

Paper 224-31

SAS® Application Introduced into China Customs

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ABSTRACT

In 2004, China became the third-largest trade nation in the world, with its foreign trade volume exceeding 1.1 trillion USD. Also the amount of data doubled in the past 4 years. Although the increase of human resources cannot keep step with workload, China Customs handles problems such as business cozenage (fraudulent schemes), management inability, and hidden risks with confidence and ease. Because, since 1999, China Customs developed a series of applications based on SAS®. With the help of these applications data quality is improved, duty losses are retrieved, hidden risks are detected, and impending conflicts evaded. Extensive use of SAS® and SAS® applications makes China Customs one of the largest SAS® Users in China and Asia.

INTRODUCTION

In China, Customs is responsible for the collecting, processing, compiling and disseminating the country's external merchandise trade statistics - known as Customs Statistics.

China's foreign trade increased very fast in the last two decades. Total volume in 1981 was 44 billion US dollar. The figure rose to 1.1 trillion US dollar in 2004.

Large amount of data gave rise to higher requirement in data processing and analyzing. From late 1990s, how to facilitate external trade while maintaining effective supervision became the main task of China Customs under the new circumstances.

Also, Customs Statistics faced the goal of full participation in risk management and function transformation from report making to decision supporting. In this historical period, SAS® was introduced into China Customs. SAS® witnessed the development of Customs Statistics to realize new functions.

From 1999, China Customs developed a series of applications based on SAS®. This paper is going to introduce three of them that play a positive role in enhancing supervision, monitoring customs administrative affairs and in supporting decision-making.

These systems are quite representative. Data Quality Control (DQC) represents basic data processing. Enforcement Assessing System (EAS) is an initial system for Customs self-evaluation. Trade Monitoring and Forecasting System (TMFS) is a great tool for decision supporting.

SYSTEM INTRODUCTION

DATA QUALITY CONTROL (DQC)

Data quality is important for reliable information and data analysis. China Customs statistics reflect status of external trade of China and world economy. Statistics are important in making policies for macro economic and strategies in international affairs, such as bilateral trade negotiation. Henceforth, data quality is the live line of Customs statistics.

The goal of DQC system is to assure that every field in every record in our origin database is reliable. This is achieved by quality control in three levels:

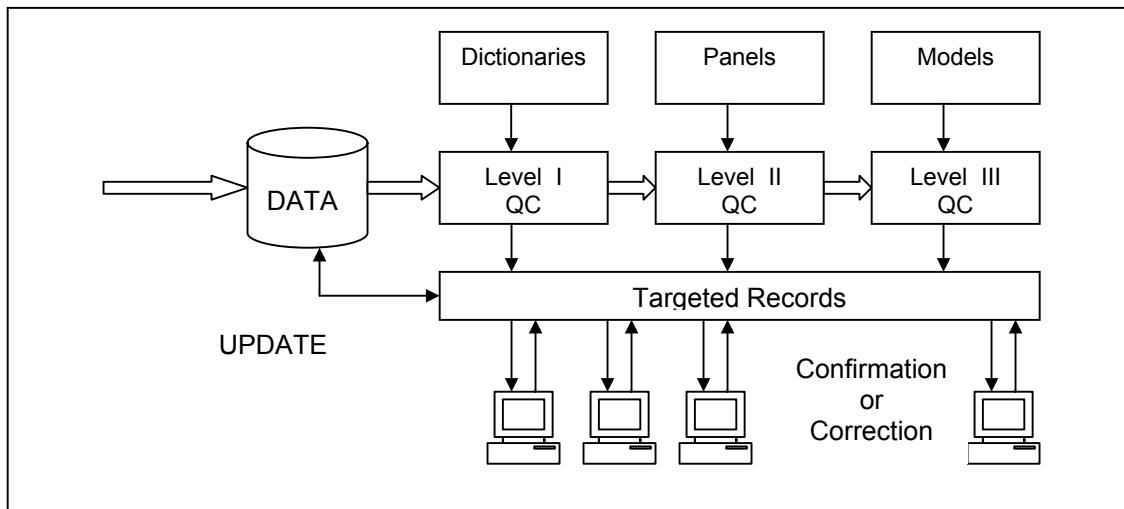
Level I: also called as field level control, is to do syntax check field by field. By looking up field dictionary, errors in typing, importing or data transmitting can be found.

Level II: also called as record level control, is to check legal (or illegal) combination of two or more fields by collating preset panels. These panels are accumulated through working experience.

Level III: also called as model level control, is to train statistical models for key variables, for example, price. Records that do not conform to the models will be targeted for further examination.

Hundreds of records are targeted for examination every month. Most of them are corrected.

Figure: Architecture of DQC system



ENFORCEMENT ASSESSING SYSTEM (EAS)

China entered the list of top 10 trade nations in 1998. Come with proud and delight is hard job. The enforcement environment was bad, for the bad compliance status of so many enterprises. Innovation of management was quite urgent for China Customs. In a scheme to build Modern Customs, the idea of risk management was proposed.

A breakthrough idea in statistics is that Customs data recorded not only result of external trade, but also procedures and performances of Customs management. Status of management could be analyzed and compared among Customs Districts by statistical methods.

Data in EAS are organized to three layers: ODS layer is based on declaration database, and 14 operational databases that record actions of enterprises and customs. Data warehouses (data mart) layer is established for each interested subjects, such as duty collection, execution of restrictive trade measures, supervision of processing trade, etc. Then, express layer have a set of indicators that was designed to reflect compliance of enterprises, effectiveness and efficiency of Customs Districts, and so on. Up to now, there are about 300 indicators fall into 5 catalogues.

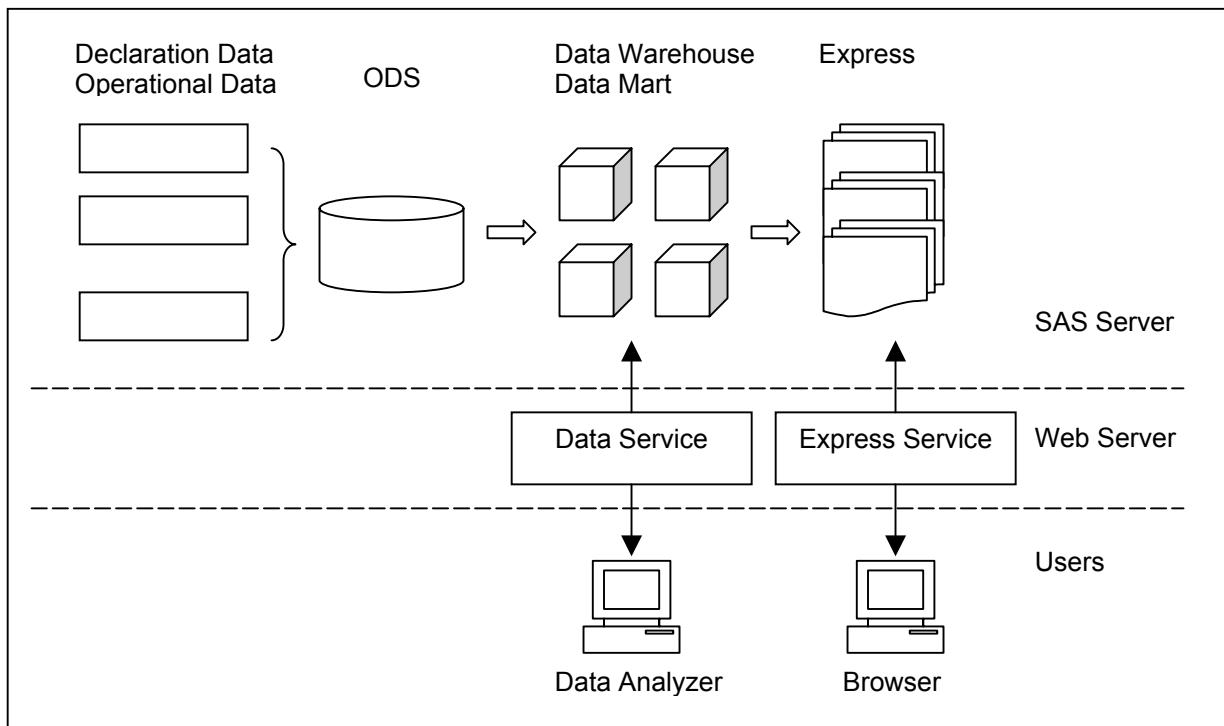
Two types of users can get two different services. Common browsers can only get access to data in express layer through express service. Experienced data analyzer can get user defined data via data service. User defined data can be prepared and downloaded for extensive analysis at local processor.

As a supplement function to EAS, a scoring system was devised to simplify the results to Light Values. Green, yellow and red stand for good, fair and bad respectively. Red light can also lead you to drill down to detail records in data warehouse.

EAS can dynamically monitor various aspect of customs operations, henceforth, instead of empirical judgment, quantitative evaluation could be obtained with less artificial factors. Also, isolated individual case studies explore regularity and tendency.

Compare with investment, value of EAS was tremendous. In 2003, thanks for risk clues given by EAS, duty loss up to 18 million US dollars was retrieved. The number mounted up to 24 million in 2004.

Figure: Architecture of EAS system

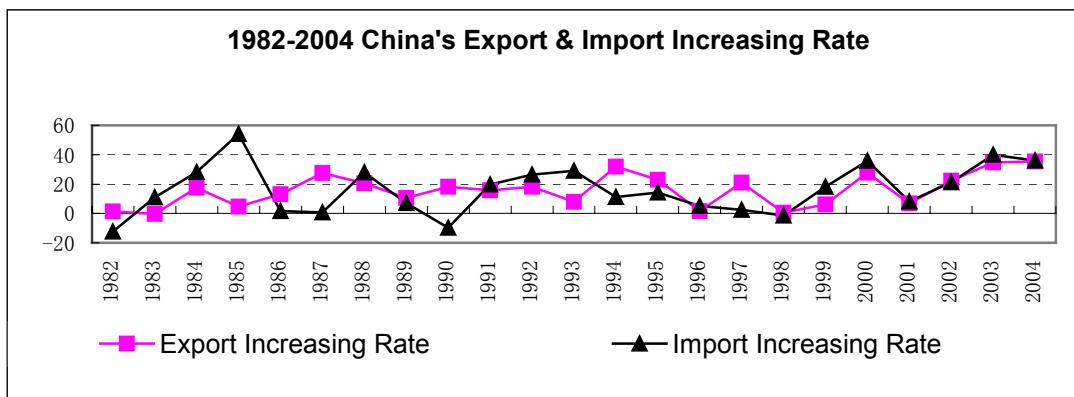


TRADE MONITORING AND FORECASTING SYSTEM (TMFS)

China entered WTO in December 2001. It is a new chance, or rather, a new challenge to China's economy and external trade.

Although China's foreign trade increased very fast, fluctuation of increasing rate is obvious. At that time, cases of dumping and anti-dumping increased very fast. How to safeguard china's economy and resolve conflict of interest by information service became more urgent to Customs Statistics.

Figure: 1982-2004 China's Export & Import Increasing Rate

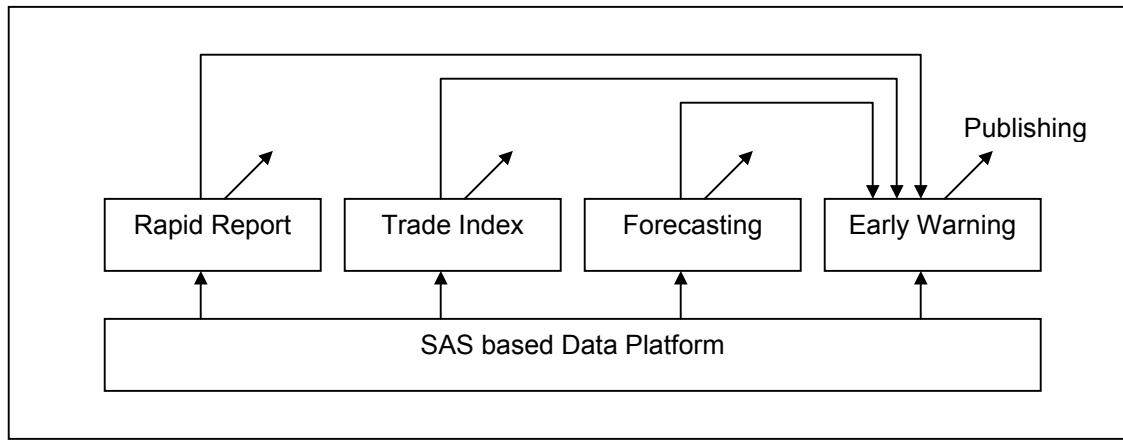


In January 2002, China Customs started to develop Trade Monitoring and Forecasting System (TMFS). The aim of establishing TMFS system is:

- Real-time monitoring
- Rapid reporting
- Scientific forecasting
- Dynamic warning

TMFS system consists of four sub-systems. They are rapid report system, trade index system, forecasting system and early warning system.

Figure: Architecture of TMFS system



The four sub-systems are somewhat independent. They all have information publishing function, while the early warning system shares output of all the other three sub-systems.

One thing must be mentioned is that SAS® is of great help in implementing various econometric models in early warning subsystem. They are:

- Coefficient of fluctuation
- Diffusion index
- Multivariate regression
- Simultaneous equations (for import)
- Vector autoregressive model
- Price elasticity
- Time series
- Panel data (for export)

For simplicity, early warning information is going to be five light values.

Red: stands for over abundance in import or export, need warning.

Yellow: stands for a bit more import or export

Green: stands for appropriate import or export

Light blue: stand for a bit less import or export

Blue : stands for over insufficiency in import or export, need warning

Take steel export in June 2005 for example, the table below shows how the early warning light be calculated by weighted summary of light values from different models.

	Weight	Light Value	Sub-model I	Sub-model II	Sub-model III	Sub-model IV	Sub-model V
Final Light		💡					
Coefficient of Fluctuation	0.15	💡	💡	💡			
Diffusion Index	0.05	💡💡		💡💡			
Multivariate Regression	0.2	💡		💡			💡

Panel data	0.15						
Vector Autoregressive Model	0.15						
Price Elasticity	0.1						
Time Series	0.2						

Now, rapid report system gives daily report of import and export for at least 300 kind of key merchandise, including daily progress of execution of China's textile export quota with EU and United States. This information is also published on the Internet.

TECHNICAL INTRODUCTION

SYSTEM ARCHITECTURE

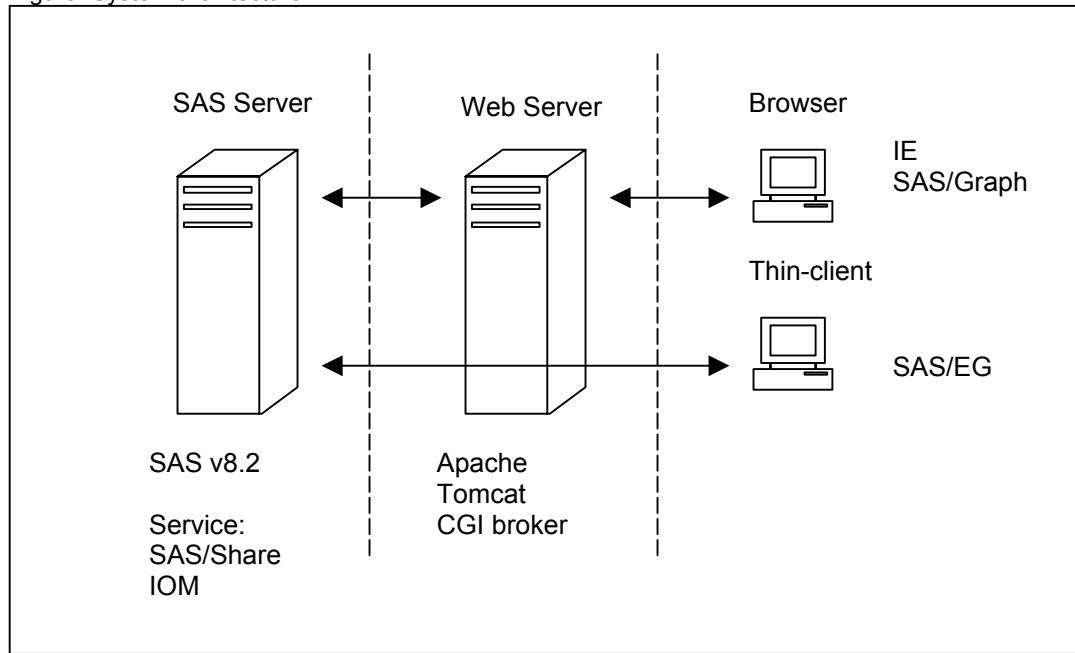
All the systems mentioned above are SAS® based applications. They have similar architecture. Take DQC system for instance:

DQC took a three-layer architecture. They are: Browser, Web server and SAS Server.

Web server provides user interface.

Two types of services on SAS Server are: SAS/Share server, which offers data access for display by JDBC, and SAS/IOM server, which offers data calculating service.

Figure: System architecture



HARDWARE AND SOFTWARE

These applications run on three PC servers with the following configurations:

4 Xeon CPU (3.0GHz), 8G memory, 2T hard disk array.

Software includes:

Windows 2000 Server, SAS® 8.2, JDK 1.4, Apache, Tomcat 4.1

SAS® PRODUCTS

China Customs have SAS® license of 14 products: Base SAS®, SAS/GRAPH®, SAS/EIS®, SAS/INSIGHT®, SAS/AF®, SAS/FSP®, SAS/ETS®, SAS/STAT®, SAS/ACCESS®, SAS/CONNECT®, SAS/SHARE®,

SAS/INTRNET®, SAS/IT® and SAS/EG®.

Econometric models implemented in TMFS let SAS® exhibit its great power in statistical analysis. The table shows key procedures used in each model:

Model	SAS® procedure
Diffusion index	PROC CORR
Multivariate regression	PROC REG
Simultaneous equations	PROC SYSLIN
Vector autoregressive model	PROC VARMAX
Panel data	PROC TSCREG

CONCLUSION

The three systems above are the most representational for they cover three important fields in Customs Statistics. China Customs benefit a lot after the implementation of these SAS® based applications. The ability in data processing and decision supporting has greatly improved.

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