will be doing the contract. They will do the communication through swift messages via mail.

In the light of this fictitious contract, this paper, in the methodology section, illustrates step by step the relationship and calculation of security required margin, on the one hand, and the market price of the security, on the other, to establish conclusively the effectiveness and the great potential of this CMS.

This paper comprises three Sections. Section II offers the literature review, Section III defines the methodology, which demonstrates the calculation of security required margin and Section IV present the conclusion.

II. LITERATURE REVIEW

Scores of researchers have produced exhaustive studies, papers, researches about the phenomenon of CMSs. Here is a brief review of some of those studies:

In their study, Blatteberg, Deighton [8] have presented a kind of collateral production scheduling based on mixed genetic simulation algorithm. While Bohus and Horvitz [9] review researches on the customer equity management and conclude the numerous studies in three sectors: customer equity analysis, strategy development and customer equity optimization. The study [10] measured the bond strength of paper-polypropylene-paper (PPP) laminates, using a peel test. On their part, Huang Yun-feng, Wang Shi-long[11] in their research conducted a critical review of one system using commodity hardware and software, independent of the vendor and authors. Sergot et al. [12] in their paper describe a model for storing tax data that has been implemented in practical business applications. Meldman [13] pronounced that big data is changing the landscape of security tools for network monitoring, security information and event management. A review of recent research and practice on service contracts with focus on service contract content and service contract management was done by Agarwal Sumit, and Robert H.

Hauswald[14]. Howorth et al.[15] have described that trust might be expected to reduce agency costs, perceived credit risk and thus the request for personal collateral. Therefore it shows that trust has a minor role in reducing the request of collateral.

III. METHODOLOGY

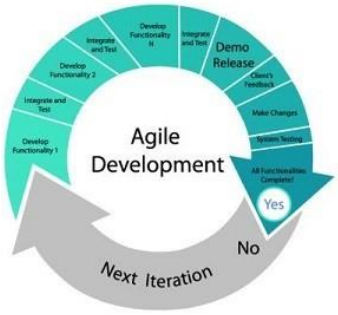

Fig 1 Client Requirement Cycle

Fig. 2 Interface Tabs

A. Interface

Interface is the place where we upload CSV files into the various tabs which are Trade, Bond, Equity, Commodity, Legal entity etc. These trade data are then used in the contracts manager for mapping purpose. The mapping is to be done by matching Counter Party name of trade file with the Legal Entity name of the respective contract. If it matches, then all the trades containing that counter party name becomes available for mapping in the contract manager, otherwise not.

B. Contract Parties

Contract parties are divided into two parts. One is for "Processor" and the other is for "Legal Entity."

- Processor and Legal Entity cover following aspects:

1. Role**:** Select role for each Processor and Legal Entity

2. Processor for Processor: This field shows only those legal entities whose role is processor. If the legal entity you have taken contains role as "Processor" then the legal entity is considered as "Processor."

i. Generate a processor in Legal Entity master and assign it a role as "Processor."

ii. Create one security book and one cash book in Book Master by using this processor.

3. Legal Entity for Legal Entity: This field shows only those legal entities whose roles are any one of the "CCP", "CCP Internal", "Counter Party" or "Agent."

We are getting these legal entities from Legal Entity master and the role is to be assigned to the legal entities in Legal Entity master only. For getting legal entity in this dropdown box,

i. Generate Legal Entity in Legal Entity master with the roles either "CCP", "CCP Internal", "Counter Party", "Agent" or combination of any of these.

ii. Create one security book and one cash book in Book Master by using this legal entity.

C. Securities Rating

The status of the contract will be decided whether to make it as "Complete" or "Incomplete." The Complete status means that the contract is complete and has all the unique data in it. The Incomplete status indicates that the contract contains all of the following entities as duplicate entity in them. The entities we need to check are: Legal Entity, Optimization, Concentration, Haircut**.** If any of the above 4 fields contain different value in it than the other contracts then the status of the contract will be "complete" and if the all the fields have the same values like in other contracts then the status of the contract will become "Incomplete" and will restrict the contract from showing in the Contract Manager.

D. Global Rating

Global rating tab is used to show all the matching securities in the form of table. The securities would be shown in the grid only if the agencies and ratings taken in the hierarchy tab are matching with the securities we have got after matching the criterion of the data filters with the respective securities. These securities are then used for paying and receiving purpose.

E. Contract Manager

Contract Manager needs a contract whose status is complete. One contract can have multiple fund groups. A Contract must contain a counter Party which will be in the trade file. If that counter party matches with the counter party of trade files then only those trades will become available for the mapping on selection of "Contract Name" in contract manager. For Contract Generation first user should create

i. Legal Entity which will contain Processor as a role to make it processor and either one or all of roles from Agent, CPP, Counter Party, CPP Internal to make it Counter Party.
ii. 2 Books using same legal entity; one as Security type and one of Cash type.
iii. Concentration of either Security type, any type, cash type.
iv. Optimization containing solver of either simplex type or rating.

The values/data requiring in Contract Manager from the contract are:

1. Threshold and MTA amount of counter party from Contract Parties
2. Base Currency of Collateral Eligibility
3. Concentration of either any type or security type.
4. Optimization of simplex type or rating type. If the solver is of type "Simplex" then on optimization "Total CTD" or "Total CTD/Rating" will be applied. If the solver is of type "Rating" then the securities would be arranged in the form of optimization sorting.

F. Total Required Margin:

The formula for calculating total required margin is given below:

As per client requirement, the formula for calculating Total Required Margin should be at current moment. The formula working for calculating Total Required Margin is:

1. Threshold Amount= Contract→contract parties→ LE→ Threshold→ Amount
2. Total Previous Margin= Interface→ Previous Margin tab→ Total previous margin (1 month before)

Eg. If current date is 25/04/2018 then our previous total margin date will be 25/03/2018.

3. MTA= Contract→ Contract Parties→LE→MTA→ Amount.
2. Cpty Amount: User entered amount in Cpty Amount field.
3. Dispute Amount: The Formula for dispute amount is given below:

Dispute Amount:

Dispute Amount= Cpty Amount – Abs(Total Required Margin).

Condition for Disputes Status:

* IF **Dispute Amount=0,**
  Then user will directly optimize the contract.
* If Dispute Amount>0
  Then dispute will occur and user will not be able to optimize the contract.
* If Dispute Amount<0,
  Then total required margin will become equal to cpty amount.

Example for Dispute Amount is:

If Cpty Amount=1000, Total Required Margin= -800

Then Dispute Amount = Cpty Amount – Abs (Total Required Margin)

= 1000 – abs(-800) = 1000 – 800 = 200

Now Dispute Amount = 200 which is greater than 0. Thus the status will become Dispute owing to which allocation could not be done.

When the dispute status is "EXPOSURE_AGREED" then user can do optimization on that contract and if the status is "DISPUTED" then user cannot do allocation.

6. Pay/Receive:

When the total required margin is Negative then the status will be "Pay" which means processor will be paying to legal entity.

When the total required margin is **Positive** then the status will be "Receive" which means legal entity will be paying to processor.

7. Independent Amount: Independent amount of Securities Rating of Rating tab of contract.
8. Interest: Formula for Interest calculation is given below:

Formula for Interest Calculation:

$$\text{Interest} = \frac{(\text{Previous cash margin} * \text{Final Rate}) * \text{No. of days}}{36500}$$

Whereas,

Final Rate = Interest Rate from contract

No. of Days = Current Date – Previous Cash Margin date.

If the status of contract is "priced_receive" then when we select the contract, a message will appear on the screen as "The status is Priced_Receive, Please upload ……. " and the rest of the process like Allocation and Execution will be done by uploading the LE inventory file via interface.

If the status of contract shows "Priced Pay" then the allocation and execution will be done by processor which will be paying to legal entity in optimization window.

G. Allocation

The margin satisfaction of securities should be equal or less than the security required margin and the margin satisfaction of cash should be less than or equal to the cash required margin. After satisfying total required margin, click on "Allocation" button; a message will appear as "Allocation successfully Done" and the status of contract will change from "Priced Pay" to "Allocated" as shown in the following figure. This is the condition when its status is priced_pay.

H. Execution

After allocation is done user will need to do execution. For that, following steps are to be done:

i. Select the contract again.

ii. Again click on "Total CTD".

iii. After selecting total CTD, filter collateral pool will generate all the eligible securities and cash which were used for allocation purpose. Now select all the securities and cash by checking all the checkboxes.

iv. Press "Execute", and a message will appear as "Execution successfully Done".

v. After execution, the status of contract will change from Allocated to Executed.

I. Recall

Recall is the case when processor calls back some securities from the legal entity. This can be covered by maximizing the market price of the securities through master which were given to the legal entity at the time of allocation and execution.

Recall will occur only in the case of Price Pay.

1) When uploaded same set of trades by reducing NPV total and our new margin is becoming less than the previous total margin, then recall occurs.

2) If no trades have been uploaded but the market price of the security is increased, then, too, "Recall" will occur and the difference displayed will be resolved by moving that much of security from Legal entity book to Processor book.

J. Return

Return is the case when processor pays (return) some securities to the legal entities. These securities would be the already received securities from the legal entity. The case of return can be generated by reducing the total required margin of the contract and that can be achieved by reducing the NPV values of the trades. There are two possible ways for generating the condition of Return. The contract should be of Price Receive.

1) By uploading same set of trades and reducing the margin i.e. the new total required margin.

2) By increasing the market price of the security which was received earlier.

By following these two conditions, the state of return can be generated. The only the condition is that the contract should be a price_receive one and the contract should be already executed.

Following are the conditions explained by taking some integer values:

i. If the Contract is of Priced Pay

1. For the first time, if our Total Required Margin is -20000 (price pay) then we do allocation and execution.

2. Then we upload the new trades with the same trade IDs and map them into the contract so that our Total Required Margin becomes

a) -25000

This means processor had already paid -20000 to the L.E. and now the new required margin is -25000 which has a difference of 5000. So, this difference then will be paid by doing Allocation and Execution. (Priced_Pay will occur).

b) -15000

This means the processor had paid 20000 previously to the L.E. and now the new required margin is -15000 which means processor had paid extra 5000 security previously. Thus, the processor will recall these 5000 from the legal entity. (Recall will occur).

ii. If the contract is of Priced_Receive

1. For the first time the total required margin was 20000 and execution was done by uploading these securities via legal entity inventory interface.

2. Then again new trades are uploaded, which has two possible total required margins:

a) 15000

This is the new total required margin and the previous margin was 20000, which means we had received an extra 5000 security from the counterparty. So, the processor then will return that much of security to the legal entity. (Return Will occur).

b) 25000

This is the new total required margin and the previous was 20000, which means the processor had received less security with the margin difference of 5000. So, the processor again will receive that much of security from the legal entity. (Priced_Receive state will occur).

Flow Graph of Work

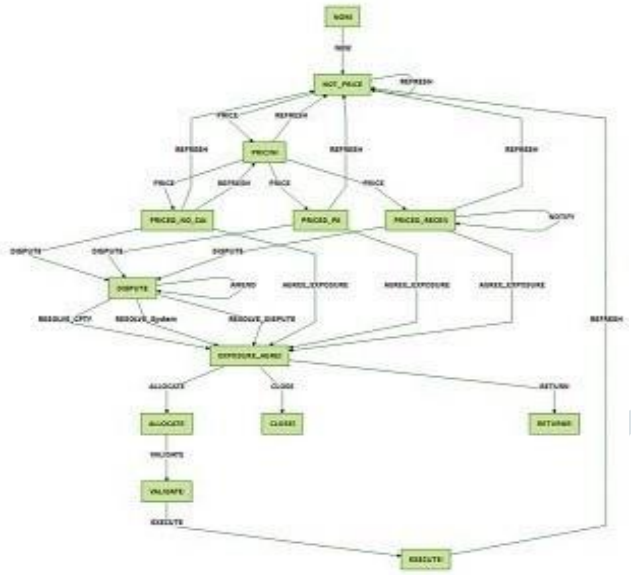

Fig 3 Flow graph of work

Result

Fig.4 Allocation

Fig 5 Execution

IV. CONCLUSION

Finally, from the above we can see the concept is that if security required margin is less than the market price of the security, then it will not bring up to be taken value in the Filter Collateral Pool. So, whenever there is security required margin present, the market price of the security should be less than it, so that it would satisfy the condition and then that security will become visible in the filter collateral pool. Thus, it is conclusively proven that this CMS is a state-of-the –art product that can compete with the best ones currently in the market.

REFERENCES

[1] D. Bohus and E. Horvitz, "Dialog in the Open World: Platform and Applications," in International Conference on Multimodal Interfaces, New York, 2009.

[2] European Committee for Banking Standards, Banking Sector Requirements from an Electronic Purse v2.0, July 2016.

[3] Huang Yun-feng, Wang Shi-long, "Five-perspective Methodology and Three-domain Architecture of Shop-floor Scheduling Research[J]", Computer Integrated Manufacturing systems, vol.15, no. 1, pp. 123-130, 2009.

[4] M. J. Sergot, F. Sadri, R. A. Kowalski, F. Kriwaczek, P. Hammond, H. T. Cory, The British nationality Act as a logic program. Commun ACM vol. 29, no.5, pp. 370-386, 1986.

[5] J. A. Meldman, "A structural model for computer-aided legal analysis", Rutgers Journal of computer law, vol. 6, 1977.

[6] Agarwal, Sumit, and Robert H. Hauswald, 2008, "The Choice Between Arm's-Length and Relationship Debt: Evidence from e-Loans", Federal Reserve Working Bank of Chicago Working paper, WP 2008-10.

[7] Howorth, Carole A. and Andrea Moro, 2012, "Trustworthiness and the Cost of Credit: An Empirical Study of SMEs and Small Banks in Italy", Small Business Economics.

[8] R. C. Blatteberg, J. Deighton, "Manage Marketing by the Customer Equity Test", Harvard Business Review, vol. 74, Dec. 1996, pp. 136-44.

[9] D. Bohus and E. Horvitz, "Dialog in the Open World: Platform and Applications," in International Conference on Multimodal Interfaces, New York, 2009.

[10] European Committee for Banking Standards, Banking Sector Requirements from an Electronic Purse v2.0, July 2016.

[11] Huang Yun-feng, Wang Shi-long, "Five-perspective Methodology and Three-domain Architecture of Shop-floor Scheduling Research[J]", Computer Integrated Manufacturing systems, vol.15, no. 1, pp. 123-130, 2009.

[12] M. J. Sergot, F. Sadri, R. A. Kowalski, F. Kriwaczek, P. Hammond, H. T. Cory, The British nationality Act as a logic program. Commun ACM vol. 29, no.5, pp. 370-386, 1986.

[13] J. A. Meldman, "A structural model for computer-aided legal analysis", Rutgers Journal of computer law, vol. 6, 1977.

[14] Agarwal, Sumit, and Robert H. Hauswald, 2008, "The Choice Between Arm's-Length and Relationship Debt: Evidence from e-Loans", Federal Reserve Working Bank of Chicago Working paper, WP 2008-10.

[15] Howorth, Carole A. and Andrea Moro, 2012, "Trustworthiness and the Cost of Credit: An Empirical Study of SMEs and Small Banks in Italy", Small Business Economics.