An Exploration of Quality Control in Banking and Finance

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Abstract

This article discusses the use of quality control techniques in the improvement of the trading, finance, banking, and service industries. One such technique being used to assess performance of trading machines is statistical process control (SPC). In addition, quality management initiatives are being implemented in Hong Kong banks to improve their competitive position. Finally, Lean Six Sigma (LSS) and Total Quality Management (TQM) techniques are improving the competitiveness of banking and service industries in the U.S. Finally, some exploration into the improvement of government services using LSS and TQM practices is attempted.

Introduction

Banking and finance industries have been through tumultuous times recently. A record number of loans are defaulting, mortgage foreclosures, loss of investments are causing failure of and sometimes even collapse of financial and banking institutions. Could the concepts of Quality Control have mitigated some of these issues? Can the concepts of Quality Control be used now to improve the current situation with regards to trading, finance, and banking? The remainder of this article will explore these questions. Recently, many companies have opted to combine the Six Sigma and Lean management techniques into Lean Six Sigma (LSS) to obtain higher quality in services and operations. This technique would help industries to improve processing and regression of relevant inputs and outputs, enhancing industry services and improving industry income. This article highlights various examples.

Statistical Process Control (SPC) and Trading Machines

Algorithm Controlled Finance (ACF) machines consist of the interacting trade selection algorithms and logic necessary to enter into and exit from positions in the financial market. ACF or "trading" machines also contain the technology required to automate some or all of the processes of trade selection, execution, and portfolio and risk management. These trading machines, therefore, perform a unique task or process with measureable inputs/outputs not unlike a manufacturing process.

SPC can be used to determine the effectiveness of these ACF trading machines by analyzing the mean and variation (standard deviation, range, skewness) of the machine's input/output using Shewhart's control charts. If a machine exhibits excessive variation, a risk manager may shut down the machine or monitor it more closely to determine the root cause of the variation. Variable charts such as X-bar and R charts can signal out-of-control performance of these trading machines while attribute charts such as P charts can present percentage of "defective" or losing trades. It is important to note that human intervention may be necessary in a financial meltdown or abnormal trading environment to perform trading operations in the event an ACF or "trading" machine is shut down. (Hassan, Kumiega, and Van Vliet 2010)

Quality Management in International Banks to improve Competitive Position

Statistical management concepts are useful for improving financial administrative processes, monitoring critical success factors and cost drivers and post-audit evaluations of capital expenditures. Because of increasing international competition in the banking industry, Hong Kong banks must tightly control costs and improve efficiency of operations in order to remain profitable. To this end, quality management has emerged as a key strategic element in maintaining and improving competitive advantage. Li, Zhao, and Lee, in their 2001 journal article, cite survey results that show which quality initiatives banks in Hong Kong used to improve their competitive advantage. From 1997 to 2000, banks surveyed in Hong Kong were using service quality, customer care, business process re-engineering, total quality management, corporate culture change, and ISO9000/BS5750. Other international research supports these quality management initiatives. In 1996, Knights and McCabe, reported the relationship between rationale of quality initiatives and management action.

The result of the six case studies, between 1993-96, done on two banks, two insurance companies, and two building societies showed numerous counter-productive managerial tendencies. Management must consider various inconsistencies to devise effective quality initiatives, promote and support staff to offer services with high customer satisfaction. Studies by Davison and Grieves (published 1996), done among 104 local governments in England and Wales to explore the issues of service quality, reported that applying proactive quality initiatives in quality services are a common rather than internal corporate concern. They recommended increasing the focus on classification of local needs for quality management to increase service quality. The Athanassopoulos study (published 1997) done on 2200 branches of banks across Greece, that included both private and public, evaluated gaps in services provided by bank staff in order to comprehend the managerial concepts of quality in services industries. The author postulated that the private bankers provided higher quality services to businesses rather than individuals; however, public bankers provided the same level of quality services to both customers groups.

Bilich and Neto produced a macro-function quality model (published in 2000) that included five categories: strategy, managerial model, organization structure, human resources, and systems. It was applied among 236 commercial banks in Brazil and showed which factors were needed to measure service quality in local banking. These factors served to guide organizational management in how to present high quality services. The model was applied in the quality improvement efforts and had best service performance from engaging high-level management in the decision-making process.

Lean Six Sigma (LSS) Improve Competitiveness of U.S. Banking and Service Industries

U.S. banks also strive to increase their competitive edge over domestic and foreign financial institutions. There are a number of quality techniques that may be employed such as total quality management or Lean Six Sigma (LSS). This article, however, will focus on U.S. banking and service industry's usage of Lean Six Sigma methods to reduce waste, defects or "errors", and cost, thereby increasing their competitive advantage.

Lean Six Sigma (LSS) and TQM Improve Function of Local Government Financial Processes

Financial processes of local governments can even benefit from LSS and TQM practices to improve their function. Often LSS and TQM practices are implemented in the private sector in manufacturing or service industries but not so often in the public sector. Furtere, Sandy, and Elshennawy presented a case study (published in 2005), which demonstrates the effectiveness of such practices at the local government level.

Materials, Methods, and Results

SPC and Trading Machines

Table 1: In-sample Test results, below illustrates the results of a trading machine at the end of a 2 year period back test of historical data. The percent increase is based simply on the starting value and ending value after each 1-year period. Then both 1-year periods were averaged to produce the data in the table. On the surface, it appears that the trading machine is wildly successful and in-control. It would not be difficult to trust such a trading machine based solely on this information.

Table 1: In-sample Test results, taken from Trading Machines: Using SPC to Assess performance of Financial Trading Systems, QMJ Vol. 17 No. 2

Performance metric	Trading system	S&P 500 index	Nasdaq 100 index	Long/Short benchmark
Average annual return	51.57%	2.29%	1.61%	8.08%
Average annual volatility	23.63%	21.55%	32.45%	6.44%
Average sharpe ratio	2.180	.106	.049	1.254

A different story is revealed if control charts are used to plot the trading performance. Figure 1: Two year X-bar chart of percent returns, illustrates how control charts can be used to assess the performance of trading machines.

The figure shows that during the same period one of the points falls outside the control limits indicating an out of control trading process. The most important question here is; would one choose to trust a machine with this kind of performance to complete ones trades? Despite the impressive performance seen in Table 1, the trading machine's process is out-of-control based on the data in Figure 1. One could be taking a significant risk in trusting the trading machine's performance given its lack of statistical control. The goal of Quality is continuous improvement of the process; or in this case, the algorithm. An out-of-sample performance test resulted in the data is obtained in Table 1.

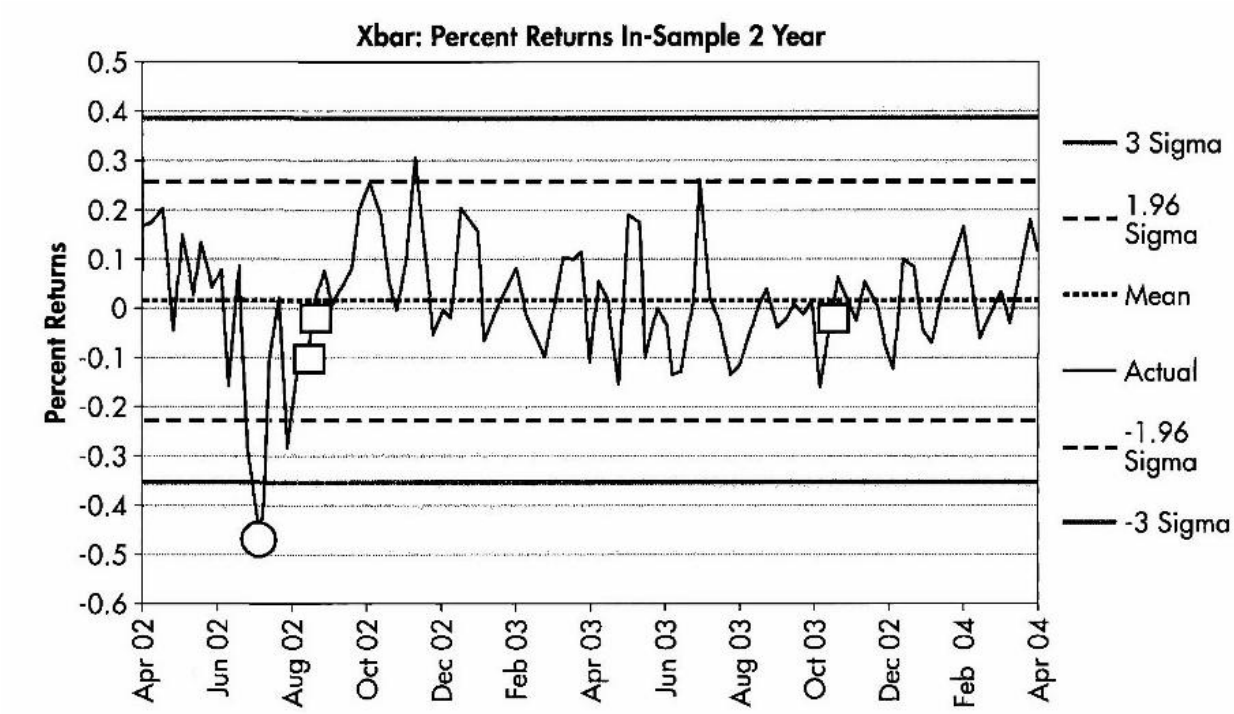

Figure 1: Two year X-bar chart of percent returns, taken from Trading Machines: Using SPC to Assess performance of Financial Trading Systems, QMJ Vol. 17 No. 2

Table 2 indicates the trading machine performance for the out of sample test was much less favorable than in the in-sample back test results seen in Table 1. SPC methods detected the trading machine's instability, which would not have been so obvious with traditional risk assessment techniques. Use of SPC charts detected a problem with the algorithms used in the trading machines to make successful trades. Therefore, the algorithm should be monitored using SPC in order to detect and eliminate special and/or common causes to continuously improve the performance of the algorithms of ACF trading machines. Therefore, traditional quantitative methods alone, are inadequate in assessing the performance of trading machines as was seen in the case study and data presented above. (Hassan, Kumiega, and Van Vliet 2010)

Table 2: Out of sample test results, taken from Trading Machines: Using SPC to Assess performance of Financial Trading Systems, QMJ Vol. 17 No. 2

Performance metric	Trading system	S&P 500 index	Nasdaq 100 index	Long/Short benchmark
Average annual return	5.79%	8.03%	8.14%	15.10%
Average annual volatility	16.86%	10.49%	15.09%	5.60%
Average sharpe ratio	.34	.766	.539	2.697

Quality Management in International Banks to improve Competitive Position

A survey conducted by E. Li, X. Zhao and T. Lee between 1997 and 2000, indicated that 61% of the banks in Hong Kong believed that quality initiatives had indeed been reasonably successful in improving their competitive position as international financial institutions. The top 3 critical success factors for quality improvement, according to the survey, were top management involvement, universal employee involvement, and good leadership. Some mention was made of a piece-meal approach, which did not always result in the best results that might have been obtained from a more holistic quality approach.

Lean Six Sigma (LSS) Improve Competitiveness of U.S. Banking and Service Industries

Six Sigma differs from earlier initiatives, such as Total Quality Management, in several key ways. First, Six Sigma factors in customer needs and requirements into the quality specification identifying "Critical to Quality" requirements. Second, Six Sigma focuses on improvements across a process, rather than on individual elements of it. Thirdly, Six Sigma emphasizes cost effective business results. In fact, financial benefits are estimated before Six Sigma projects are launched, and often re-evaluated during the project to ensure the cost of improvements justifies the benefits. The methods of Six Sigma are described in this excerpt below.

> "In general, Six Sigma has been used mainly in large organizations because of the depth of resources required for pursuit of "high-impact opportunities." For example, traditional deployment typically demands a well-trained staff, including dedicated experts (called Black Belts). It also requires other staff spending considerable time on key projects, which often last six months or more.
>
> While the methodology employs a variety of tools and techniques, most Six Sigma projects follow a basic procedure known by its acronym DMAIC (Define-Measure-Analyze-Improve-Control). DMAIC is a data-driven, problem-solving strategy, not unlike the scientific method, which can be applied to any process or system. In general, DMAIC is used in processes that already exist, but need to be improved in order to meet customer requirements for a product or service. Another strategy called DMADV—an acronym for its five phases; Define-Measure-Analyze-Design-Verify—is used when a process needs to be developed. DMADV, a Design for Six Sigma (DFSS) methodology, is implemented during the design for redesign phase of a process to minimize the likelihood of problems emerging in the first place. Both DMAIC and DMADV are used to reduce defects to Six Sigma levels of quality, and both call on a wide range of Six Sigma tools in each of their phases." (Carlivati 2007)

As of 2007, many of the top banks in the U.S. (such as Bank of America) used Six Sigma methodology and projects to yielded multiple returns on implementation costs and contribute millions of dollars to the bottom line. The original intent of LSS was to reduce the variability of a business process so the odds of a customer encountering product or service "defect" were below 3.4 per million opportunities. Empirical evidence cited by ASQ suggests, "improved quality through Lean Six Sigma efforts lends to reduced costs, better customer satisfaction, and improved bottom-line profitability." (Carlilvati 2007)

In 2005, National City Corp initiated a new quality management program known as "Best in Class." As part of this new program, the bank applied Lean Six Sigma to improve the experience of new customers. Corporate clients included in the study were those whose services such as business financing, cash management, global trade and treasury management. As its first step, the bank initiated the "Voice of the Customer" approach; this technique involved interviewing a significant number of corporate clients about their experiences. The interviews were conducted by a group of 10 people over a 60-day period. The process uncovered how many steps were required to become a new customer and provided insight into the preferences of clients to have a single point of contact when providing their information to the bank. The information gathered through these interviews enabled the bank to use Lean Six Sigma techniques to eliminate unnecessary steps in the process which did not add value to the customer or bank and which thereby reduced the potential for defective information. They also began assigning a single point of contact between the bank and the new customer. A follow up customer satisfaction survey was performed with dramatic and positive results. The bank made these change found from their Lean Six Sigma project permanent.

For LSS to work best, managers at all levels must commit to invest in the resources to initiate, promote, actualize and support the process. It is crucial that management provide employees with training, resources, knowledge, authority, and time to solve problems and complete the LSS project (Wang and Chen 2010).

Lean Six Sigma (LSS) and TQM Improve Function of Local Government Financial Processes

Furtere, Sandy, and Elshennawy presented a case study in 2005, suggesting utilization of Lean Six Sigma tools to improve the quality and timeliness of a local government's financial administrative processes. After applying LSS and TQM concepts to reduce waste and variation, and improve quality, the following improvements were made. Payroll processing time was reduced by 60%. Purchasing and accounts payable processing time was reduced by approximately 40%. Accounts receivable processing time was reduced by approximately 90% while reconciliation processing time was reduced by approximately 87%. Some of the techniques used to accomplish these very-significant improvements include; cause-and-effect diagrams, Pareto charts, and a moving range control charts.

Recommendations

The encouragement of the finance industries in the United States to apply Lean Six Sigma (LSS) and Total Quality Management (TQM) techniques is recommended. These will eventually improve the competitiveness of banking and service industries worldwide. Use of statistical process control (SPC) will help finance industries determine the effectiveness of these Algorithm Controlled Finance (ACF) trading machines by investigating the mean and variation (standard deviation, range, skewness) using Shewhart's control charts to chart the input/output signals. Finally, if there is any truth in the perception that government financial operations are inefficient and wasteful then said operations are an excellent place to implement LSS and TQM improvements.

Conclusion

Applying quality control techniques to improve trading, marketing, and finance is most important in services industries such as banking. Statistical process control can be used to evaluate the productivity of the ACF trading machines. Also, industries could use the variable charts to control the services and workers performance as X-bar and R charts. Finally, utilizing Lean Six Sigma in banking industries is as beneficial as SPC in trading machines. Banking and service industries need to improve efficiency of operations processes to cope with increasing international competition. These industries must apply quality management and improvement techniques to reduce waste and/or errors in order to improve cost effectiveness and productivity. LSS and TQM techniques are the keys to realizing these improvements and maintaining a banking or service industries' competitive edge.

The function of government financial sectors can even be significantly improved by use of LSS and TQM techniques. Given the general perception that government processes are inefficient and wasteful, much might be done in countering that perception if governments implemented Lean Six Sigma and Total Quality management techniques and then provided proof of their improvements in efficiency and waste reduction e.g. reducing spending without cutting services or perhaps even reducing taxes. Governments should explore this possibility.

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