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Analysis of a data-flow in a financial IoT system

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Abstract

Data retrieving, analysis e management are usually known as complex task in financial contexts. In an Internet of Things (IoT) system data-flow processes represent the knowledge base used in mathematical models for credits and financial products. Several sources such as distributed database systems, portals and local information are generally used as input of inferring models. In this paper we describe an overview of software tools, methodologies and strategies in real data-flow system.

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Keywords: Internet of Things; Financial system; data-flow management.

1. Introduction

In many applicative scenarios processes make use of huge amounts of interrelated data: this explains the necessity of techniques for their classification and managing. Iot frameworks are very suitable to this kind of contexts for several reasons, in particular: i) the diffusion of sophisticated tools (smart phones, tablets and smart watches); ii) the possibility of real time data; ii) efficient *communication models* among devices. As it concerns the point iii), we list some common models: a) *Device-to-Device Communications*, i.e. two or more devices that directly connect and communicate between one another; b) *Device-to-Cloud Communications*, where the IoT device connects directly to an Internet cloud service like an application service provider to exchange data and control message traffic; c) *Device-to-Gateway Model*, where there is an application software operating on a local gateway device, which acts as an intermediary between the device and the cloud service and provides security and other functionality such as data or protocol translation. One of the main opened problems related to IoT systems is a *derivative effect*, i.e. many financial transactions are based on information from intangible sources and only indirectly form real objects (for this reason, scientists research new methods for the improving of IoT sensors and the analysis of the their data). For an introduction to IoT the reader can see [1]. IoT finds several applications in the cultural heritage (see [2,3,4,5,6,7,8]).
Another sector characterized by very big data flows to analyze and from which inferring information is represented by *financial* one. For example, in banking context, IoT applications are able to improve underwriting processes for several

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purposes: a) obtaining more information of goods; ii) monitoring the condition of different assets market; iv) helping traders to choose the best opportunity. In particular, all these characteristics can take advantage in the determining the *no arbitrage price of a European option* (this problem is discussed in[9],[10],[11]); for IoT financial description we refer to[12].

2. Financial Data Flow System

In Finance, data can be involved in a complex and long process which allows the financial institution to properly treat and make advantage of them. Data losses, misinterpretation and optimization are one of the main issues financial (and non) institutions must face.

We can wrap up the data-flow in three main phases:

- **Data retrieving**: the financial institution retrieves data from more than one source, often causing operational risk.
- **Data analysis and management**: data are extracted from the database to be used for analysis purposes.
- **Data reporting**: data are transferred again to the main database and/or externally reported.

This general and simplified scheme is represented with more details in figure 1.

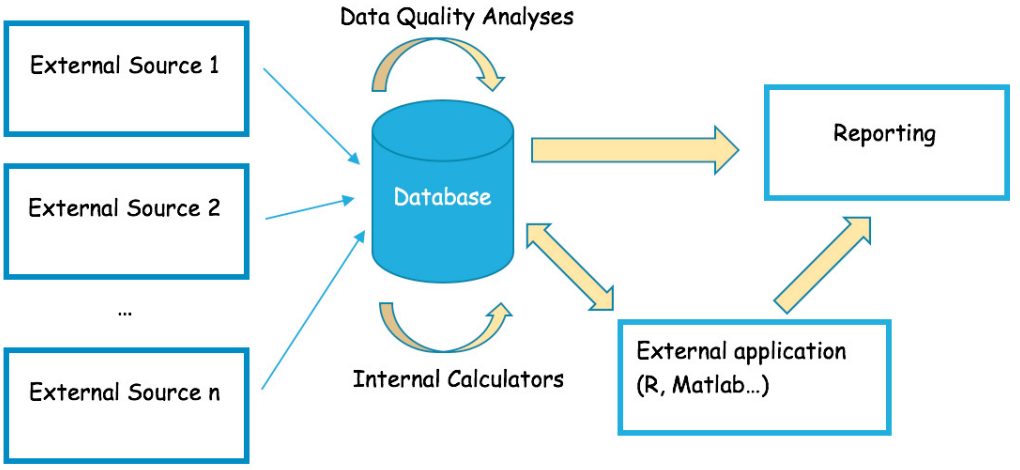

Figure 1. Data-flow.

2.1. *Data Retrieving*

The ideal situation for a financial institution would be gathering all data from only one database. Nowadays, Business Intelligence is taking care of this aspect and is facing the tough challenge of joining old databases in a new, functional one.

Typically, given the huge size of banks and their step by step adjustment to new software and technologies, it is still hard to combine all data, particularly when treating historical ones. This is the reason why also (if not especially) huge financial institutions are still working with more than one database, generating overlapping data which in general do never exactly match.

We will here provide an example of how databases containing data for Risk Management department could be structured. We can imagine a database for credit risk data and a second database for market risk data retrieval.

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