A Tree-Based Approach for Detecting Redundant Business Rules in Very Large Financial Datasets

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ABSTRACT

Net Asset Value (NAV) calculation and validation is the principle task of a fund administrator. If the NAV of a fund is calculated incorrectly then there is huge impact on the fund administrator; such as monetary compensation, reputational loss, or loss of business. In general, these companies use the same methodology to calculate the NAV of a fund; however the type of fund in question dictates the set of business rules used to validate this. Today, most Fund Administrators depend heavily on human resources due to the lack of an automated standardized solutions, however due to economic climate and the need for efficiency and costs reduction many banks are now looking for an automated solution with minimal human interaction; i.e., straight through processing (STP). Within the scope of a collaboration project that focuses on building an optimal solution for NAV validation, the authors will present a new approach for detecting correlated business rules and show how they evaluate this approach using real-world financial data.

Keywords: Business Rule Validation, Correlated Rules, Net Asset Value (NAV), Net Asset Value Validation, Straight through Processing, Tree Topology

INTRODUCTION

Fund administration is a subsection of the investments industry – i.e., trading on the stock exchange (Abner, 2010). When it comes to trading on the stock exchange there are three tiers administration, at the front line is front office- these are the traders, they trade on behalf of their clients. The second tier is middle office, where all the actual trade information and other data are tabulated and sent in an agreed format to the final tier; back office (Gross, 2006). Back office is the accountancy work that is carried out.

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for all trades as per front office’s instructions; hence the price or Net Asset Value (NAV) of a fund is calculated. There are many steps in the pricing or valuation of a fund. This depends on what type of fund it is, however, all funds consist of six core pieces: (1) Stock reconciliation, (2) reflection of corporate actions, (3) pricing of instruments, (4) Booking, calculating and reconciling fees and interest accruals, (5) cash reconciliation and finally (6) NAV/price validation.

The NAV validation (CFA Institute, 2008) price is as vital as this is the verification for accuracy and correctness occurs. If a NAV price released to a client is incorrect then the fund administrator is liable according to the fund administration agreement. In this case there may be hundreds of thousands of monetary compensation to investors and the clients.

Besides, most fund administration companies in Ireland are located in the financial district IFSC (International Financial Services Centre-Dublin); therefore are regulated by the financial regulator (FR) and are audited yearly. So according to the Irish and EU directives there are many checks and standard reports that must be available, these reports are always checked for manual intervention. As this is an international fund administration company, their operations are spread throughout the world; i.e., Europe, Asia, North America, etc. Therefore there is an urgent need for an improved approach to maintain and track all operations across this distributed environment. Therefore, the fund administration industry is trying to reduce the operational cost of NAV validation process.

In the NAV validation step (step (6), cf. page 1), results from previous steps in producing a NAV (from (1) to (5), cf. page 1) are checked. The data that are reflected on the fund accounting system are checked against broker statements, pricing vendor reports, cash statements, etc. This step is normally completed by eye balling the reports and making sure that the external reports match what is reflected on the NAV (in the fund accounting system). If the data does not match or is not within the allowable tolerance dictated by the prospectus then valid evidence must be attained to answer why not, this evidence is attached as a hard copy within the file for audit purposes. Each fund has its own set of business rules attached to it. The selection of rules is based on the attributes of a fund.

Recently, in the context of reducing operational cost, the fund administration business has raised some questions on the optimisation of rule sets. Concretely, how can the user optimise their performance, minimise their running expense by selecting a reduced set of rules without compromising the NAV validation. This analogy leads to many challenges. We firstly need to have a strong knowledge of the given business. Secondly, there is a need to analyse the relationships among these rules and these relationships are normally not straightforward. This step requires a fund accountant to verify each rule against the total population of rules applied to a given fund. In our recent study, it took an expert one working day (8.5 hours) to analyse the correlation within a set of 20 rules. It takes then approximately a further 4 working days to verify these results using real-world data retrieved from a NAV validation system. In reality, in order to carry out the NAV validation of a fund, a set of 50 to 100 business rules is applied. Note that the complexity of this task is $O(n^2)$ where $n$ is the number of rules. Moreover, a fund administration business can run thousands of funds in multiple regions around the world. In addition, new funds launch daily and hence a set of rules needs to be attached to this new entity. As a consequence, the new set of rules needs to be scrutinised.

In this paper, as part of collaboration between our research laboratory and an international investment bank within the context of creating a BI-Based organisation (Wixom & Watson, 2010), we propose a tree-based solution for detecting correlated rules within a rule set that can be applied to a fund. This solution is built as a software tool that can assist users for automatically validating their rule sets. We also evaluate our approach using real data to illustrate its efficiency.
Alignment of Knowledge Sharing Mechanism and Knowledge Node Positioning
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