Financial Impact of the usage of the Forecast and Analysis system of Economics and Finances of the Russian Regions

BY:
Dr. Igor Kadoshchuk, Alexander Nikolsky, Ludmila Bakhareva
From SERVER, Inc.
And
Tatiana A. Ilyina, Larisa G. Shchukina
From Central Bank of Russia

Abstract
The regional economic and financial analysis and forecast system -- AFFECT™ -- helps its users, such as regional Central Bank managers, local administrative and legislative bodies and others, take correct business-decisions. The AFFECT™ system can deeply AFFECT the manner in which Russian regional economic, financial and social spheres are administered and helps to:

- Optimize and manage the regional financial and social risks;
- Analyze and forecast trends underway in the regional banking system and commercial banks;
- Optimize the regional payment and monetary aggregates turnover;
- Optimize usage of state-owned resources to achieve maximum economic growth;
- Provide external recording, analysis and forecasting of non-monetary and shadow turnovers;
- Reach a new level in financial accounting;
- etc.

The AFFECT™ system helps analyze the current state of different branches of economy (reactive) and generate short- and mid-term forecasts for the situation in the regional economy (proactive), making it possible to the analysts to answer the “Why?”, “What if?” and “How to?” questions. The system supports non-standard data studies and queries.

By using the AFFECT™ system one can decrease the costs associated with analysis, forecasting and report generation in the regional administration and Central Bank offices, significantly increase the amount of parameters being analyzed and reveal hidden and complicated inter-relations between these parameters. The AFFECT™ system offers a unique way of solving tasks of such complexity on the regional level of state administration.

Preface
Dear Mr. Chairman, dear ladies and gentlemen!
It is a pleasure to me to use this opportunity to inform you of the financial results of the implementation of a unique decision support system in the offices of Russian regional authorities. The system is based upon original economy analysis and forecast technology capable of tracking
inter-relations between the economy and the credit and finance sphere of a region, and is implemented using SAS Software.

It is a pleasure to me to announce the following results brought by the AFFECT™ system in the year of 1997:

- The net discounted profit of regional budget amounted near four hundred fifty millions USD.
- The payback period of the AFFECT™ system is 18 months.
- The profitability ratio is about 380 %.
- And, finally, the ROI is about 2 240 %.

In my brief report I will cover the following issues:

- The criteria used to estimate the financial effect: economic and commercial effect, financial analysis and ROI;
- The activities of Russian local authorities and how they AFFECT the economy, production, banking and finance spheres in the region, etc;
- Brief description of the system: its functionality and new functions, results and their reliability, users, creation history, structure and development team;
- Financial results by each criterion and their reasons;
- And the probably most interesting part for a certain part of the audience – the role of SAS Software in the system: big bucks, power, unique mathematical technologies and SAS Institute software (!). We will talk about the specifics and trends of modern Russian politics and economy, and about the role of Russian local authorities focusing on the Ural region. After that we will discuss the technological side of the system – methods used to design and implement the system and to model economic trends and how the software of SAS Institute was used for it.
- And finally we will discuss the future of the system and the results of analysis it generated both for the federal and for the regional level of Russian economy.

Financial Impact Criteria

I am going to tell you about the financial results of the usage of the Forecast and Analysis system of Economics and Finance by Russian regional authorities. Below are the evaluation criteria we have chosen:

- The net discounted profit is the positive difference between overall financial income and expenditures;
- The payback period is the minimal time period from the beginning of the project, after which the financial result becomes positive. Though it is usually given in years, we give it in months;
- The profitability ratio is the correlation between the overall discounted financial effect and the investment;
- The Return on Investment (ROI) is the product of the Return on Revenues by Capital Turnover, that is:

\[
\frac{\text{Revenues} - \text{Expenses}}{\text{Revenues}} \times \frac{\text{Revenues}}{\text{Investment}} = \text{Return On Investment}
\]

The above list of criteria is rather traditional for the financial evaluation of a project.
What business we are talking about?

Central banks need to have sound systems for acquiring, sharing, and analysing economic and financial data so that they can respond quickly to unforeseen developments and steer monetary policy to achieve its objectives. The overall message of the paper is that, central banks can make some use of econometric techniques and of models to improve their understanding of how their economy works and to make forecasts very effectively, when sufficient data are available. These techniques should be used to support good economic analysis, but not as a substitute for it. Computer system that SERVER builds based on imitational mathematical model of the regional economy and statistics techniques can be used to improve the process significantly.

One of the primary task of the Central bank of Russian Federation officials is to operate monetary policy to secure price stability. To help them formulate policy, they have several departments whose job it is to analyse developments in the real and financial sectors of the economy. Data are collected from various sources. In some cases, the central bank will be using statistics put together by other agencies, such as a government statistical office; in other cases, the central bank will itself be the primary source of statistics assembled from information provided by, for example, commercial banks.

Russian central bank economists analyse the information from these various sources to try to understand what is currently happening in the economy, and why. Because changes in monetary policy take some time to influence the economy in general and inflation in particular, policy-makers will also expect their economists to offer a view on the future course of the economy - that is, a forecast.

Russian government officials and policy-makers may also wish to know the likely effects of policy changes which are under consideration, in which case they may ask for a number of projections based on different assumptions to be prepared. It would be easy to despair at this point!
Economists in Russian central bank have no crystal ball enabling them to see the future clearly, and any forecast made is almost bound to prove wrong in some degree. But what they can and want do is assemble relevant information, and analyse it in a clear logical framework which takes due account of theory and of past experience. To do this, they may devise various types of models; and they may use econometric and computer techniques to help determine the structure and parameters of such models which best explains their own economy.

Russia is the very big country, and Russian central bank is divided on the number of regional headquarters. They have the same tasks on the regional level as the central headquarters on the federal level, but associated with the region.
Regional Central Bank managers, local administrative and legislative bodies and others, have to take correct business-decisions on the regional level of Russian economic, financial and social spheres. They have to resolve several specific and very complex tasks systematically, such as:

- Optimize and manage the regional financial and social risks.
- Analyze and forecast trends underway in the regional banking system and commercial banks.
- Optimize the regional payment and monetary aggregates turnover.
- Optimize usage of state-owned resources to achieve maximum economic growth.
- Provide external recording, analysis and forecasting of non-monetary and shadow turnovers.
- etc.

If we talk about regional state and financial authorities, they can be described by the following numbers:
The annual production volume in the Sverdlovsk region was 11.7 billions USD. The monthly amount of circulating money was ca. 980 millions USD. The annual official income of the population was 7.7 billions USD, and the unofficial income made up 50-55%. The regional budget (regional taxes) amounted 2 billions USD.

We can see that the regional state authorities have to deal with big bucks, and the regional (Central Bank) financial authorities have to handle serious turnover. The losses caused by their incorrect decisions can be in billions USD.

**What is the System that we have built?**

The AFFECT™ system is designed to handle the important tasks above. The main project goals were the following:

- To develop methods to analyze and forecast trends in the regional economy and inter-relations between the regional economy and the regional financial sphere;
- To develop methods to evaluate short-term and mid-term consequences of financial and economic decisions;
- To develop a model-based software system capable of analyzing and forecasting trends in the regional economy, which is compatible with the existing IT-system of the Russian Central Bank.

The system is intended to assist specialists in following up and forecasting economic trends in different sectors of economy, taking into consideration macro-economic parameters and the situation on external markets.

Now I am happy to say that the main goals have been already achieved — the system is functional and we can even speak of certain economic results.

The system has been built by a team of excellent specialists from Server Inc. in the Central Bank main office in one of Russia’s largest industrial regions — the Sverdlovsk region. The managers of this project from the side of the Central Bank are present here. They are Ms. Tatyana Ilyina and Ms. Larissa Schoukina. The head of the development team of the macro-economic model of regional economy is Member of the Academy of Sciences Mr. Alexander Petrov. Egor Lipchinski was the software development leader of the project. He is senior SAS analyst and programmer in SERVER Inc. I have the honor to be the manager of this project.

Initial development took a year for 14 people to build the system: seven experts for mathematical modeling of economy, five SAS-programmers and two managers. The users of the system are economy analysts from the Central Bank of Russia, headed by deputy director of the regional main office.

The system analyse the macro-economic characteristics covering the main processes underway in a macro-economy, such as:

- Production data split by branch and by form of ownership of respective businesses; employment situation by branch;
- Prices and their development;
- Nominal income and spending of private persons;
- Real income of citizens;
- Import and export of goods in the region;
• Income and spending for the regional budget;
• Financial situation in industry;
• Overall situation in the banking business;
• Bank loans;
• Money circulation in the region and between neighbour regions.

The quality of analysis is determined not by just stating the appropriate figures, but by discovering their interrelations and the influence the governmental and regional authorities have on them by changing:
• Taxation policy;
• Expenditures of federal and regional authorities;
• Activity on the free market;
• Regulations regarding obligatory bank reserves;
• etc.

Analytical problems have been solved using the system:
• evaluation of after-effects of macro-economic policy on regional and federal levels;
• exploration of economically dangerous variant of macro-economic policy;
• exploration of correlation between macro-economic indexes, which characterise condition of real economic sectors, monetary system and social sphere in different variants of macro-economic policy;
• exploration of influence of outer conditions into state and trends of development of region economy;
• etc.

Sorry, but special report about functionality of our SAS Software system AFFECT™ was rejected by the SEUGI committee due to the limited space available in the conference centre, so as the special report about modelling of regional economy and finances with the help of the SAS Software, so as our achievements in full text processing, abstracting, classification and so on.

Detailed report about using SAS Software in developing of AFFECT™ system is in the demonstration report of Max Emelenko and Egor Liptchinski in this conference: “Using SAS Software in Developing of the Regional Economy And Finance Analysis And Forecasting System”.

Sources of Financial Effect

The main sources of financial and economic effect from using the system are:
(1) Automatization of reporting and analytical document turnover, acceleration of statistical and model-based calculations, decreasing of costs of analytical research work needed for decision support;
Decreasing of **losses caused by non-optimal decisions** due to higher-quality analytical results. Below a list of some of the factors which can be analyzed and forecasted to provide better support for the local authorities’ decisions:

- VAT collection;
- Unofficial (=illegal) income analysis
- The share of outstanding payments in the product price
- Use of the securities market to finance the regional budget
- Sales tax introduction problem
- Price growth ratio comparison for metal industry products and for energy carriers
- Analysis of de-industrialization of economy (replacement of energy-consuming technologies by labor-consuming)
- Analysis of transaction costs of trading and brokerage institutions

Estimates were made on possible losses caused by non-optimal decisions by local authorities on each of the above issues. Losses to each of the above issues were calculated as the product of their possibility by the volume of financial resources involved. The overall losses were calculated as the sum of losses related with each issue.

**Financial Impact Results**

We have calculated the financial effect the use of the AFFECT™ system brought in 1997 and received the following results:

- The net discounted profit of regional budget amounted near four hundred fifty millions USD.
- The payback period of the AFFECT™ system is 18 months.
- The profitability ratio is about 380%.
- And, finally, the ROI is about 2 240%.
- Discount rate: 20%.
- Inflation rate is near 12%.
- Initial Project development cost was about three hundred thousand USD.
- Initial software and hardware expensed was about two hundred thousand USD.
- Internal software and hardware support costs is near one hundred fifty thousand USD per year.
- Consulting support cost is near three hundred thousand USD per year.

**The role of SAS Software in the project**

It is typical for Russian economy that economic trends change very rapidly. For us as for the developers of the system it was not too important what trends we could model and study, but how fast we could do it.

Theoretically, we could have used any development software instead of that by SAS to implement our project. In this case the cost of development software would be 30-40% less, but development itself would have been much more complicated and would have taken 3-6 times the time. We could
not afford economic changes to always be 4-7 months ahead of our development efforts, and
decided to use SAS Software.

Besides, we had to create methods and technology to enable parallel development of the application
itself and of the financial model. This was the only way we could keep pace with Russian economy.
We have tested over 200 models of economy, hundreds of input and internal and over five hundred
output parameters each. Ca. 100 parameters have constantly been compared with the actual
development of economic indications and parameters were kept within 5-10% tolerance. This
would never be possible without SAS Software!

Out of our own experience we can say that using SAS Software, the quickest RAD ever, is the only
effective way to build systems like ours.

Future of the system

If we talk about the prospects of our system, we should first think about the creation of a similar
AFFECT™ system on the federal level. This would be a project with the following main goals:
• To create methods to analyze and forecast different trends in the economy and finance of the
whole country (Russia) and their inter-relations;
• To develop methods for evaluation of short- and mid-term consequences of economic and
financial decisions taken by the government;
• To develop an application to analyze and forecast the country’s economic development.
The above task is to a certain extend easier than that we’ve already solved, because a country’s
economy is significantly more isolated than that of a region. Macroeconomic parameters are better
defined and easier to handle. Financially such a project would make great sense, because with just a
little more effort we will be able to achieve an immense financial effect.
The reliability of analysis results will also increase, because we will be able to use a two-level
(regional and federal) analysis system. SAS Software is especially good to provide inter-operability
of the two levels. But politically such a project would be not an easy one because of all kinds of
complications like government changes, changes in the economic policy etc. etc.

Conclusion

Dear ladies and gentlemen!

In my brief report I informed you of the financial results of the implementation of a unique decision
support system in the offices of Russian regional authorities. The system is based upon original
economy analysis and forecast technology capable of tracking inter-relations between the economy
and the credit and finance sphere of a region, and is implemented using SAS Software.

About main results: the following financial impact criteria values were obtained during the using of
AFFECT™ system in 1997:
• The net discounted profit of regional budget amounted near four hundred fifty millions USD.
• The payback period of the AFFECT™ system is 18 months.
• The profitability ratio is about 380 %.
• And, finally, the ROI is about 2 240 %.

In my brief report I have told you about:
• The activities of Russian local authorities and how they AFFECT the economy, production,
banking and finance spheres in the region, etc.;
• We have talked about the specifics of modern Russian politics and economy, and about the role of Russian local authorities focusing on the Ural region;

• AFFECT™ system: what it does, its main tasks, functionality and functions, obtained results, users and decision makers, who are they;

• We have discussed the technological side of the AFFECT™ system – methods used to design and implement the system and how SAS Software was used for it;

• AFFECT™ system creation history and system development team;

• We have talked about the sources of financial effect, and financial results by each criterion: net discounted profit, payback period, profitability ratio and ROI;

• We have discussed the role of SAS Software in the system designing, developing, usage and future reengineering;

• And finally we have discussed the future of the AFFECT™ system and the results of analysis it generated both for the federal and for the regional level of Russian economy.

About the Authors
Dr. Igor Kadoshchuk is a recognized Moscow expert in software projects management and development. He is the Project Director of SERVER, Inc. and Associate Professor of the Dept. of Management and Applied Mathematics in Moscow Institute of Physics and Technology.
Mr. Alexander Nikolsky is the General Director of SERVER, Inc. during last seven years.
Mrs. Ludmila Bakhareva is the Commercial Director of SERVER, Inc.
SERVER, Inc. is the first and the only SAS Institute Quality Partner in Russia.
Mrs. Tatiana A. Ilyina is the Deputy Director of the Ekaterinburg main office of the Central Bank of Russia.
Mrs. Larisa G. Shchukina is the Director of Future Technology Department of the Ekaterinburg main office of the Central Bank of Russia.

1 Capital turnover shows the number of revenue dollars generated annually by each dollar of investment.

Autor/Co-authors contact details:
Dr. Igor Kadoshchuk, Alexander Nikolsky, Ludmila Bakhareva, SERVER, Inc.,
Tel. +7 095 7373496, +7 095 7641172. Fax: +7 095 7373497. E-mail: icad@server.ru;
URL: http://www.server.ru.

Tatiana A. Ilyina, Larisa G. Shchukina, Central Bank of Russia, 
Tel. +7 3432 228198. Fax: +7 095 3432 206505. E-mail: usn@centrobank.e-burg.ru;
URL: http://www.cbr.ru.