


## Complexity-Based Early-Warnings in Defaulting Companies

 August 24<sup>th</sup>, 2019

The search for early-warning signs is one of the key issues for decision makers. The advantages of knowing in advance the evolution towards critical situations are obvious.

Complexity is a new and powerful indicator that quantifies the degree of sophistication and governability of a business and which impacts its Resistance to Shocks [1] (RtS). Both complexity and RtS indicators establish a radically innovative means of anticipating crises. As of today, conventional methods have failed to identify such signals, especially with this level of details.

Through the Quantitative Complexity Management (QCM) [1] any business which is undergoing severe stress or is on a path to collapse shows a rapid complexity fluctuation. A consistent and continuous reduction of complexity is a typical pre-alarm. If this occurs, then a decision maker, e.g. a trader, is able to put in place all those actions needed to avoid financial losses and/or take advantage of these situations e.g. via shorting.

**Fact: Changes in complexity indicate imminent crisis.**

In the next paragraphs it will be shown how Complexity and Resistance to Shocks (RtS) of Balance Sheets are able to provide early-warning signals of an imminent crisis.

We have analysed the complexity of 3 listed companies whereby:

- At the end of July 2016, two companies filed for bankruptcy and
- Since August 2016, one company operates under judicial management

The bottom line is that these crises could have been predicted with considerable anticipation.

Based on the measurement of complexity the first symptoms were as follows:

1. Swiber Holdings: from the 1st quarter 2014, i.e. two years before judicial management.
2. Halcon Resources Corp: since the 2nd quarter 2014, i.e. seven quarters prior to default
3. Atlas Resource Partners: from the 2nd quarter 2015, i.e. three quarters prior to default

The plots below compare the evolution of Balance Sheet complexity versus Total Assets of the three companies.

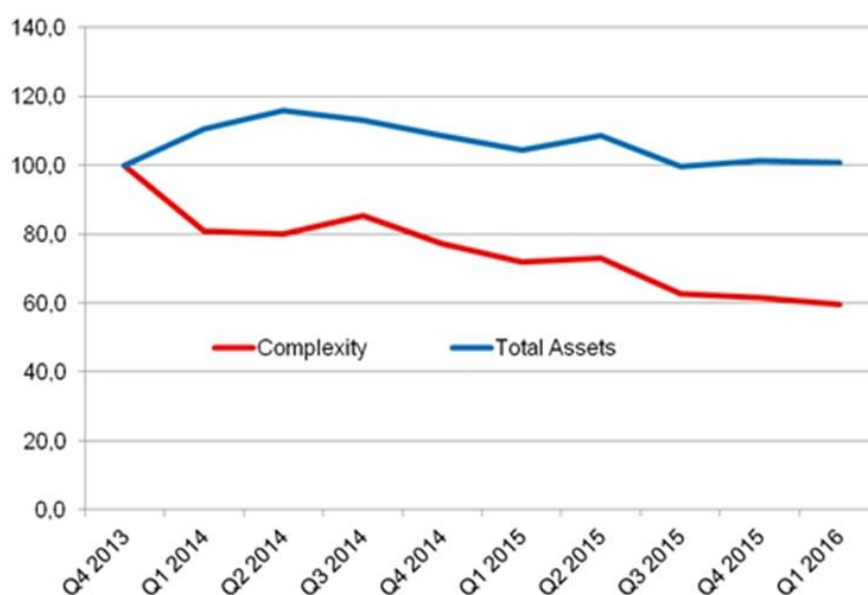
In all cases Total Assets of each Company were still growing, while situations of concealed crisis have been revealed by the corresponding complexity trend.

The consistent complexity decrease in all cases points to an increase of ‘decorrelation’ of the corresponding Balance Sheets. This means that the relationships between the various Balance Sheet entries are becoming more independent (i.e. the correlations are becoming weaker, pointing to a ‘less structured’ situation). Consequently, the business is more ‘disordered’, hence difficult to control/predict and is therefore more exposed to unexpected events.

Let us examine the three cases.

1. Swiber Holdings

Figure 1. Complexity and Total Asset evolution of Swiber Holdings (Q4 2013=100)



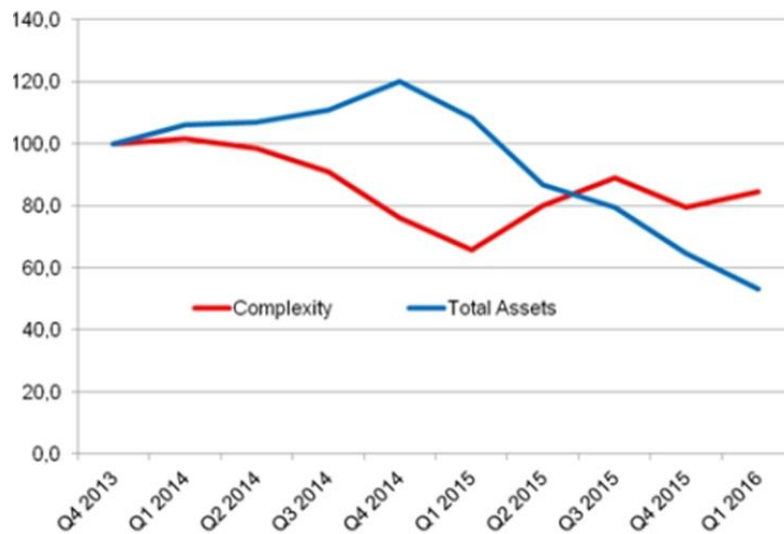
Source: Optimum Complexity

The growth of the company’s Total Assets, between the 4th quarter 2013 and the 2nd quarter 2014, conceals a critical situation.

A complexity reduction of 20% of within just one quarter is a typical symptom that something is going wrong. The compounded quarterly growth rate of complexity (-4,1%), double of that of Total Assets (-2,0%). Such complexity decrease is mainly due to growing disorder (lower correlations) in the Balance Sheet. Basically, the structure of the information within the balance sheet is becoming weaker.

2. Halcon Resources Corp

Figure 2. Complexity and Total asset evolution of Halcon Resources Corp (Q4 2013=100)

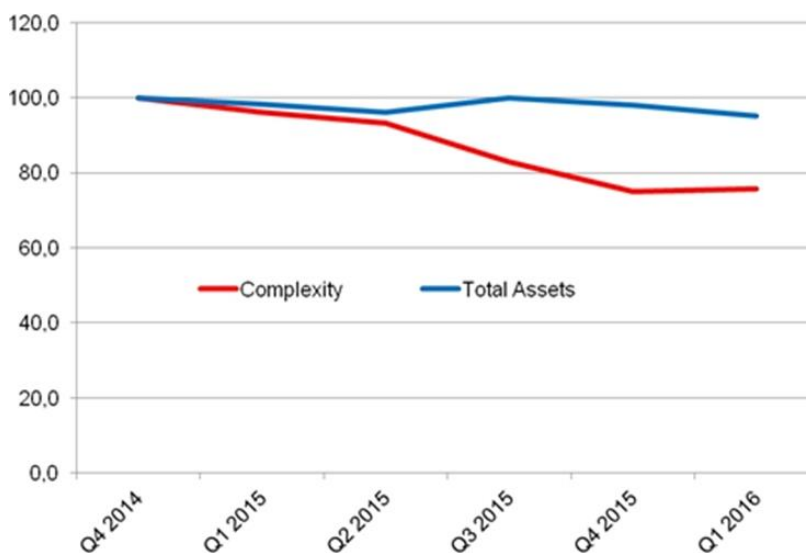


Source: Optimum Complexity

The growth of Total Assets between the 4th quarter 2013 and the 4th quarter 2014, hides a critical situation highlighted by complexity reduction: -23% compared to a growth of Total Assets of 20%. As in the previous case, the Balance Sheet is becoming more 'disordered', pointing to a more fragile business.

3. Atlas Resource Partners

Figure 3. Complexity vs Total assets evolution of Atlas Resource Partners (Q4 2014=100)



Source: Optimum Complexity

The small decline of its Total Assets, between the 4th quarter 2014 and the 1st quarter 2016 (-5%), hides a critical situation reflected by a complexity reduction of -24%. The situation is becoming critical

from the 2nd quarter 2015 onwards. The 24% of complexity reduction within a half-year period is a typical symptom of a failing/declining system.

In conclusion, the monitoring of complexity provides businesses with new information of systemic nature which reflects the interplay of structure and disorder in Balance Sheets, and which may be expanded to include Cash Flow, Income Statements or Ratios. A sustained loss of complexity points to de-correlation which, in turn, reveals a growing level of disorder. This constitutes a formidable early-warning mechanism which classical Balance Sheet analysis will not reveal.

Notes:

**[1] QCM** methodology and the related software tools allow to quantify the complexity and the RtS. The QCM approach complies with UNI 11613 Business Complexity Assessment guidelines. UNI 11613 furnishes guidelines as to how an organization may establish, monitor and put into practice the assessment of business complexity. The goal is to identify the critical complexity of a business and to identify and rank its drivers, with the objective of increasing the resilience of an organization. UNI, Ente Nazionale Italiano di Unificazione, performs regulatory activities in Italy.

**[1] Resistance to Shocks (RtS)**, sometimes known as resilience, or ‘shock-worthiness’, measures the capacity to absorb shocks or destabilizing events, such as financial contagion, stock market collapses, market bubbles, natural disasters or geopolitical events. It provides an indication of how stable a company, portfolio or market is and how it will react to the said events.

Disclaimer

The Adviser Optimum Complexity Ltd. is an appointed representative of Atlantide Asset Management Limited which is authorised and regulated by the Financial Conduct Authority

The concepts and methods presented in this document are for illustrative purposes only and are not intended to be exhaustive. This document is not intended as a recommendation, an offer or solicitation for the purchase or sale of any securities or other financial instruments. It is not intended to serve as the basis of any future investment decision and should not be considered as a recommendation or investment advice. No investment decision should be made on the basis of this document in whole or in part. No warranty is made as to the accuracy or reliability of any estimates, opinions, conclusions, recommendations (which may change without notice whether in writing or otherwise) or other information contained in this document and, to the maximum extent permitted by law, all liability and responsibility for any direct or indirect loss or damage which may be suffered by any recipient through relying on anything contained in or omitted from this document is disclaimed without reservation. This document has been published by Optimum Complexity Ltd. based on information provided to it. Optimum Complexity Ltd. has taken care in the preparation of this document to ensure that it accurately reflects the current state of the development of the project, though no representation or warranty is provided as to its accuracy. Certain information contained in this presentation has been obtained from public sources prepared by other parties. No responsibility is assumed for the accuracy or completeness of any information in this document. Any reproduction or distribution of this document, in whole or in part, without the prior written consent of Optimum Complexity Ltd. is prohibited. Reverse-engineering of the concepts, methods or ideas contained in this document is strictly forbidden. The methods described in the present document are protected by US patents. This document should not be accessed by any person in any jurisdiction where it is unlawful to do so. This document is for the intended recipient only and is provided on the condition that it be kept confidential and that it is not copied or circulated in whole or in part.