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Developing and Implementing an Internet-Based Financial System Simulation Game

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Developing and Implementing an Internet-Based Financial System Simulation Game[1]

(JEL code: A2: Teaching Economics)

By Joseph Santos

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Abstract

Thanks to the internet and server-side technology such as Active Server Pages (ASP), developing and implementing interactive pedagogy is proving quickly to be both user-friendly and relatively inexpensive, requiring of faculty and students only pedestrian programming skills and access to the internet, respectively. The Financial System Simulator (FSS), developed over a summer term, is one such example. The FSS is an internet-based, interactive teaching aid that introduces undergraduate students to the domestic and international consequences of monetary policy. While simulators are common among computer-aided interactive learning devices in today's undergraduate economics curricula the FSS is unique because students, representing nations, interact with each other rather than a computer. Hence, the exercise provides users with real-time outcomes based upon their decisions, as well as the decisions of other students. According to student surveys the game helped students understand domestic and international implications of monetary policy and kept students motivated and interested throughout the learning process.

Twenty-six copies were made by the Economics Department at $1.80 per copy.

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Two years ago, the Governor's Office of the State of South Dakota began to accept proposals for innovative methods of bridging teaching with information technologies such as the internet. Recipients of these "Teaching with Technology" grants fulfilled their grant proposals during the summer term and implemented their projects during the subsequent fall or spring semesters. The Financial System Simulator (FSS) discussed below was made possible by such a grant, received in the summer of 1999. The FSS is available at http://econnet.sdstate.edu/index.asp.

1. Introduction

Most undergraduate economics programs offer three credit hours of "Money and Banking," a significant component of which consists of monetary theory and policy. Too often the latter is taught using either a comparative static "talk and chalk" approach or it's left for students to explore through multiple choice questions and word problems that lack the depth and realism necessary to convey the subject matter effectively. Nonetheless, despite documented success with interactive exercises, undergraduate economics curricula have been diffident to embrace such methods because of their requisite costs (explicit and otherwise) [See Katz and Becker (1999) and Becker and Watts (1996)]. But, thanks to the internet and server-side technology such as Active Server Pages (ASP), developing and implementing interactive pedagogy is proving quickly to be both user-friendly and relatively inexpensive, requiring of faculty and students only pedestrian programming skills and access to the internet, respectively. The Financial System Simulator (FSS), developed over a summer term, is one such example.

The Financial System Simulator is an internet-based, interactive teaching aid that introduces undergraduate students to the domestic and international consequences of monetary policy. While simulators are common among computer-aided interactive learning devices in today's undergraduate economics curricula [See Case and Fair (1985) and Katz (1999)], the FSS is unique because students, representing nations, interact with each other rather than a computer. Hence, the exercise is interactive on two levels; it provides users with real-time outcomes based upon their decisions, as well as the decisions of other students.

During the Fall 1999 semester, the Financial System Simulator was implemented in two sections of Money and Banking (Econ 330) at South Dakota State University. Student surveys indicated the game helped students understand domestic and international implications of monetary policy and it kept students motivated and interested throughout the learning process. Indeed, 90% of those surveyed agreed the game should be a permanent component of the Money and Banking course.

2. Money and Banking: The Traditional Approach to Teaching Monetary Policy

Most undergraduate programs in economics offer some variant of a one-semester "Money and Banking" course that examines the role of the financial system in a capitalist economy. In general, the course begins with a look at financial markets (money and capital) and ends with both a theoretical and institutional exposition of financial intermediaries. Typically, the "Money" component of the course deals primarily with the monetary aggregates, security pricing, the Federal Reserve System, monetary transmission mechanisms, and the familiar Keynesian-Monetarist debates, while the "Banking" component focuses primarily on commercial banking theory, including information asymmetries, structure and legislation, investment banking, and international finance.

Assigning prerequisites to this course is not an easy task. In the interest of making the course available generally to economics majors and non-majors, departments tend to require relatively few prerequisites. Moreover, many economics majors are locked out of upper division courses until calculus and statistics prerequisites are satisfied; often Money and Banking is one of few courses that can be taken in the meantime. For these reasons, typically only Introductory Macroeconomic Theory is listed as a prerequisite. But in fact, while a portion of the course's material is quite straightforward - identifying and defining terms, describing institutional architectures (e.g., the Fed and Treasury), and explaining banking legislation - the monetary theory component often proves very difficult for those entering with only an introductory exposure to economics. How the central monetary authority's tools effect desired changes in real output, the price level, and so on, requires a level of macroeconomic intuition that few students possess upon entering Money and Banking.

Absent a relatively more creative pedagogical medium, the intricacies of monetary policy are left generally for the students to explore, absent supervision, through practice questions of the sort described in table 1. Nonetheless, such questions are limited in several respects. To put the matter bluntly, the author's experiences suggest students find such exercises esoteric, dull and void of realism. In addition, while students may become proficient with such exercises over the semester, their ability to handle more complicated (and realistic) economic questions is neither assessed nor addressed during the course. Finally, this approach is limited to comparative static circumstances where all other factors, including the international community's response to domestic policy, are assumed constant.

That interactive exercises maintain (or gain) student interest in economics, as well as dispel preconceived notions regarding the esotericism of economic theory, is well established in the literature [See Goeree and Holt

(1999)]. Thankfully, the internet provides educators with both a user-friendly and relatively inexpensive method of developing and implementing interactive pedagogy. The Financial System Simulator, developed over a summer term, is one such example.

3. An Overview of the Financial System Simulator

The Financial System Simulator (FSS) is an internet-based, interactive teaching aid that introduces economics undergraduates to the domestic and international effects of monetary policy. The FSS is designed after the operational architecture of the US Federal Reserve's Open Market Committee, the monetary policy-setting arm of the US central bank. Each team's headquarters consist of eight web sites (or rooms), five of which are password-protected, providing access to monetary policy tools as well as sensitive information regarding team performance and past monetary policy decisions.

The application allows teams of students, who represent nations, to interface with one another in a virtual global economy through a series of web sites. A global economy, or game, consists of two nations; for example, team alpha plays team beta, while team gamma plays team sigma. In a typical semester two to three simultaneous games are played per course section. Each nation, comprised roughly of five students, submits five monetary policy decisions for their economy per week; decisions include the required reserve ratio, level of nonborrowed reserves, discount rate, currency to deposit ratio (target) and excess reserve to deposit ratio (target).

A server-resident program driven by a mathematical model of an international macroeconomy is executed automatically each week, incorporating all team decisions and random shocks that occurred in the last seven days. Upon execution, the equilibrium values of each economy's macro variables (i.e., real output, price level, interest rate, exchange rate, etc.) are updated and made available to all teams immediately; students may access these results in tabular, chart and text formats.

Students participate in the simulation game for a period of six weeks, immediately following the monetary policy portion of the course; at that point students have learned about the monetary base and the Fed's arsenal of tools designed to affect both its size and composition. Team progress is gauged periodically during class time and the consequences (planned and unplanned) of team decisions, as well as possible future strategies, are discussed at that time. Finally, each team presents a brief analysis of their economy's experience over the past six weeks. Team summary statistics are downloaded from the FSS site and graphed for the end of semester presentation.

While simulators, and computer-aided interactive learning devices in general, are increasingly visible in economics pedagogy [See Case and Fair (1985) and Katz (1999)], such learning devices are not perfect. Indeed, as Wykoff (1989) points out, the "black box" with which some computer-assisted instruction presents students can limit the contributions of such methods to little more than rote and "non-intellectual activity."[2] This criticism does not apply to the FSS, as it is based upon, and powered by, the same IS-LM model to which students are introduced in their macroeconomic core (as well as Money and Banking in some instances). Hence, as discussed below, the FSS is parameterized such that traditional notions regarding short-run ramifications of monetary policy are reinforced by playing the game. While reality deviates from such notions often, albeit far less than the discipline's critics would have others believe, that students see these stylized facts reinforced in such computer-aided exercises is crucial to the development of their economic intuition.

4. Architecture of the FSS

The FSS is designed to evoke images of the elusive Federal Open Market Committee, complete with password-protected *Situation* and *Decision* rooms as well as *Forecasting* departments and *Headlines* from the financial press; a brief description of the game's site map, summarized in table 2, follows.

A team's homepage, which is generally accessible by all students, is used for two purposes. In addition to providing a portal to a team's headquarters, a team homepage contains members' contact information, including name, office/title held in game, email, personal homepage, icq address and a brief comment regarding when/how they can best be reached by team members. The first time a student accesses his/her team headquarters, s/he goes initially to the Correspondence Room where a form prompts the student for this contact information. Once submitted to the server, the information is posted immediately to the appropriate team homepage. Each student needs to visit this room once.

In order to determine the week's monetary policy decisions, team members meet in their respective Situation Rooms, or server-resident "chat rooms," to discuss options and strategies. Like any internet forum, the Situation Room allows students to meet and plot strategy on-line in real-time. However, unlike most forums, this site is not a commercial service so it is immune to the dissonant advertising banners and such that permeate most "free" discussion rooms.

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[2] Wykoff, Frank. "Economics: on-line and interactive," p. 547.

The task of setting monetary policy can be a daunting one, requiring both economic intuition as well as some sense of the economy's (or game's) relative sensitivities. Hence, to aid students in making their monetary policy decisions teams have continual access to three "intelligence sources," including Economic Statistics, the Decision Archives, and the Forecasting Room. Economic Statistics offers real-time summary statistics on all teams in all global economies, giving students a sense of how they and their peers (including their opponents) are doing at any point in the game. Next, the Decision Archives offer students a listing of all decisions ever submitted by their team only. That students peruse both these sites prior to submitting decisions for the next period is recommended strongly. Finally, to gain some idea as to how their global economy is likely to react to monetary policy, as well as to understand how their opponent's decisions may complement or nullify their own, students may consult the Forecasting Room. This room allows students to input trial decisions on behalf of their team as well as their opponent's. The decisions are submitted to the server but processed using a "mock-up" of the actual model. While the forecasts are not clairvoyant, students can gain a sense of how their decisions (as well as their opponents) may affect their economy.

Lastly, the Headlines site provides all students with real-time summary statements highlighting the performance of each team relative to its opponent; statements are phrased using a writing style similar to what one might find in the financial press. Examples of such headlines include: "Despite Real GDP growth in both economies, Team Beta finished the period with a 1.5% increase, compared to Team Alpha's 1.2%," or "While Team Beta's Price Level dropped by 2.2% in the last period, Team Alpha's fell by a larger than expected 3.1%." The Headlines site is driven by computer code that determines the relationship between the summary statistics of two opposing economies, and then chooses an appropriate phrase from several pre-coded possibilities so that the statements appear unique to each team's situation.

5. The Economic Model

The Financial System Simulator is powered by what macroeconomists term an "International IS-LM" model; the same model that undergraduate students encounter in the short-run fluctuations component of their Intermediate Macroeconomics course [See Branson (1989) or Gordon (2000)]. The model specifies each team's economy as a series of (log-) linear equations and equilibrium conditions, summarized in tables 3a and 3b, respectively. The equations associated with each game (two economies, ten equilibrium conditions) are solved simultaneously and the equilibrium values of output, price level, interest rate, exchange rate, money supply,

aggregate expenditure components, balance of trade and nominal and real exchange rates are determined for both teams. The model's simplicity (i.e., linearity) ensures a unique solution is found each time.

The IS-LM equations and equilibrium conditions specified in table 3a and b are standard in the undergraduate macroeconomics core. Nonetheless, the choice of parameter values is crucial to insuring that students experience the game in a manner consistent with the stylized facts taught throughout their undergraduate training. For example, an increase in the money supply should lower the real rate of interest, stimulate investment, produce some inflation and depreciate the own-currency. Parameter values are chosen for the FSS so that the standard monetary transmission mechanism just described, that is the Keynesian interest rate channel with international effects, applies.

Three parameterizations in particular are noteworthy. First, price expectations (table 3a, eqn A12) are such that economic agents possess less than perfect foresight, hence aggregate demand policies have real effects on the economy (through counter-cyclical effects on the real wage). Second, the balance-of-payments of each economy (table 3b, eqns B3 & B8, respectively) are restricted to zero, forcing exchange rates and prices to vary such that these conditions are met. This ensures that aggregate demand policies are "beggar thy neighbor" by design - expansionary monetary policy creates a trade surplus by depreciating the domestic currency. Lastly, growth in an economy's capital stock each period is hindered by prior periods' inflations. Two realities of monetary policy are captured by this specification. Namely, the effectiveness of expansionary monetary policies are limited by slower future growth in the nation's capital stock, and disinflation is recessionary; while both points are often addressed in Money and Banking, neither are borne out in comparative static exercises.

Finally, both the demand and supply sides of the economy are shocked randomly. Specifically, the demand side is affected by shocks to both the currency to deposit and excess reserve to deposit ratios. Students are asked to target these, since in reality neither is determined by the central bank. In addition, each nation's capital stock is shocked to simulate real cyclicality in the economy. While none of the shocks are large enough so as to make outcomes of a policy counter-intuitive, they do dampen the desired effects of a particular policy. For example, an increase in nonborrowed reserves will increase the monetary base and hence the money supply, but a simultaneous rise in the currency to deposit ratio will thwart partially the effects of the intended expansionary monetary policy.

6. Active Server Pages Technology

To perform the tasks described above, the Financial System Simulator uses a Server-Side technology referred to as Active Server Pages (ASP) [See Francis, et. al. (1998) and Hatfield (1998)]. Simply, *server-side technology* refers to the fact that a server (the computer on which the web pages reside), rather than a web browser (client-side) does the churning, calculating, and processing of the computer code required to present a web application such as the FSS [See Oliver, et. al. (1996)]. For example, since students are submitting decisions that affect, and are affected by, the decisions of others, all information must reside (and be processed) at a central location; this central location is the server [See figure 1].[3] Further, Active Server Pages is a technology that makes possible the inclusion of code (to be read by the server) alongside HTML (to be read by the client's browser) in the same file. Hence, the same page that has the HTML code on it for web page graphics, wallpaper, etc., - a technology with which many instructors are now reasonably familiar - also contains lines of code to be read and processed by the server. Indeed, the only obvious difference between a standard HTML page and a page that includes both HTML and code written for the server is that the file extension of the former is .htm(l) while the file extension of the latter is .asp. Indeed, the latter suffix instructs the server to read through the file for server-specific code prior to showing the web page to the user.[4]

This server-specific code can be written in a number of scripting languages such as JScript (*not JavaScript*) or Vbscript. The FSS is coded in Vbscript, or Visual Basic Script, a scripting language with which most non-programmers (including the author) find most agreeable; it bears strong resemblance to Microsoft's earlier Beginners All-Purpose Symbolic Instruction Code (or BASIC) [See Brophy and Koets (1996) and Hatfield (1998)]. A brief example of an .asp page that acts as both client-side web page and server-side code is captured in the following example of a program that calculates student g.p.a.'s:

```
<html>
<head>
<title>Grade Program</title>
</head>
<body>
<%      dim wght_1, wght_2, exm_1, exm_2, gpa
        gpa= wght_1*exm_1+ wght_2*exm_2        %>
<P>Your grade point average in the course is</P><% =gpa %>
</body>
</html>
```

[3] The FSS server runs the Windows NT Server 4.0 operating system.

[4] Moreover, any webpage can end in .asp even if it doesn't contain code for the server to read and process prior to posting the page for the user to see. However, routing the page through the server in this manner is time consuming, hence if the page has nothing "for the server to see," ending the file will .asp rather than .htm(l) is discouraged.

Note, with the exception of the code set between the symbols, <%, %>, the page is a simple website titled Grade Program and consists of the following statement "Your grade point average in the course is." But, if this file is named grade.asp rather than grade.htm(l), the server will know to read through the file prior to showing the page to the client. In doing so, the server will follow the instructions between the <%, %> symbols, thus computing the student's g.p.a. and presenting that calculation at the end of the text message discussed above (the *dim* statement identifies the variables to be manipulated in the proceeding code).[5]

The FSS is the culmination of several such html/Vbscript-coded pages, very similar in form to the grade program above. For instance, like the exam grades above, the tools of the Fed are submitted to the server, the server calculates the macro model based upon these decisions, and returns the new equilibrium values of output, price level etc. to the student within seconds. Indeed, server-side technology is an easy way to make interactive learning accessible and cost effective. Surely, with the advent of the internet and ASP technology, earlier concerns regarding the cost-effectiveness of computer aided instruction [See Lewis, et. al. (1985)] have diminished significantly.

7. Student Feedback

During the Fall 1999 semester, the Financial System Simulator was implemented in two sections of Money and Banking (Econ 330) at South Dakota State University. At semester's end, both sections (a total of forty-one students) were surveyed regarding their experience using the FSS during a three-week pilot program. The survey, consisting of 19 questions, was divided into three categories: the internet, web design, and teaching effectiveness. Survey questions and student responses (% of total) are presented in table 3.

The internet portion of the survey elicited student responses regarding the ease with which they were able to access the internet, and hence the FSS. Students found accessing the internet to be relatively hassle-free and quick, particularly when accessed from school (student dorms are high-speed access equipped). Moreover, although the FSS's internet platform made the game relatively more interesting, it contributed only modestly to making group work easier. Indeed, during the pilot program the instructor encountered student complaints of teammate "shirking" only slightly less frequently compared to group projects assigned in the past.

Surveys indicate that the design of the FSS was most adequate. Navigating through sites, logging in and out of headquarters, and submitting policy decisions were all simple enough to do. Nonetheless, student responses

[5] Of course, a more elaborate and worthwhile program would first prompt the student for the necessary grades, take these grades back to the server, do the necessary calculations and return the solution.

to question 10, "My team's situation (chat) room operated correctly," indicated a problem that was most likely not related to the FSS code itself, but rather web-browser compatibility. Indeed, roughly 60% of those who experimented with the Situation Rooms reported no problems; moreover, all team sites were programmed identically; and lastly, problems reported to the instructor during the pilot could not be replicated on his, or his colleagues', browsers. Such browser incompatibility is a fundamental but quickly disappearing problem associated with internet applications in general. Indeed, since the time of the survey, recent students have reported success with all facets of the simulator, including situation (chat) rooms.

Lastly, results indicate the game achieved two key objectives; namely, it helped students understand domestic and international implications of monetary policy and it kept students motivated and interested throughout the learning process. Indeed, 91% of students believed that their understanding of central bank policy and its effects on an economy was improved by participating in the game. Moreover, 90% of students felt the FSS should be included as a component of the Money and Banking course.[6] Additional written comments at the end of the survey back these findings substantially. Indeed, the most common criticism of the pilot was that is was too short. Many students suggested that they be allowed to access the game prior to their completing the course's introduction to monetary policy.

One issue not captured by these surveys is the degree to which students actually learned as result of participating in the game. Indeed, while most educators agree that students enjoy participating in computer-aided exercises, and most students report learning under such circumstances, the claim that such pedagogical tools actually facilitate learning is far more difficult to demonstrate. Future research might examine this latter issue by partitioning students into test (participate in FSS) and control (do not participate in FSS) groups during a semester and then testing both groups on their knowledge of monetary transmission mechanisms at semester's end.

Conclusion

Thanks to the internet and server-side technology such as Active Server Pages (ASP), developing and implementing interactive pedagogy to replace traditional "talk and chalk" approaches to teaching monetary theory and policy is proving quickly to be both user-friendly and relatively inexpensive. The Financial System Simulator, developed over a summer term, is one such example.

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[6] Interestingly, a small percentage of students said that the FSS introduced them to the internet and email. Of course, introducing students to such technologies is (a) not the purpose of the game, and (b) certain to diminish in importance within the next year or two.

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During the Fall 1999 semester, the Financial System Simulator was implemented in two sections of Money and Banking (Econ 330) at South Dakota State University. Student surveys indicated the game successfully achieved two key objectives; namely, it helped students understand domestic and international implications of monetary policy and it kept students motivated and interested in the learning process. Indeed, 90% of those surveyed agreed the game should be included permanently in the Money and Banking course.

Figure 1: The Financial System Simulator and Server-Side Technology

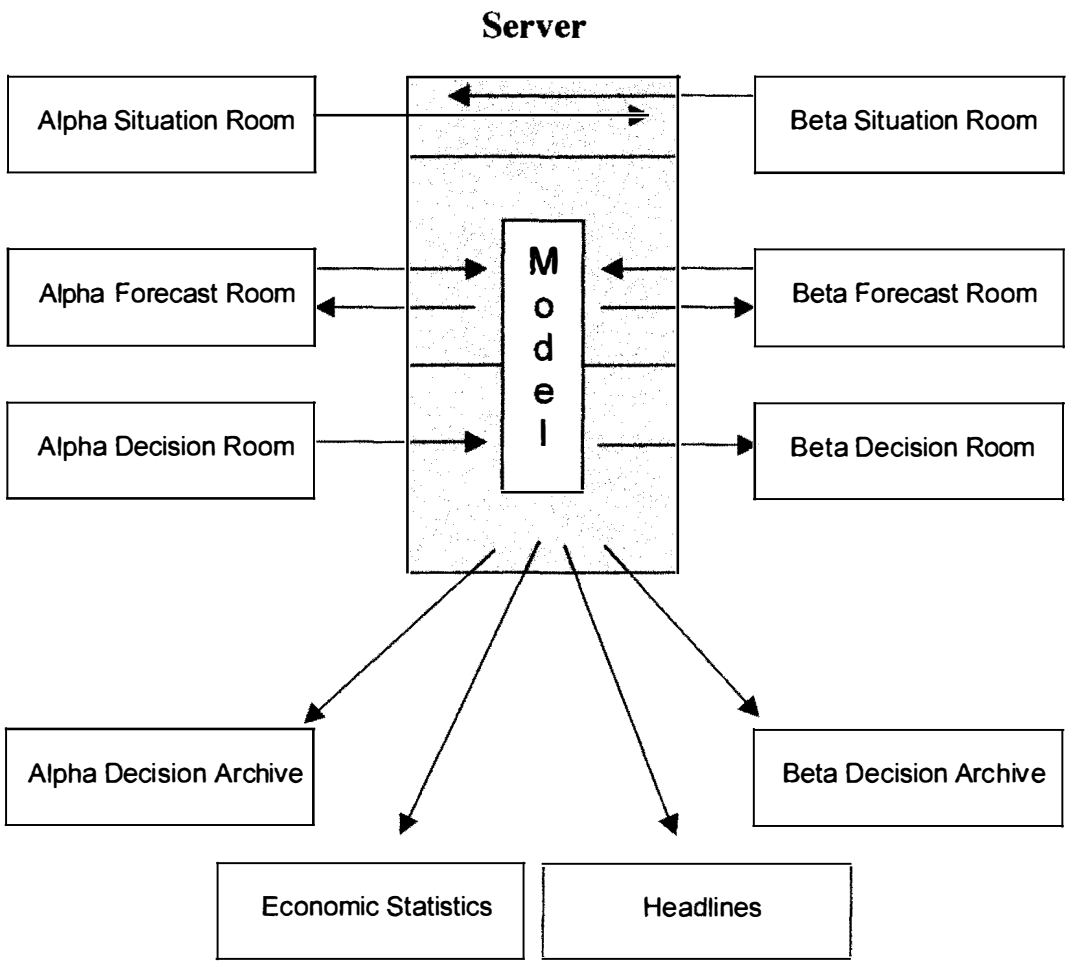

Table 1: Sample Practice Questions for the Monetary Policy and Theory Component of Money and Banking (multiple choice answers are omitted)

1. If the required reserve ratio is ten percent, currency in circulation is $400 billion, checkable deposits are $800 billion, and excess reserves total $0.8 billion, then the money supply is …

2. If the Federal Reserve wants to drain reserves from the banking system, it will …

3. Open markets purchases _____ the monetary base thereby _____ the money supply.

4. When interest rates fall in the United States (with the price level fixed), the value of the dollar _____, domestic goods become _____ expensive, and net exports _____.

Source: MacArthur and Mishkin (1998)

Table 2: A Brief Description of the Various Rooms Inside the Financial System Simulator

The **Situation Room** is a discussion room that allows team members to "chat" on-line simply by logging on to the FSS. Since the Situation room is not a commercially provided service students can meet without the distractions typically associated with "free" chat rooms.
The **Decision Room** allows students to change three monetary policy tools (discount rate, non-borrowed reserves, reserve ratio) as well as target two others (excess reserve ratio, currency to deposit ratio). Decisions are submitted to the FSS server and run through the simulator that evening.
The **Economics Statistics** site is generally accessible and allows everyone to observe the real-time performance of all FSS economies. Gauges include: a graphing applet, a table of summary statistics and a data store, from which data can be downloaded and analyzed off-line.
The **Forecasting Room** allows students to input trial decisions on behalf of their team as well as their opponent's. The decisions are submitted to the FSS server but processed using a "mock-up" of the actual model. While the outcomes of these forecasts are not perfect, students can gain a sense of how their decisions will affect their economy.
The **Decision Archives** contain a running summary of all decisions (time and date stamped) ever submitted by a team. Team members are encouraged to consult the archives prior to making a decision so that they may understand better how the economy is being affected by their operations.
In order for team members to post their contact information to the team homepage (discussed earlier), they must provide the necessary information in the **Correspondence Room**. Immediately after a team member submits this information to the FSS server, their respective team homepage is updated accordingly.
After each run of the FS simulator, a new edition of **Headlines** is published instantaneously. Headlines consist of simple phrases highlighting the economic performance of every team relative to its partner. The FSS server uses a series of phrases so that the headlines appear unique for each news piece. Headlines are generally accessible.
The **Reference Section** is comprised of two parts. First, it offers students help on how to go about playing the game. This part is drawn largely from students' questions. In addition, the Reference Section defines all of the economic variables used in the game and provides a brief discussion of how movements in these variables should be interpreted.

Table 3a: The International IS-LM Model

A1.	Consumption:	$c(y_{d_t}) = c_0 + cy_{d_t}, \quad c_{y_d} > 0$
A2.	Investment:	$i(r_t) = i_0 + \lambda r_t, \quad i_r < 0$
A3.	Government:	$g(y_t) = \tau y_t, \quad g_y > 0$
A4.	Exports:	$m^f(y_t^f, p_t^f, e_t^f) = m_0^f + \mu_y^f y_t^f + \mu_p^f p_t^f + \mu_e^f e_t^f, \quad m_y^f > 0, m_p^f > 0, m_e^f > 0$
A5.	Imports:	$m(y_t, p_t, e_t) = m_0 + \mu_y y_t + \mu_p p_t + \mu_e e_t, \quad m_y > 0, m_p > 0, m_e > 0$
A6.	Net K Outflows	$f(r_t) = f_0 + \delta r_t, \quad f_r < 0$
A7.	Money Demand:	$m^d(y_{d_t}, p_t, r_t) = ky_{dt} + lr_t + p_t, \quad m_{y_d}^d > 0, m_p^d > 0, m_r^d < 0$
A8.	Money Supply:	$m^s = \overline{m}^s = mb + \ln(R_{C/D} + 1) - \ln(R_{C/D} + R_{ER/D} + R_{RR/D})$
A9.	Labor Demand:	$n^d(n_t, p_t) = p_t + y_n(n), \quad y_n > 0, y_{nn} < 0$
A10.	Labor Supply:	$n^s(n_t, p_t^e) = p^e(p_t) + g(n), \quad g_n > 0$
A11.	MRS_n	$g(n) = \gamma n, \quad \gamma > 1$
A12.	P-Expectations:	$p^e(p_t) = \pi p_t, \quad 0 < \pi < 1$
A13.	Production Fn:	$y(n_t, \overline{k}) = a + \alpha n_t + \beta \overline{k}, \quad \alpha, \beta > 0, \alpha + \beta \leq 1$

Table 3b: Equilibrium Conditions (*f* denotes other, or foreign, country)

B1.	Goods Market:	$c(y_{dt}) + i(r_t) + g(y_t) + m^f(y_t^f, p_t^f, e_t^f) - m(y_t, p_t, e_t) = y_t^s$
B2.	Money Market:	$m^d(y_{d_t}, p_t, r_t) = \overline{m}^s$
B3.	Balance of Payments:	$p_t + m(y_t^f, p_t^f, e_t^f) - p_t^f + e_t - m(y_t, p_t, e_t) = 0$
B4.	Labor Market:	$p_t + y_n(n) = p^e(p_t) + g(n)$
B5.	Production Function:	$y(n_t, \overline{k}) = a + \alpha n_t + \beta \overline{k}$
B6.	Goods Market:	$c^f(y_{d_t}^f) + i^f(r_t^f) + g^f(y_t^f) + m(y_t, p_t, e_t) - m^f(y_t^f, p_t^f, e_t^f) = y_t^{s^f}$
B7.	Money Market:	$m^{d^f}(y_{d_t}^f, p_t^f, r_t^f) = \overline{m}^{s^f}$
B8.	Balance of Payments:	$p^f{}_t + m(y_t, p_t, e_t) - p_t^f + e_t - m(y_t^f, p_t^f, e_t^f) = 0$
B9.	Labor Market:	$p_t^f + y_n^f(n^f) = p^{e^f}(p_t^f) + g^f(n^f)$
B10.	Production Function:	$y(n_t^f, \overline{k}^f) = a^f + \alpha^f n_t^f + \beta^f \overline{k}^f$

Table 4: Financial System Simulation Game Student Survey: Questions and Response Rates

SA: Strongly Agree, A: Agree, D: Disagree, SD: Strongly Disagree; FH: From Home, FS: From School, FW: From Work, 1L: From 1 location, NA: Not Applicable.

The Internet: In this section, please comment on the usefulness of an internet-based learning tool.					
1. Gaining access to the internet was easy.	SA 37%	A 59%	D 5%	SD 0%	NA 0%
2. The Financial System Simulation game downloaded most quickly when I accessed the internet:	FH 7%	FS 44%	FW 0%	1L 41%	NA 7%
3. Using the quickest access to the internet available to me, the Financial System Simulation game downloaded quickly.	SA 30%	A 43%	D 20%	SD 5%	NA 3%
4. I usually accessed the Financial System Simulation game:	FH 54%	FS 32%	FW 7%	1L 7%	NA 0%
5. The internet-based format of the Financial System Simulation game made group work easier than if the game were not internet-based.	SA 20%	A 32%	D 34%	SD 5%	NA 10%
6. The internet-based format of the Financial System Simulator made the game more interesting than if the game were not internet-based.	SA 34%	A 51%	D 15%	SD 0%	NA 0%
Web Design: In this section, please comment on the design of the Financial System Simulation Game.					
7. Navigating my way through the Financial System Simulation game websites was easy.	SA 37%	A 61%	D 0%	SD 2%	NA 0%
8. Logging on to my team's website was easy.	SA 49%	A 44%	D 7%	SD 0%	NA 0%
9. Posting my contact information (name, email, etc.) to my team website was easy.	SA 44%	A 49%	D 7%	SD 0%	NA 0%
10. My team's situation (chat) room operated correctly.	SA 8%	A 43%	D 30%	SD 5%	NA 15%
11. Submitting monetary policy forecasts was easy.	SA 37%	A 54%	D 5%	SD 2%	NA 5%
12. Submitting our team's monetary policy decisions was easy.	SA 32%	A 56%	D 5%	SD 0%	NA 7%
13. The output screen, where team summary statistics, charts and data could be obtained, was user friendly.	SA 21%	A 63%	D 2%	SD 0%	NA 5%
14. Password-protected sites could not be accessed without a password.	SA 59%	A 32%	D 2%	SD 0%	NA 7%

Table 4: continued.

Teaching Effectiveness: In this final section, please comment on the teaching effectiveness of the Financial System Simulation game.					
15. My understanding of how central bank policy can be used to affect an economy was improved by observing the effects of my team's decisions on our simulated global economy.	SA 32%	A 59%	D 7%	SD 2%	NA 0%
16. My understanding of the international effects of monetary policy was improved by participating in the Financial System Simulation game.	SA 20%	A 68%	D 10%	SD 0%	NA 2%
17. Participating in the Financial System Simulation game introduced me to the internet.	SA 2%	A 17%	D 44%	SD 32%	NA 5%
18. Participating in the Financial System Simulation game introduced me to email.	SA 8%	A 5%	D 40%	SD 40%	NA 8%
19. The Financial System Simulation game should be included as a component of the Money and Banking course offered at South Dakota State University.	SA 45%	A 45%	D 8%	SD 3%	NA 0%

BIBLIOGRAPHY

Becker, W. E., and M. Watts. 1996. "Chalk and Talk: A national survey on teaching undergraduate economics," *American Economic Review,* Vol. 86, May, pp. 448-453.

Brophy, Keith and Timothy Koets. 1996. *Teach yourself Vbscript in 21 days.* 1st ed. Indianapolis, IN: Sams.net Publishing.

Branson, William. 1989. *Macroeconomic Theory and Policy.* 3rd ed. New York, NY: Addison Wesley Longman

Case, Karl E. and Ray C. Fair. 1985. "Macro Simulations for PCs in the Classroom," *AEA Papers and Proceedings,* Vol. 75, No. 2, May, pp. 85-90.

Daniel, Joseph I. 1999. "Computer-Aided Instruction on the World Wide Web: The Third Generation," *The Journal of Economic Education,* Vol. 30, i2, Spring, pg. 163.

Deluzain, H. Edward and Lawrence Baines. 1998. "Coming online: one teacher's journey to integrate technology into instruction," *The Clearing House,* Vol. 71, No. 6, July-Aug., pp. 342-344.

Francis, Brian, John Kauffman, Juan T. Llibre, Dave Sussman, and Chris Ullman. 1998. *Beginning Active Server Pages 2.0.* Birmingham, UK: Wrox Press Ltd.

Goeree, Jacob K. and Charles A. Holt. 1999. "Classroom Games: Rent Seeking and the Inefficiency of Non-Market Allocations," *Journal of Economic Perspectives,* Vol. 13, No. 3, Summer, pp. 217-226.

Gordon, Robert J. 2000. *Macroeconomics.* 8th ed. New York, NY: Addison-Wesley.

Hatfield, Bill. 1998. *Active Server Pages For Dummies.* Foster City, CA: IDG Books Worldwide, Inc.

Katz, Arnold. 1999. "A Computer-Aided Exercise for Checking Novices' Understanding of Market Equilibrium Changes," *The Journal of Economic Education,* Vol. 30, i2, Spring, pg. 148.

Katz, Arnold and William E. Becker. 1999. "Technology and the Teaching of Economics to Undergraduates," *The Journal of Economic Education,* Vol. 30, i3, Spring, pg. 194.

Lewis, Darrel R., Bruce R. Dalgaard, and Carol M. Boyer. 1985. "Cost Effectiveness of Computer-Aided Economics Instruction," *AEA Papers and Proceedings,* Vol. 75, No. 2, May, pp. 91-96.

McArthur, John and Frederic S. Mishkin. 1998. *Test Bank to accompany The Economics of Money, Banking, and Financial Markets,* 5th ed. New York, NY: Addison Wesley Longman.

Mishkin, Frederic S. 1995. *The Economics of Money, Banking, and Financial Markets.* 5th ed. New York: Harper Collins.

Oliver, Robert, Christian Plazas, John Desborough, David Gulbransen, Joel Millecan, George Eckel, and Rick Segal. 1996. *Building a Windows NT 4 Internet Server.* Indianapolis, IN: New Riders Publishing.

Wykoff, Frank C. 1989. "Economics: on-line and interactive," *Economic Inquiry*, Vol. 27, No. 3, July, pp. 547-554.