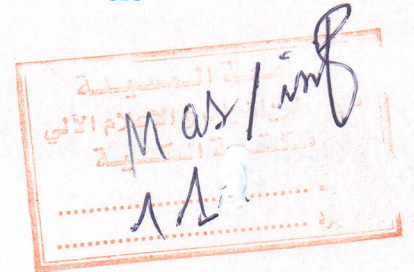


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Market Liquidity Risk Management Platform
Based on Complex Event Processing

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Chapter 1: Introduction

Chapter 1

Introduction

The Risk management is an important task in the Global financial system. The institutions must evaluate continuously the risk management process, especially in the recent years when the crises have increased due to failures in the risk management strategies. Institutions today are facing three main financial risks, credit risk, market risk and liquidity risk. While credit and market risk are the major risks, the liquidity risk has appeared as the risk that has tendency to each of them, so that it shouldn't be isolated. The liquidity risk management has become a great challenge for financial institutions, what led the Basel Committee on Banking Supervision (BCBS) and The Financial Services Authority (FSA) to publish regulations and recommendations on liquidity risk management and supervision encouraging and helping the financial institutions to implement frameworks based on their policies. In doing so, institutions have to apply liquidity risk management requirements and build robust frameworks that have the ability to monitor risks by capturing and collecting all relevant data from funding liquidity and Market liquidity sources, such as the unpredictable cash flows and the uncertainty of asset returns. These data should be used by measuring techniques such as liquidity ratios, cash flow gaps and assets liquidity risk measures.

From the market side, market (or asset) liquidity risk is the risk that a firm cannot easily offset or eliminate specific exposures without lowering market prices due to inadequate market depth or market disruption. While the trading environment has become more challenging for traders as well as brokers due to the speed required for executing large volume of transactions, this challenging environment creates consequently a high frequency trading data or tick-by-tick data. So to keep pace with the market, the risk managers should analyze and evaluate risk models on intraday intervals rather than one day. To meet these challenges, Intraday VaR and L-VaR models were proposed as an extension of VaR and L-VaR for intraday returns. Others go so far and assumed that the estimation of risk should be in real-time basis rather than intraday or near real-time. In fact, real-time risk estimation can be little difficult to implement, because risk measures VaR and L-VaR require a high calculation capabilities as well as the availability of real-time data.

Complex Event Processing (CEP) is an Event Driven Architecture (EDA) style consists of processing different events within the distributed enterprise system

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attempting to discover interesting information in timely manner. For some enterprises is very necessary to react immediately for these information, because any information may represent an opportunity or risk exposure. EDA is software architecture refers to generation, reaction, detection and consumption of events that represent notable changes in the state of enterprise's activities. EDA like any architecture based on layers, the first is the event generator, which indicates the type of event and its structure. The next layer is the channel appropriate for this event, which whereby the event is transferred to the next layer. The third layer is the event processing engine, where the reaction scenarios for events are created and executed. The last layer is the downstream end where the outputs are driven to. Processing events is the most important task in EDA, from which we can distinguish three styles of EDA: Simple, stream and complex. Whereas Simple event processing is about driving events related to defined measures or statuses to downstream which were already specified, the Event Stream Processing (ESP) is about giving the ability for different subscribers to subscribe continuously to sets of events. So the complex event processing (CEP) is stream processing technology that can processes the events across multiple streams to create a higher level of events, what makes the CEP as a full event driven architecture.

The main goal of this dissertation is to implement a market liquidity risk management platform based on CEP. This platform combines between the intraday and real-time risk management concepts. In our approach, real-time risk management refers to monitoring market liquidity risk factors (Spread, Depth, Resiliency) in real-time by processing the real-time quotes giving a better insight on the Market microstructure, Whereas intraday risk management refers to forecasting L-VaR over intraday interval depending on market data captured every 30 minutes.

Abstract

Since the last economic crisis, the management of liquidity risk has become one of the most challenging tasks in the global financial system, what led the Basel Committee on Banking Supervision (BCBS) and The Financial Services Authority (FSA) to publish regulations and recommendations on liquidity risk management and supervision. Therefore, all the institutions should apply Liquidity risk management requirements and build robust platforms that have the ability to monitor risk as fast as possible by capturing and collecting all relevant data from funding liquidity and Market liquidity sources.

Complex Event Processing (CEP) is an Event Driven Architecture (EDA) style consists of processing different events within the distributed enterprise system, attempting to discover interesting information in timely manner. For financial enterprises, it is very necessary to react immediately for information, because any information might represent an opportunity or risk exposure.

In this dissertation, we propose a market liquidity risk management platform based on CEP. We combine between the monitoring of real-time risk factors, and the forecasting of intraday risk using intraday Liquidity-adjusted Value at Risk (L-VaR) model.

Résumé

Depuis la dernière crise économique mondiale, la gestion du risque de liquidité est devenue cruciale dans la gestion des risques financiers, ce qui a conduit le Comité de Bâle sur le contrôle bancaire (CBCB) et l'autorité des services financiers (FSA) à publier des instructions et des recommandations sur la gestion et la supervision des risques de liquidité. Par conséquent, toutes les entreprises devraient développer le management du risque de liquidité et construire des plates-formes qui permettent de surveiller les risques en temps réel et de disposer des données pertinentes sur la liquidité de marché et des fonds.

Complex Event Processing (CEP) est une Event Driven Architecture (EDA) technologie ; consiste à traiter des différents événements dans un système distribué d'une entreprise en visant la détection des informations intéressantes dans le temps opportun. Pour les entreprises financières, il est primordial de réagir immédiatement suivant l'information reçue, parce que toute information pourrait présenter une opportunité comme elle pourrait impliquer un risque.

Dans ce travail, nous proposons une plateforme pour la gestion du risque de liquidité du marché en se référant au CEP. Nous combinons entre la surveillance des facteurs de risque en temps réel, et la prévision du « intraday » risque de liquidité en utilisant un « intraday » modèle de Liquidity-adjusted Value at Risk (L-VaR). Cette approche apporte aux managers une connaissance approfondie sur la microstructure du marché grâce au partage de toutes les informations en temps opportun.

ملخص

منذ الأزمة الاقتصادية الأخيرة، إدارة مخاطر السيولة أصبحت أكثر طلباً في النظام الاقتصادي، ما أدى لجنة بازل المعنية بالإشراف على المصارف وسلطة الخدمات المالية بنشر لوائح وتوصيات حول إدارة مخاطر السيولة. ولذلك يجب على جميع المؤسسات تطبيق متطلبات إدارة مخاطر السيولة، وبناء تطبيقات قوية لديها القدرة على رصد المخاطر في أسرع وقت ممكن من خلال رصد وجمع جميع البيانات ذات الصلة من مصادر السيولة النقدية والسيولة المرتبطة بالأصول.

معالجة الأحداث المركبة هي تكنولوجيا قائمة على معالجة مختلف الأحداث داخل منظومة من أجل اكتشاف معلومات مهمة في الوقت المناسب. للمؤسسات المالية، من الضروري جداً الرد فور الحصول على المعلومات، لأن أي معلومة قد تمثل فرصة أو تعرض لخطر.

في هذه الرسالة، نحن نقترح تطبيق إدارة مخاطر السيولة في السوق قائم على معالجة الأحداث المركبة والذي يجمع بين رصد عوامل الخطر في الوقت الحقيقي، والتنبؤ به عن طريق نموذج معدل لإدارة السيولة في السوق.