White Paper

Automated Trading Systems: 5 fundamental questions to assess the technology-related risks

Document Version 3.3

Creation…….……..	2014/08/15
Last Revision……..	2015/10/13
FIA Japan Technology Committee Approval……...	2014/11/26
FIA Japan Board Approval……..	2015/10/13

Introduction Note

In March 2015, the Automated Trading Committee of the FIA Market Technology Division published a "Guide to the Development and Operations of Automated Trading Systems" (ATS) in the US.
https://americas.fia.org/articles/fia-issues-guide-development-and-operation-automated-trading-systems

While acknowledging risks of other natures like financial risks, this has prompted our FIA Japan Technology Committee to further reflect on the specific technology-related risks undeniably associated with the use of ATS.

In a first step, the exercise has consisted in defining the core constituents of any ATS so that the committee could, in a second phase, identify the fundamental technology-related risks inherent to such system. It has led the committee to create the definitions and check list presented below, which gathers five "simple but not easy" open questions on ATS technology risks.

The committee strongly recommends that any organization directly or even remotely involved with ATS closely considers these questions.

Tokyo, Japan, September 30, 2015

Bruno ABRIOUX
FIA Japan, Technology Committee Chairman

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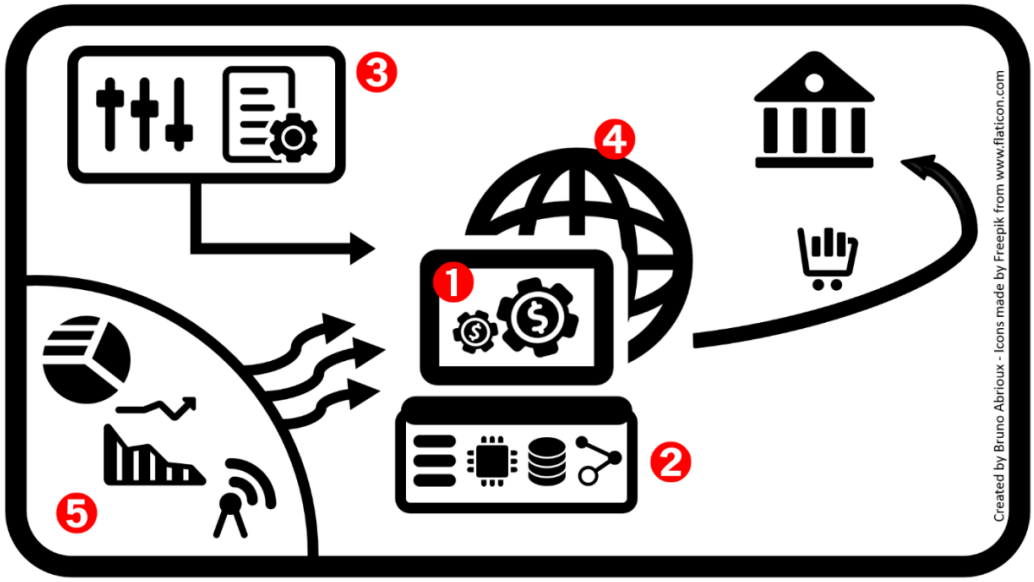
Technical Definition of an Automated Trading System

Among various definitions, an Automated Trading System can be referred as:
"a logic running on an IT system without human intervention that is set to make contextual trading and execution decisions based on the analysis of dynamic data"



Legend:

❶ the logic, often referred as algorithm: a program developed to make decisions (outputs) based on a number of inputs

❷ the IT system running the logic without human intervention; "IT system" is to be understood here in its broad meaning: from infrastructure including computational resources like CPU, memory, storage, network connectivity… down to the operating system and software application layers

❸ the settings associated to the logic: configuration parameters and other non-real-time static data

❹ the context: the conditions that define the market and trading environments

❺ the dynamic data flow such as real-time market prices, company risk data updates, news, social media sentiment…

This definition intentionally depicts the concept of ATS in its widest possible spectrum: from basic VWAP execution algorithm to advanced HFT programs.

The 5 technology-related risks of ATS and their fundamental assessment questions

In a pro-active prevention spirit, the below section will focus on the five core constituents of any ATS as described above and brings key questions helping assess its level of technology-related risk.

1. Technology-related Risk ❶: a flawed or corrupted decision logic

Be it inadvertently through misconception or miscoding or be it deliberately through malicious intentions to improve the business performance in a non-compliant fashion, an ATS can present risks of flawed or corrupted logic. In the former case, this could lead to a sudden erratic behavior of your ATS (including possible violations of trading rules) while, in the latter case, this could purposely direct to regulatory breaches.

☞ **Key Question to assess Risk ❶:**

Which measures do you take to guarantee that your ATS logic does not include any flawed design, malfunction or intentional non-compliant code?

2. Technology-related Risk ❷: system performance issues

Insufficient computing capacity, faulty equipment, network traffic congestion… are as many risks that may lead to an improper behavior of your ATS. Indeed, under such conditions, vital functions such as processing the real-time inputs, computing decisions, triggering and relaying the output action commands down to the market in a timely manner may be affected.

☞ **Key Question to assess Risk ❷:**

How do you ensure that your IT system shows sufficient processing capacities to run the ATS logic at any time and permanently delivers full redundancy in order to cope with faulty equipment or network connectivity problems?

3. Technology-related Risk ❸: erroneous settings

Setting inadvertently wrong configuration parameters or inputting mistaken static data could obviously bring your ATS to operate in an unexpected, unpredictable way.

☞ **Key Question to assess Risk ❸:**

Which change management procedures do you have in place to confirm a proper validation, authorization, scheduling, execution, communication and documentation of any ATS-related settings modification?

4. Technology-related Risk ❹: ATS logic running under an unidentified context

Every program is normally conceived and tested to perform under a given identified context. Beyond those known boundaries, the behavior of the program may no longer be accurately predictable. Imagine here your ATS running under flash crash conditions or abnormal market volatility like the ones during the Japanese great Tohoku earthquake…

☞ **Key Question to assess Risk ❹:**

To which extent have you identified the context under which your ATS can operate safely and predictably and how far can you detect changes in the market or trading environments conditions pushing your ATS beyond its known validated boundaries?

5. Technology-related Risk ❺: delayed, missing or inaccurate dynamic data

In the face of unreliable dynamic data (missing or delayed delivery of real-time data, corrupted information, data inaccuracies) and despite a perfect logic, your ATS will very probably command the wrong decision; this is infamously known as Garbage In – Garbage Out (GIGO).

☞ **Key Question to assess Risk ❺:**

What safeguards have you deployed to ensure a constant integrity of your dynamic data (content accuracy, timely delivery) and, in case of unreliable data despite your safeguards, to keep your ATS behavior under control?

Conclusion note

Despite all risk prevention efforts, all kind of testing (unit testing, functional testing, acceptance testing, stress testing…), things can sometimes turn really wrong in production. This is especially true when it comes to solutions designed to burst automatically an infinite number of trading commands to the market in the shortest possible time unit… This is even more true with the new generation of ATS leaning toward Machine Learning ATS or AI-type of ATS) (ie ATS with a capacity to adjust dynamically and without human intervention the decision strategy based on the underlying market/trading context in order to optimize revenue and/or circumvent some rules, ATS capable of auto-diagnosis and self-correction…) and the increased use of unstructured data as source of decision.

Thus, looking at the past large market incidents involving ATS, limiting the overall damage for your company and the market itself often comes down to one question: how fast can you detect that something is going wrong with your ATS and trigger the appropriate chain of actions to pull the plug and cure the remaining situation?

As a conclusion, the FIA Japan Technology Committee hopes that this high-level thought provoking check list has helped you assess your ATS technology-related risks and strongly suggests complementing your evaluation by consulting the comprehensive FIA "Guide to the Development and Operations of Automated Trading Systems".

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