Running the Economy: A Review of the Internet-Based Fairmodel

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Abstract. Since February 1997, Fair's large macroeconometric multi-country model has been freely available through the Internet. In this article both the history and the use of the Fairmodel are discussed. The Fairmodel enables students to work with real data and it makes economic theory come to life. A drawback is that getting started with the model can take up a great deal of time. A realistic example of working with the model is presented. The Fairmodel shows that the internet could drastically change the manner in which economics is taught.

Key words: macroeconometric modeling, internet, economics education

Introduction

'. . . a great leap forward in teaching economics'. That is how a disk-based version of Fair's macroeconometric model for the United States was advertised in 1985. Since February 1997, Fair's multi-country model has been freely accessible through the internet. This article is a review of the site that could in fact be the major leap in economics teaching of this decade. For a complete technical description of the model itself, the reader is referred to Fair (1994, 1984).

The internet site http://fairmodel.econ.yale.edu/ is a must for every economist or economics student. Logging into this site allows the user to work with Fair's main contribution to the field of economics: the Fairmodel. The Fairmodel basically consists of a macroeconometric model for the United States (the U.S. model) and an extended model for the whole world (the MC model). The user can work with the model to predict the future of the world economy and even that of the White House (as one of the on-site examples shows). Fairmodel allows for everyone to be a policy maker and could therefore perhaps help to bridge the gap between theorists and practitioners.

Historical Background

Fair began working on macroeconometric models at about the time he completed his graduate work at MIT in 1968, and has not stopped since. Three books, written

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at ten year intervals, give a good overview of his work (Fair, 1974, 1984, 1994). Fair has always been a strong advocate of the Cowles Commission Approach, which he thinks is being undervalued these days, when compared to the New Keynesian or Real Business Cycle approaches. It is the Cowles Commission to which Fair accredits his sound methodological basis, which is present throughout all his work: 'A model to the Cowles Commission was a null hypothesis to be tested'. (1994, p. 10). From the beginning, Fair has stressed three important themes that should be present in his models: basing macroeconomics on solid micro theory, permitting disquilibrium in some markets and describing all balance sheet and flow of funds constraints (1984, p. 35).

Apart from just building models, Fair has always been occupied with spreading his enthusiasm. He has tried to make his work available to as many people as possible, in order to stimulate the interest in structural macroeconometric models and modeling. In 1983 his US model was released as an educational disk-based package, which allowed students to carry out policy experiments. Fair hoped that this package would help reduce the difference between macroeconomics in the classroom and macroeconomics as it is used in practice (Case and Fair, 1985, p. 85). He did not succeed completely, as most reviewers judged the package to be too expensive and too time consuming for regular students to use. In 1985 the Fairmodel package cost almost $100 per student, it took almost twenty minutes to solve a single forecast and the start-up time was considerable (Yohe, 1985; Yoho, 1989). Fair himself said the disk-based model was 'kind of a pain' for students to use, and he did not use it in his course last year (Abrecht, 1996). The launch of the Fairmodel internet site seems to have taken away most, if not all, of these problems. The number-crunching server solves the U.S. model in no more than a second and access is free.

The Model and the Data

The Fairmodel server, which serves both the U.S. and the MC model, consists of a Pentium Pro 200 computer with 64 mb of memory and a 9 gb hard drive connected from Fair's office to the internet through the Yale network. The operating system is Windows NT with a Netscape server. This computational power is necessary, as solving the MC model is one of the biggest number-crunching problems available in real time on the internet. The U.S. model alone contains 131 equations (30 stochastic and 101 identities). The MC model consists of the US model plus models for 32 other countries, with up to 15 stochastic equations each. Including the U.S., the total number of stochastic equations is 351 and the total number of estimated coefficients is 1538. In addition, there are 1237 estimated trade-share equations. Trade-share data were collected for all the mentioned countries plus an additional 12 (one of which serves as an all other category), so the trade share matrix is 45×45. The total number of endogenous and exogenous variables, not counting the trade shares, is about 4000. The equations are estimated by using two

stages least squares, and for solving the model the Gauss-Seidel technique is used (Fair, 1996). Solving the MC model will still take a minute and if too extreme changes are made, the model might not solve at all. Setting unemployment at zero will definitely lead to a crash. Generally, however, the application is quite robust.

The estimation period for the United States begins in the first quarter of 1954 and for the other countries as soon after 1960 as the data permit. Collecting usable data is one of the challenging tasks an econometrist has to face. Fair's data come from several different sources: the U.S. Flow of Funds Accounts, the U.S. National Income and Product Accounts, the Federal Reserve, The Bureau of Labor Statistics, the IMF and the OECD. All these data had to be standardized before they could be used in the model. Now anyone can work with these data without having to download a single byte.

The Site

After entering the Fairmodel site, there are several options to choose from. Of course, one can work with the U.S. or the MC model, which will be discussed in detail later on. In addition, one can also read or download documentation, memos and papers, including several chapters of 'Testing Macroeconometric Models' (Fair, 1994) which the publisher allows to be downloaded free of charge. One can also download the Fair-Parke program, which is a very powerful econometric tool, or download the U.S. Model data-set for EViews. Finally, one can read and leave comments at the Message center, although this option has not been used very much as yet.

The first-time user is prompted to start by reading all the documentation, as the U.S. and MC model are very powerful, but also very complex machines and useless without having read the proper manuals. Having done this, one should start with the U.S. model, because the MC model is much more difficult and time-consuming. Everything that is learnt by using the U.S. model will carry over to the MC model. It will thus take a considerable amount of time before one can work comfortably with the MC model.

When one has decided to start with one of the models, the first thing to do is to create a personal data-set. At the beginning this data-set is copied from the base (standard) set, but after one has made changes in the personal data-set, the changes are saved and the results can be compared with the base-set. All the users' data-sets are saved on Fair's hard-disk, or at least for as long as capacity allows. A minor drawback is that the site does not allow the user to reset the data-set, so that every time one wants to start again with a 'clean' set of data, a new set has to be created with a new name. In order to write this article the author had to create over 20 different data-sets.

Once one is in possession of a personal data-set, the real work can begin. The menu screen allows several different possibilities: to change exogenous variables, to change assumptions about monetary policy, to change the prediction period, or

to modify the model itself. All variables can be set, but one can also adjust the functional form of the equations. The MC model also allows one to look at a single country at the time. Naturally, one can solve the model and analyze the results.

The U.S. model workbook and the MC model workbook, both available on the site, include several exercises that take the user through all of the models' possibilities (Fair, 1997a, b). They start off by prompting the user to merely examine historical data, which in itself can be extremely instructive. Hardly ever do students get the chance to observe this much raw data. It is very interesting to observe all the historical ups and downs in the GDP or unemployment rate for the U.S., Germany, Japan or even Jordan and try to spot the similarities. The site allows the user to choose between tables or graphs in several different forms, or to display the output in a spreadsheet format. Hours can be spent just by looking at all the different graphs, e.g. observing business cycles.

As soon as one is comfortable with the way in which the output is presented, the real work can begin. Different policy scenario's can be compared! Once again, the workbooks contain several examples of what can be done. The experiments are arranged in such a way as to take the user through an intermediate macroeconomics course. First the effects of the different ways of government spending are examined, next the monetary policy effects, subsequently price and market shocks, after which the user is prompted to do several experiments with interest-elasticities. The MC model workbook also includes experiments that analyze the effects across countries. For instance, it is possible to analyze Germany's best response to an interest increase undertaken by Federal Reserve president Greenspan. It is also possible to analyze historical episodes and carry on counterfactual experiments. Questions like 'How rich would we have been now if the prices had not risen as much as they did in the 1970s' can be answered. One could even try to find a better economic policy for coping with the East and West German reunion. The user can actually see what life (or at least the economy) would have been like if he or she were to rule the entire world. Finally one can have a go at personally running the world economy.

Evaluation

Pretend to be a policy maker if you wish, but be warned: Fairmodel is not a toy. As mentioned, it takes a considerable amount of time before one can actually work comfortably with one of the models. The site was not built for people who want to surf in and out just for a few minutes during their lunch-break, but is aimed at business forecasters, government policy analysts, macroeconomic researchers, teachers and students. It is the latter, students, who will make up the biggest share of the users. Being able to make an actual policy analysis is a great addition to most students' courses in macroeconomics. Too often these macroeconomics courses consist mainly of theoretical models in simple comparative statics frameworks. The transition from theory to empirical work is not straightforward and therefore often neglected. Working with the Fairmodel really brings the mouldy theories to

life and makes it much more interesting to analyze e.g. multiplier effects. It is very educational for students to get a feel for real data and to learn how to interpret the results of variable changes.

The revolutionary aspect of the Fairmodel site is that, to the best of the author's knowledge, this is the first time in economics that the internet is used the way it should be: for interactive educational purposes. Students from all over the world can, in a way, do a course taught by Fair without having to go to Yale, or having to pay a tuition fee. Although the internet is not appropriate for all kinds of teaching, the possible uses could be widely extended. In reply to questions from the author, the Dutch Central Planning Bureau and the U.S. Federal Reserve both answered that they were considering to put their respective (and respected) models on the internet. And this is just the beginning. The internet could in fact dramatically change the way in which economics is taught. Restrictions on the number of students would no longer be of any consequence. Teaching colleagues could jointly teach courses while living in different parts of the world. Students in poor third-world countries could do courses taught by internationally renowned professors. Though still having to pay for a computer, they no longer would have to raise the funds to go to the United States. In the future a real global education system could be set up.

But that is all in the future. Today, even the Fairmodel still has its limitations. Even though everything has been done to make working with the site as easy as possible, it does take a great deal of effort before one can actually work with the model. The site would benefit greatly from an extensive interactive tutorial that takes the user step by step through all the site's possibilities and asks questions and gives a warning when an error is made. An extensive tutorial would make it much easier for students to just plunge in and start working with the model. Without that, the model takes up a lot of time, too much to be easily inserted in a macroeconomics course. Either the Fairmodel site should be extended so as to really become a full macroeconomics course, or the site should be made even easier to work with, so that it can become a very valuable addition to a standard macroeconomics course, without taking up too much extra time. The big remaining question is of course: who is to pay for Fair's time? The internet site is free and will hopefully stay that way. Extending it with a large tutorial will take up lots of expensive time without anyone ever paying for it. Hopefully some good economist will come up with a proper solution for this problem.

An Example: Loosening Germany's Monetary Policy During the 1980s

In this section an actual experiment with the Fairmodel is described. The MC model is used to estimate the consequences of a less rigid German monetary policy in the 1980s. The example is taken directly from the MC model workbook. The experiment is a good example of a 'counterfactual' experiment. The model is used to examine 'what would have happened if. . . ' instead of predicting the future. When doing counterfactual experiments one becomes very aware of the importance

of correct data-handling. One small mistake will result in large deviations, not as a result of a different policy, but because of the wrong use of data.

The first thing to do is to create a personal data-set by copying the initial values from the base data-set. The experiment examines what would have happened in the 1980s, so the next thing to do is to set the prediction period at 1982 through 1990. To be able to compare the results of an alternative policy with the unchanged output, it is important to tell the model to use historical errors. If this is not done, the results of the alternative policy will be compared with actual values for the period under examination. In that case it is not possible to differentiate between the results from the changed policy and straightforward prediction errors.

The aim of this experiment is to see what would have happened if Germany had exercised a less tight monetary policy. This is done by lowering the three-month treasury bill rate. As the Fairmodel normally takes the bill rate to be endogenous, the equation has to be dropped out of the model before any changes can be made. Having made the bill rate exogenous, the following changes are made: in 1982 and 1983 the rate is lowered by 1.0 percent, in 1984 and 1985 it is lowered by 0.75 percent, in 1986 and 1987 it is lowered by 0.5 percent and finally, from 1988 through 1990 it is lowered by 0.25 percent. These changes have to be saved to the (Fair's) disk, after which the model is solved and the results can be analyzed. The user can choose between graphs and tables for examining the output. Usually the graphs are easier to interpret, but for some further processing of the data the exactness of the tables can be necessary.

As can be seen in Figure 1 and Figure 2, the results of the test-run are very interesting. Lowering the three-month bill rate would have led to lower unemployment throughout Europe. Prices would have increased slightly, but real national income would still have ended up slightly higher. The United States would hardly have been affected at all. From this experiment it seems like it would have been a good thing if Germany had tried to lower interest rates in the 1980s. The gain from lower unemployment seems to outweigh the inflation cost, as real national income would have gone (slightly) up. The other European countries, like France, would have benefited substantially. In retrospect, of course, it is always easy to say what Germany should have done. Also, one has to remember that this is just a model and there is no way of knowing what would really have happened.

Conclusion

The Fairmodel site is a valuable addition, for both the internet and economics education. At the same time it shows how to make optimal use of the opportunities of the internet and how to teach economics by using real data and realistic policy experiments. It allows students to work with the data and implement different policy rules without having to download a single thing to their computer, while all the computational work is done by the server. In the long run, sites like this one can change the way in which economics is taught. For now, the Fairmodel site
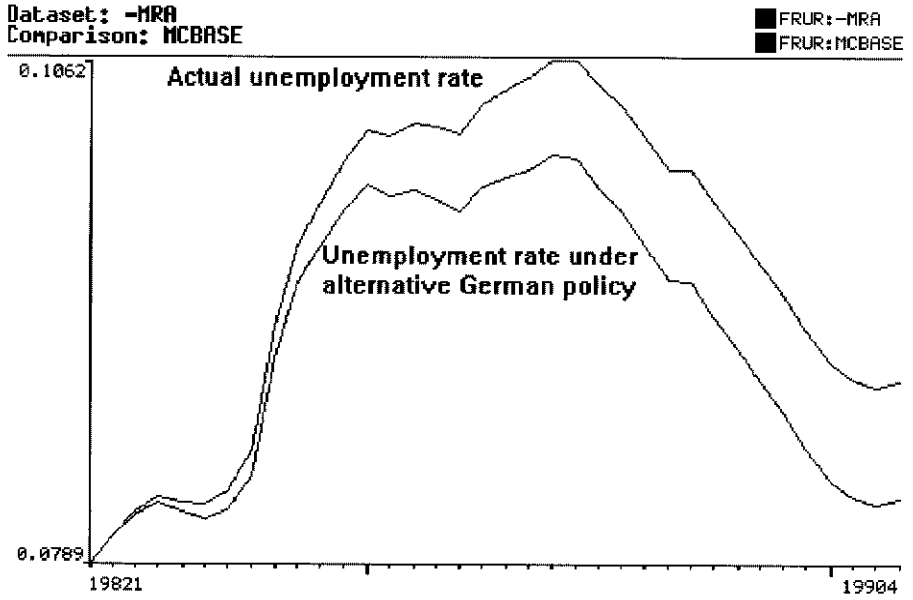
Dataset: -MRA
Comparison: MCBASE

■FRUR:-MRA
■FRUR:MCBASE

Figure 1. French unemployment during the 1980s, actual and under the alternative German monetary policy.
Source: http://fairmodel.econ.yale.edu/
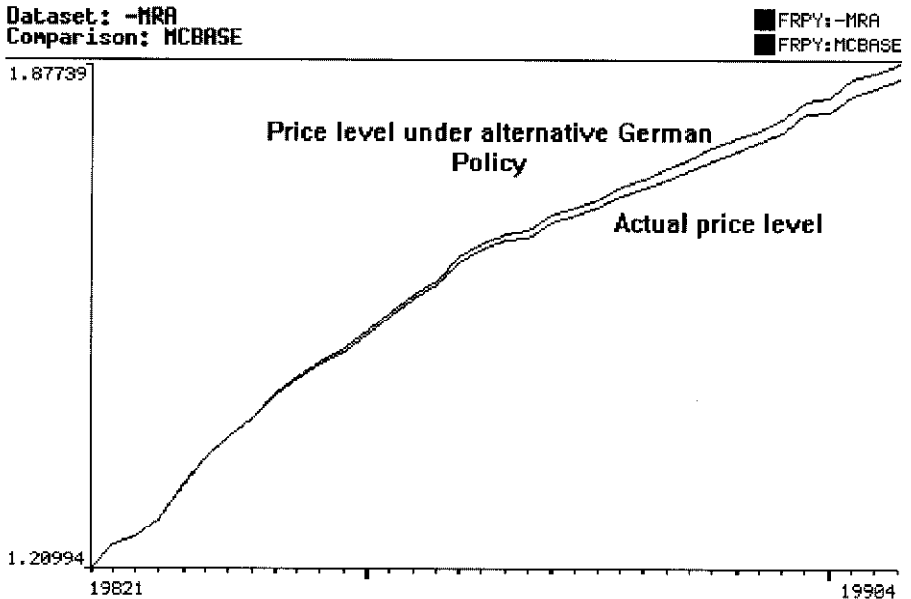
Dataset: -MRA
Comparison: MCBASE

■FRPY:-MRA
■FRPY:MCBASE

Figure 2. French price level, actual and under the alternative German monetary policy.
Source: http://fairmodel.econ.yale.edu/

can be a good, if rather time-consuming, addition to standard economics courses. Hopefully many professionals all over the world will follow Fair's example and use the internet the way it should be used.

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