

BMS - Bond Market Simulation

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Abstract – BMS is a computer program for bond market simulation. With this computer program students can simulate the buying and selling of bonds in three different markets or scenarios, the bond market in the USA, Germany and Slovenia. By analyzing the results they can decide if passive, semi-active or active investment strategies are more appropriate for bond investments in mature or emerging financial markets. This computer software was carefully programmed in the mid nineties using CLIPPER v. 5.00 and several other utility programs so it is running on PCs with Operation Systems from MS DOS to Windows Vista.

could buy and sell government bonds, municipal bonds and corporate bonds according to their investment strategy, a more passive or active one. The coupon payments were once a year, i.e. after the second quarter and sixth quarter of the whole investment period, taking into account accrued interests. The nominal interest rates were based on real data for the bonds included in the game. Interest payment on non-invested money as well as transaction costs were also taken into account.

I. INTRODUCTION

A decade ago there was a significant development of financial markets in transitional countries, especially in Central and Eastern Europe, like Croatia and Slovenia, where securities trading and investments became more important. Therefore the need for development of educational software for investments at the Universities in these countries became evident.

Since in several countries bond markets developed faster than stock markets, it seemed appropriate to develop a bond market simulation program, i.e. a computer program where students could test different investment strategies in the so called fixed income securities markets. Two of the authors (Prohaska and Orlić) defined the structure of the bond market simulation program, Prohaska provided the data and Orlić programmed it in Clipper v. 5.00 in the mid nineties. [6] [7] [8] The program was called BMS - Bond Market Simulation and it contained three scenarios, the bond market in the USA, Germany and Slovenia.

For every round necessary financial data was provided, e.g. yield to maturity and price of the bond as well as a time series graph, the shape of the yield curve, macroeconomic and monetary data and relevant financial market news. At the end of each round the students could buy and sell bonds and they got a report of their portfolio structure, i.e. how many bonds they have bought, how much money they have invested, what were the transaction costs and what was the market value of their investment, both in absolute and relative terms (percentages). [1] [4] [5] After two years or eight rounds the simulation stopped presenting the results for all groups of students. In the portfolio results report the students could see what was their rank position, how much money they have earned or lost in absolute terms and as a percentage, how much provisions they have paid and what was the number and value of transactions. According to this it became clear which investment scenario, a more passive one (buy and hold) or a more active one, was appropriate for the mature bond markets in the USA and Germany and which scenario has given better results for an emerging bond market like Slovenia. [3] (Fig.1)

II. BOND MARKET SIMULATION

The purpose of the BMS is to simulate real life investments in fixed income securities without losing any money. Based on monthly data for a time period of two years, but squeezed into eight rounds, the students (groups)

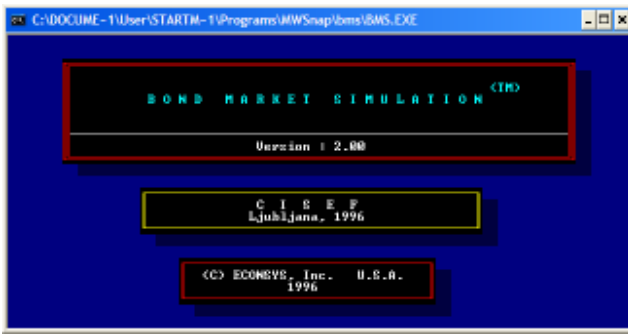


Fig. 1 Introduction screen screenshot

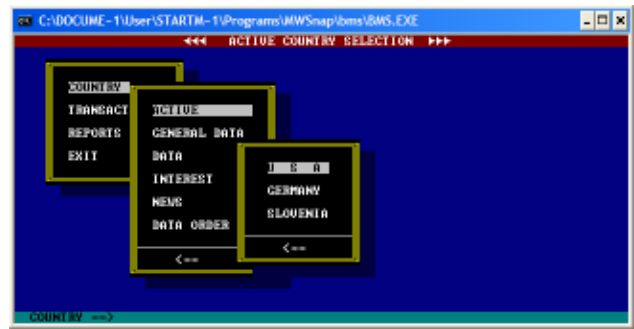


Fig. 3 Active country selection menu screenshot

This educational bond market simulation program was quite successful and was run on Universities with undergraduate and graduate students in Slovenia and Croatia as well as in courses where professional brokers, traders and investment analysts participated. In terms of international copyright protection it was later necessary to establish a joint stock company in the USA called Econsys, Inc.

III. THE PROGRAM AND ITS STRUCTURE

The program (main menu) is divided into four parts, the Country menu, the Transactions menu, the Reports menu and Exit to DOS or to other OS menu. (Fig. 2) [2]

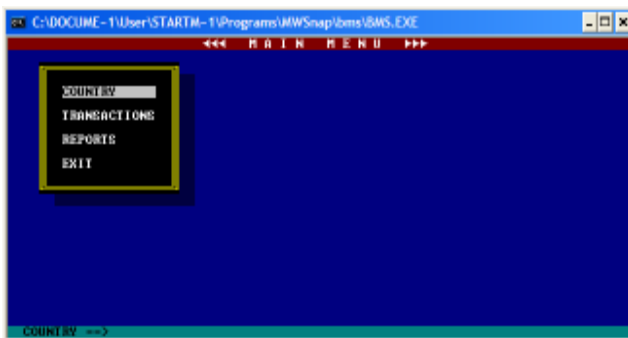


Fig. 2 Main menu screenshot

The first or the Country menu enables the selection of six submenus. The first Active selects the country or bond market scenario (USA, Germany or Slovenia) (Fig. 3), the second General data defines the currency, the amount to be invested, the number of groups and the nominal value of the bonds. (Fig. 4)

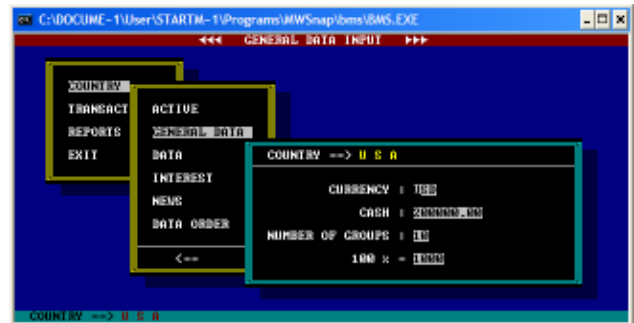


Fig. 4 General data input menu screenshot

In the Data submenu general data mentioned above can be input or modified/deleted. In the Interest submenu the interest rates for government bonds, municipal bonds and corporate bonds are to be typed in, as well as the so called interest on cash, i.e. the interest rate for the amount of money not been invested yet. (Fig. 5)

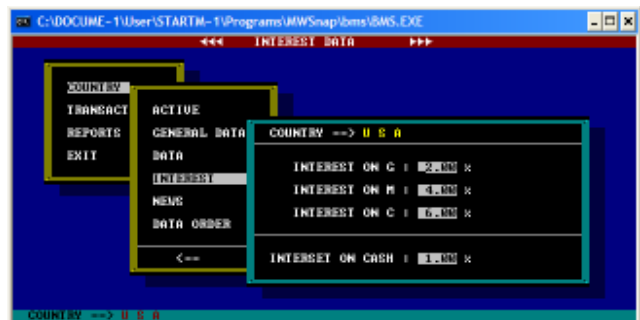


Fig. 5 Interest data menu screenshot

The News submenu presents all actual bond market news necessary to take investment decisions and the Data order submenu gives the organizer of the bond market simulation the possibility to change the predefined data order of the bond prices and their yield to maturities.

The second menu, the Transactions menu consists of two submenus, the Transactions submenu and the Portfolio submenu. In the Transactions submenu the round of the

Bond Market Simulation can be selected, i.e. from the first to the last or eighth round. (Fig. 6)



Fig. 6 Round selection menu screenshot

After that the Transactions input screen appears on the monitor which enables the organizer to type in the amount of bonds to be bought or sold by each group participating in this bond market simulation. The screen mask is looking the same as the order to buy or to sell bonds handed out to the participants of the game earlier, so possible errors are minimized, but even if an input error happens it can be modified or corrected immediately. (Fig. 7)

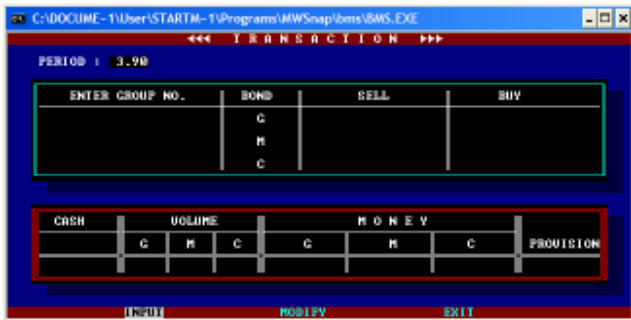


Fig. 7 Transaction screen screenshot

The third menu or the Reports menu is separated into four submenus, The Display, the Print Graph, the Portfolio and the Results submenu. (Fig. 8)

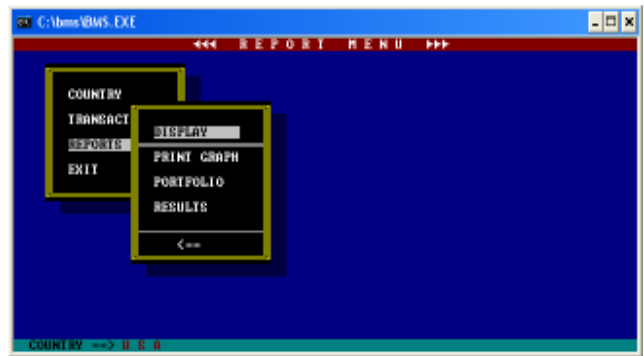


Fig. 8 Report menu screenshot

These submenus fulfill two different tasks. The first one or the Display submenu consists of four screens which give basic information to the investors about the bonds they have invested in. The first screen presents data about bond prices and yield to maturities for government bonds, municipal bonds and corporate bonds on a monthly basis together with a simple time series graph of the stipulated yield to maturities. (Fig 9)

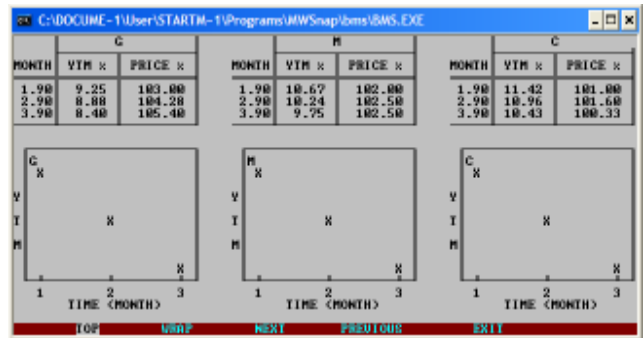


Fig. 9 Display submenu and time series graph screenshot

The second one provides the same data but presents the shape of the yield curve which gives the participants of the simulation information about the possible trend of interest rates in the future. The shape of the yield curve can be ascending, descending, flat or humped. (Fig. 10)

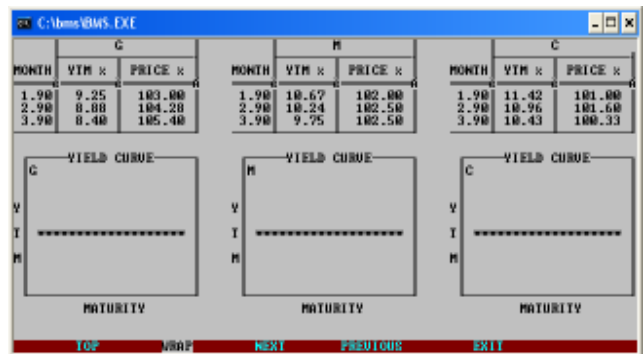


Fig. 10 Display submenu and yield curve graph screenshot

The next screen gives basic macroeconomic and monetary data, the exchange rate, money supply (M1), discount rate, deposit rate, lending rate, consumer prices, industrial production, employment and current account balance. All the data is presented on a monthly basis. (Fig. 11)

D A T A	1. MONTH	2. MONTH	3. MONTH
EXCHANGE RATE (per ECU)	0.84	0.84	0.88
M1	612.20	621.70	640.00
DISCOUNT RATE	7.50	7.50	7.50
DEPOSIT RATE	7.88	7.81	7.80
LENDING RATE	9.50	9.50	9.50
CONSUMER PRICES	131.90	132.30	132.70
INDUSTRIAL PRODUCTION	114.50	115.50	116.40
EMPLOYMENT	100.90	109.10	109.40
CUR. ACCOUNT BALANCE (Q)	-31.51	-31.51	-31.51

Fig. 11 Macroeconomic and monetary data submenu screenshot

The last or the fourth screen called News points out all necessary information about the financial market in the selected scenario, so the participants are informed what is going on the bond market they are investing. This data is collected from main financial newspapers or databases. (Fig. 12)

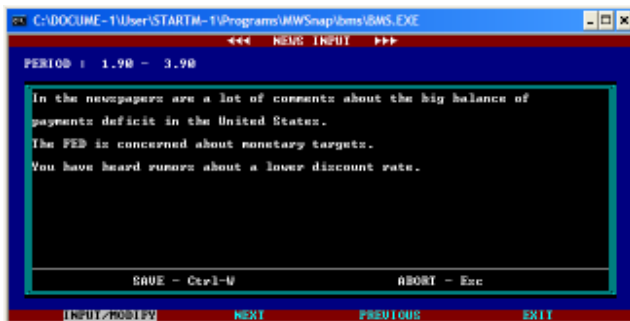


Fig. 12 News input submenu screenshot

The second submenu or Print Graph prints reports on prices and yield to maturities of bonds, the third submenu Portfolio is more important since it presents after each round the amount and the structure of the bond portfolio for a selected group of investors or bond market participants. (Fig. 13)

Fig. 13 Portfolio submenu screenshot

The fourth submenu Results illustrates the results of the bond market simulation at the end of the game. It shows the rank position of each group, the final value of the portfolio in absolute terms and as a percentage, the provision paid to brokers, and at the end the number and value of all transactions. (Fig 14)

RANK	GROUP NO.	% CAPITAL USD	PERFOR-MANCE %	PROVISION USD	NO. OF TRANS.	VALUE OF TRANSACTIONS
1.	4	202,359.66	1.18	1,789.49	2	170,949.00

Fig. 14 Simulation results submenu screenshot

According to these portfolio results the participants of the bond market simulation can conclude which investment strategy was the most successful (passive, semi-active or active strategy) and why it was the case, e.g. because of buying the bonds with the highest nominal interest rate and reinvestment of the coupons or by buying and selling bonds more often and earning the capital gain.

The last menu item is called Exit and is divided into two submenus Yes and No and represents the possibility to end the program by exit to DOS or other Operating System or returning to the program.

IV. DISTRIBUTION AND INSTALLATION

BMS is an educational computer program so its delivery and installation are easy. The program consists of one application file (BMS.EXE), ten database files (*.DBF) and three DBT files.

To install the program BMS it is necessary to copy all the files to a directory on the hard disk of a PC (for example C:\BMS) and to start the program by typing (BMS) (Enter). Pull down menus can be activated by highlighting the menu item or by pressing the first letter as a macro.

V. CONCLUSION

BMS is a bond market simulation program, i.e. a computer program where students could test different investment strategies in the so called fixed income securities markets. They could buy and sell bonds in three different markets or scenarios, the bond market in the USA, Germany and Slovenia. According to the results they can conclude which investment strategy (passive or active) was the most successful one. This computer program was carefully programmed in the mid nineties using CLIPPER v. 5.00 and several other utility programs so it is running on PCs with Operation Systems ranging from MS DOS to Windows Vista.

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