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Integrating Scoreboard for Excel into Introductory Economics

The Scoreboard for Excel website (https://www.scoreboardexcel.com/) offers instructors a free download of the program and tutorial videos for assignment creation. The Appendix to this article contains example files that can be used as-is, or adjusted to meet faculty needs.

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1. Introduction

Integrating Excel into introductory macroeconomics enhances student engagement and fosters a deeper understanding of key concepts. Its versatility in data analysis makes it an essential tool across disciplines (Bell, 2000), while its hands-on approach promotes skill mastery and transferable competencies (Jamie, 2002; Velleman and Moore, 1996). Despite its widespread utility in academia and industry (University of Reading, n.d.; Palocsay et al., 2010; Erfle, 2001; Dobson, 2024), many students lack proficiency in Excel (Creighton et al., 2006). Despite Excel's ubiquity, there still exists a gap between student competencies and skills needed in industry (Borders, 2023; Alobaidani et al., 2023). The responsibility lies with academic programs to provide opportunities that enhance these skills. This article outlines a framework for using Excel to bridge this gap and equip students with critical analytical skills for academic and professional success.

Scoreboard for Excel is a free EdTech software that helps teach quantitative concepts using Excel. As its name suggests, it creates a real-time Scoreboard inside an Excel assignment, keeping a running score and providing formative feedback as students complete the assignment. It is like having a tutor sit beside each student as they complete the assignment. Scoreboard's design supports active learning through three overlapping pedagogical theories: scaffolding, real-time formative feedback, and self-determination.

We designed three assignments to serve as examples and inspiration centered around three prominent topics in introductory macroeconomics: GDP, CPI and Inflation, and Employment. These are located in the Appendix. The customizability of Scoreboard allows the faculty to create endless assignments unique to their priorities, and they can be randomized so that no two students receive an identical assignment. Grading is also conducted in bulk, minimizing faculty workload.

In the following sections, we illustrate the creation and application of assignments using Scoreboard for Excel. In section 2, we explain the rationale and approach to classroom integration. Section 3 illustrates an overview of how faculty can utilize Scoreboard for in-class exercises and assigned homework. Section 4 expands on the process by providing a walkthrough to guide the reader through every step necessary. This includes access, showcasing available resources, assignment creation, and grading. Lastly, we conclude in Section 5.

2. Approach and Rationale

Scoreboard appeals to instructors who favor active learning with real-time feedback and those who want to create their own material without extensive grading. Scoreboard automates assessment and streamlines grade recording, saving time and allowing instructors to focus on content and student interaction. Faculty retain complete control over assignment content, empowering them to design tailored assessments without reliance on publisher materials. Scoreboard's multiple honesty controls help minimize academic dishonesty, ensuring a fair and robust evaluation process.

Grounded in Vygotsky's scaffolding theory, Scoreboard adjusts support to bridge gaps in student ability, enabling instructors to create challenging yet attainable tasks (Vygotsky & Cole, 1978). The software's immediate feedback mechanism, shown to optimize learning outcomes (Hattie & Timperley, 2016; Epstein et al., 2001), supports active learning by allowing students to learn from their mistakes during the assignment process. Faculty can further customize assignments to gradually reduce support, fostering greater independence in problem-solving.

Further, Scoreboard promotes intrinsic motivation by addressing the core components

of Self-Determination Theory—autonomy, competence, and relatedness (Ryan & Deci, 2000). Faculty benefit from the flexibility to structure assignments across multiple parts or sheets, allowing students to navigate their work in personalized ways. By integrating practical Excel skills with structured, feedback-rich learning experiences, Scoreboard equips students with valuable competencies while aligning with evidence-based pedagogical practices (Garfield, 1995; Moore, 1997).

Scoreboard for Excel can be applied to any discipline that uses Excel. The small and growing collection of instructors who have implemented Scoreboard come from accounting, business statistics, economics, and finance backgrounds. Any business discipline that uses spreadsheets can benefit from Scoreboard for Excel. Economics is an ideal discipline to use Scoreboard due to its constant use of data. Data collected from sources (e.g., Federal Reserve Economic Data [FRED], Organization for Economic Cooperation and Development [OECD] National Accounts, World Development Indicators, Bureau of Labor Statistics [BLS]) often comes in Excel spreadsheets. Integrating Scoreboard into the introductory economics classroom builds familiarity with managing data, competency in navigating tables, and proficiency in calculations. Additionally, introductory economics courses are often taken early in a student's academic career. For instance, where this is a core course in a business school, the student can benefit in later courses regardless of their major path.

To start, faculty should visit the Scoreboard website (https://www.scoreboardexcel.com) to download the free Scoreboard Excel file. To use Scoreboard, the instructor creates their assignment in Excel, including data, formulas, graphs, pivot tables, and multiple-choice questions, among other elements. This file serves as an answer key. Scoreboard converts the answer key with a single button click into a self-grading assessment for students. This reduces the faculty burden while maintaining a practical and customizable learning experience. For students, the required version of Excel is Office 365 (usually available free to students through a university license) or Excel 2021 or later. The website offers additional features to customize the rigor, and tutorial videos are available.

The Appendix includes files ready to use and answer keys that can be customized. The 'start' files can be posted directly to your course learning management system for students to download, complete, and submit. Alert users that they must click the 'enable editing' button that appears at the top of the screen. The 'answer key' files are answer key files with certain numerical values color-coded to adjust within a range of 5% (e.g., prices for GDP and CPI questions, labor force figures for employment statistics). These can be processed through the Scoreboard Excel file (invoking the value shifting feature) along with a course roster to create unique assignments for each student. Using cloud storage, the assignments can be linked to your course learning management system for student access.

3. Integration Overview

There are many ways to use Scoreboard in the classroom. This is one example of how one author integrated Scoreboard into an Intro Macroeconomics class. If you are not teaching in a computer lab, instruct your students to bring their laptops and ensure that Excel 365 is installed on their computers. The software will not operate correctly if accessed through a web application. As of this writing, Microsoft Office 365 is available for free download to students.

Step 1 - Preparation

For each lesson where Scoreboard is used, the instructor created three files. The first file, which we refer to as 'class work,' is used as a demonstration. We recommend making a file using a question from your textbook for reference. A good example is a GDP calculation involving a

table of prices and quantities. Create labels for answers as if you were to solve the problem.

The second file, which we refer to as 'class task,' is used as an in-class exercise. We altered the previous class work file to create a similar question with different values. Solve it completely using formulas or cell operations. Once we are satisfied with the solutions and layout, we create the assignment in Scoreboard using the default settings, except that we toggle the feedback setting to 'feedback off - student controlled.' This means that the assignment will start with feedback off, but the student can turn feedback back on at any time. Creating the assignment requires you to create a password; do this now. Once prepared, select the 'create start file' button. The start file gets posted to the class learning management system.

The third file, which we refer to as 'assignment', is used for homework. Here, the instructor takes some liberties to create fun assignments that suit their personality. References to pop culture, film, television, or video games have all been well-received. Solve it completely using formulas or cell operations. Additional settings are employed here. Certain cells (e.g., prices) are colored purple (for random value shifting), and honesty controls are set to 'named files for each student,' 'shift formulas down and over,' and 'vary values up to value shift %.' Once satisfied with the file, create the assignment in Scoreboard using a class roster saved in a separate Excel file. This creates a unique file for each student. The cells that were colored purple will randomly adjust their value within the percentage specified in the Scoreboard Excel file (default is 5%), and the entire sheet will shift by a few rows or columns, with the extra rows/columns minimized in size. The assignments look nearly identical, but will differ enough so that no two are the same. One student may have a price of good x equals $10.13, whereas another student's price may be $10.17. The cell where one student will answer a real GDP question might be cell G10, and another student's may be H12. Copying a classmate's file will be ineffective because the values and cell references will not match, motivating students to solve their own work. These files can be uploaded to the course learning management system or a cloud folder and linked to the learning management system.

Step 2 – In the Classroom

Teach your lecture as usual, emphasizing the logic and form of calculations. Then, open the class work file and invite the students to do the same. We walk through the calculations and explain the process step by step. This may be the first time students experience Excel functionality in an intro class. Emphasize starting each answer with '=' and then clicking appropriate cells to create price-times-quantity calculations. We have even gone so far as to use the =sumproduct() formula for GDP calculation. Once complete, we save this file and upload the solved file to the learning management system for students to reference.

Then, assign the class task file for an in-class activity. Encourage them to talk with each other and turn on the feedback if they wish. This feedback mechanism will immediately identify incorrect answers and provide feedback. We use this time to walk around the classroom and answer questions.

Step 3 – Assign and Grade the Homework

Once the lesson is complete, assign the homework by making the uploaded student assignments available. Instruct students to download their named file (automatically named by Scoreboard from the roster), complete it, and upload it to the learning management system. Students can see their progress on the assignment and attempt it as many times as needed before submission. Once they submit their assignments, download them all into a folder. Open the Scoreboard Excel file, select the 'recorder' tab, and click the ''record grades' button. The prompt will allow you to locate and select the assignments, record their grades, save the grade

sheet to your chosen location, and then display the output. The output will be an Excel table displaying all of your students and their scores for the assignment, which can be easily entered or copied into your gradebook.

Online Variation

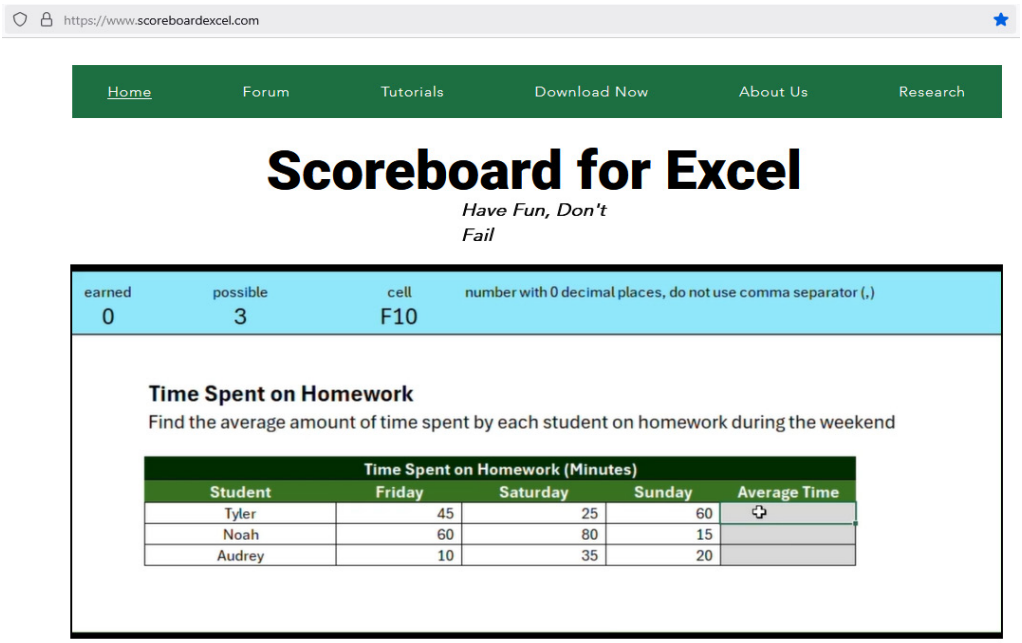
Scoreboard has been successfully integrated into online instruction in both synchronous and asynchronous formats. Each delivery method includes three Scoreboard assignments—prep, guided application, and homework—all providing real-time feedback and grading. These assignments differ primarily in the level of professor assistance. First, students are provided a prep assignment. In both online environments, students receive a step-by-step video to guide them. Next, a guided application is assigned. In the synchronous class, students complete the assignment alongside the professor, who offers real-time hints similar to those given in a face-to-face classroom. For asynchronous delivery, students watch a short video containing hints and guidance. Lastly, both deliveries are assigned homework completed asynchronously, though collaboration among students is encouraged. Additionally, in either online format, students may submit their unfinished assignments and questions directly to the professor for further support.

4. Detailed Walkthrough of Process

4.1 – Accessing Scoreboard

Instructors should first access the Scoreboard website at scoreboardexcel.com. The website's layout is illustrated in Figure 1. There are many resources to explore, such as the forum and tutorials. The forum provides a space for individuals to post questions and files for feedback from the creators. Tutorials bring the individual to a series of topically themed YouTube videos highlighting particular processes. For the initial setup, the instructor should select the download now tab at the top.

Figure 1



The page for downloading Scoreboard is shown in Figure 2. Instructors only need to fill out the contact information shown and select send. The following page, shown in Figure 3, provides the links to the Scoreboard program for download, along with access to a repository containing the Excel files used in the tutorial videos. These videos are accessible with the link on this page and on the home screen. Faculty should download the most recent file of Scoreboard, and save it to their computer. This file can be opened and used once the instructor has created an assignment.

Figure 2

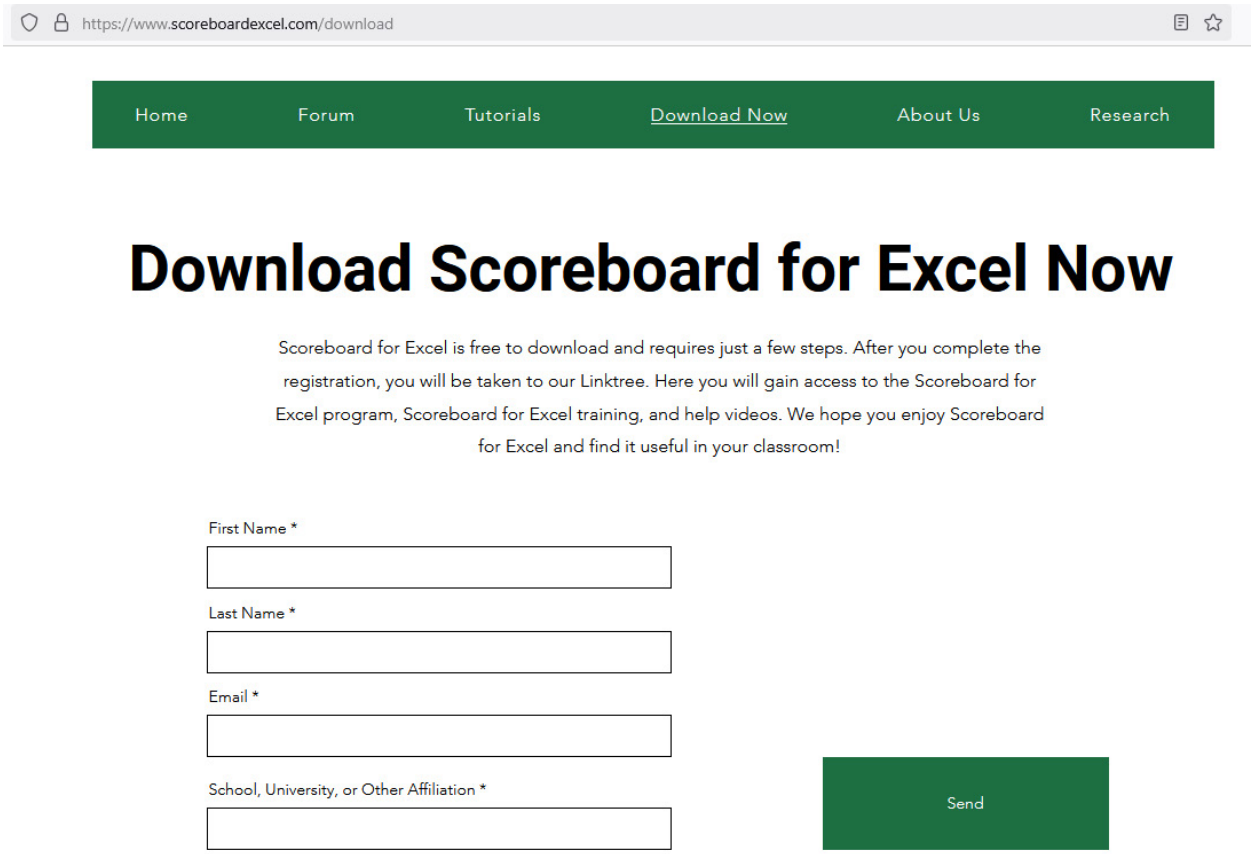
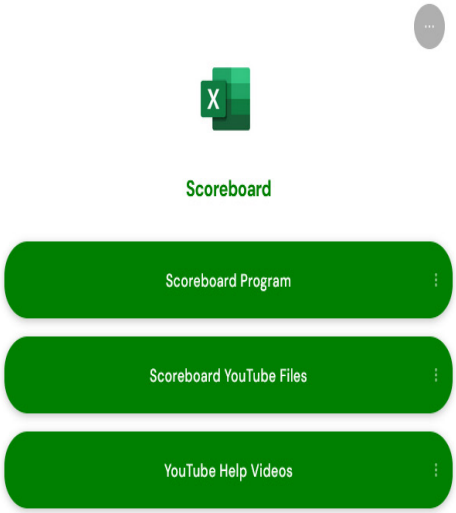


Figure 3

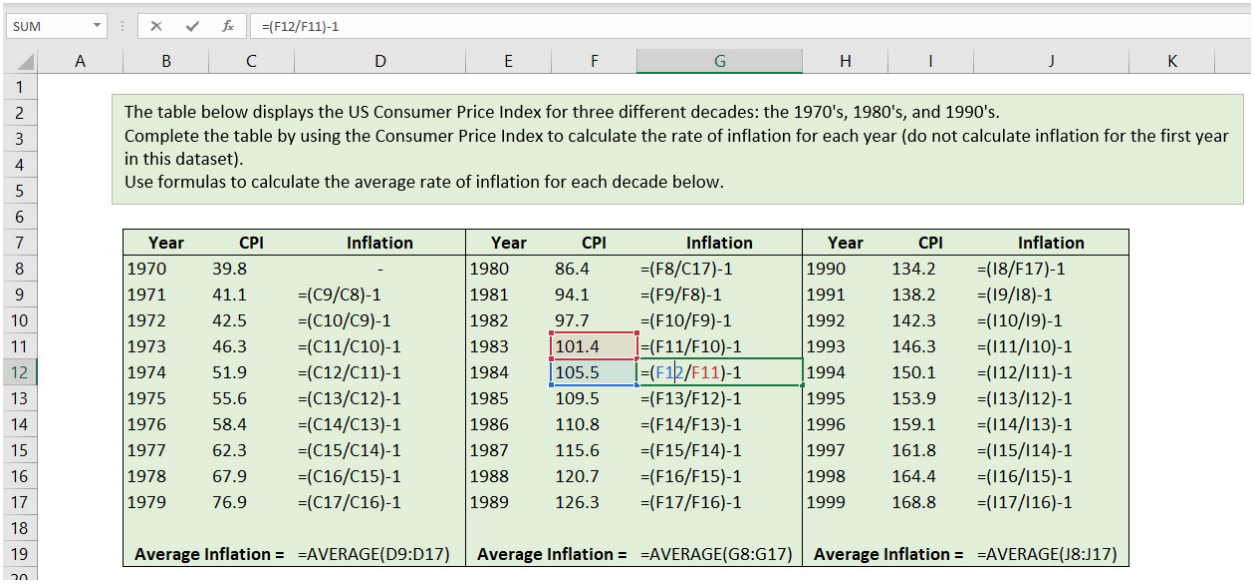


4.2 – Answer Key Creation

The assignment master file is referred to in Scoreboard as the 'answer key.' This completed assignment uses whichever formulas or cell operations you want to use. The time spent creating the initial assignment can vary based on the length, complexity, and originality. In some instances, one author has used Excel files from textbook questions to create assignments. These take only a few minutes to create. Instructors can create completely original assignments if they wish. We have found that assignments that reflect the instructor's style and language have been well received. The initial creation can take a few minutes, but efficiencies arise in future uses. Updating data points or creating additional examples only requires adjusting names and values. We will use the CPI & Inflation file for this walkthrough, which is available in the index. This answer key took the author roughly 20 minutes to create.

Figure 4 shows the first inflation question with formulas displayed. Here, the student calculates inflation using the annual change in the CPI over 30 years. These years are split into three decades, from the 1970s through the 1990s. Once inflation is calculated, they are then to use the =average formula to calculate the average inflation for each decade. The CPI data was downloaded from the St. Louis Federal Reserve Economic Database, and the problem was organized by one of the authors. For this assignment, students will need to use simple cell operations to find the percent change and utilize the =average formula to receive credit.

Figure 4



Year	CPI	Inflation	Year	CPI	Inflation	Year	CPI	Inflation
1970	39.8	-	1980	86.4	=(F8/C17)-1	1990	134.2	=(I8/F17)-1
1971	41.1	=(C9/C8)-1	1981	94.1	=(F9/F8)-1	1991	138.2	=(I9/I8)-1
1972	42.5	=(C10/C9)-1	1982	97.7	=(F10/F9)-1	1992	142.3	=(I10/I9)-1
1973	46.3	=(C11/C10)-1	1983	101.4	=(F11/F10)-1	1993	146.3	=(I11/I10)-1
1974	51.9	=(C12/C11)-1	1984	105.5	=(F12/F11)-1	1994	150.1	=(I12/I11)-1
1975	55.6	=(C13/C12)-1	1985	109.5	=(F13/F12)-1	1995	153.9	=(I13/I12)-1
1976	58.4	=(C14/C13)-1	1986	110.8	=(F14/F13)-1	1996	159.1	=(I14/I13)-1
1977	62.3	=(C15/C14)-1	1987	115.6	=(F15/F14)-1	1997	161.8	=(I15/I14)-1
1978	67.9	=(C16/C15)-1	1988	120.7	=(F16/F15)-1	1998	164.4	=(I16/I15)-1
1979	76.9	=(C17/C16)-1	1989	126.3	=(F17/F16)-1	1999	168.8	=(I17/I16)-1
Average Inflation =		=AVERAGE(D9:D17)	**Average Inflation =**		=AVERAGE(G8:G17)	**Average Inflation =**		=AVERAGE(J8:J17)

Notice the selected cell in Figure 4. The percent change in this answer key is written in the form shown below. This form requires the selection of two cells.

Inflation= (CPI_1984/CPI_1983)-1 = (F12/F11)-1

The standard textbook version, shown below, requires three.

Inflation= (CPI_1984 - CPI_1983)/CPI_1983 = (F12-F11)/F11

Implementing the first inflation calculation signals Scoreboard to look for correct answers using at least two selected cells. This means students using either formula will create satisfactory results. If the answer key uses the second inflation formula, students will need to select three cells, which eliminates the first formula from consideration.

Figure 5 showcases a different question where the student will create a CPI for a fictitious economy. There are five products and four years of prices, all of which were made up by the instructor. Figure 5 presents the questions with formulas displayed. This particular question uses the =sumproduct formula, which is explained in class. Instructors can certainly employ the lengthier PxQ approach; however, this variation provides the opportunity to teach students to

Figure 5

	A	B	C	D	E	G	H
1							
2	The table below details the CPI basket for a small rural economy. Complete the table below. Use the =SUMPRODUCT function to						
3	calculate the cost of the CPI basket for each year. Using Year 1 as the base year, calculate the CPI for each year.						
4							
5							
6		Basket	Year 1	Year 2	Year 3		
7	Product	Quantity	Price	Price	Price		
8	Wool (in lbs)	35	1.95	2.16	2.12		
9	Berries (in lbs)	40	1.12	0.98	0.95		
10	Steak (in lbs)	24	8.03	7.36	8.24		
11	Sweaters	15	11.89	13.44	13.84		
12	Potatoes (lbs)	55	3.98	4.12	4.45		
13							
14		Basket Cost		CPI	Inflation Rate		
15	Year 1	=SUMPRODUCT(B8:B12,C8:C12)		=(B15/B15)*100	-		
16	Year 2	=SUMPRODUCT(B8:B12,D8:D12)		=(B16/$B$15)*100	=(D16/D15)-1		
17	Year 3	=SUMPRODUCT(B8:B12,E8:E12)		=(B17/$B$15)*100	=(D17/D16)-1		
18	Year 4	=SUMPRODUCT(B8:B12,F8:F12)		=(B18/$B$15)*100	=(D18/D17)-1		

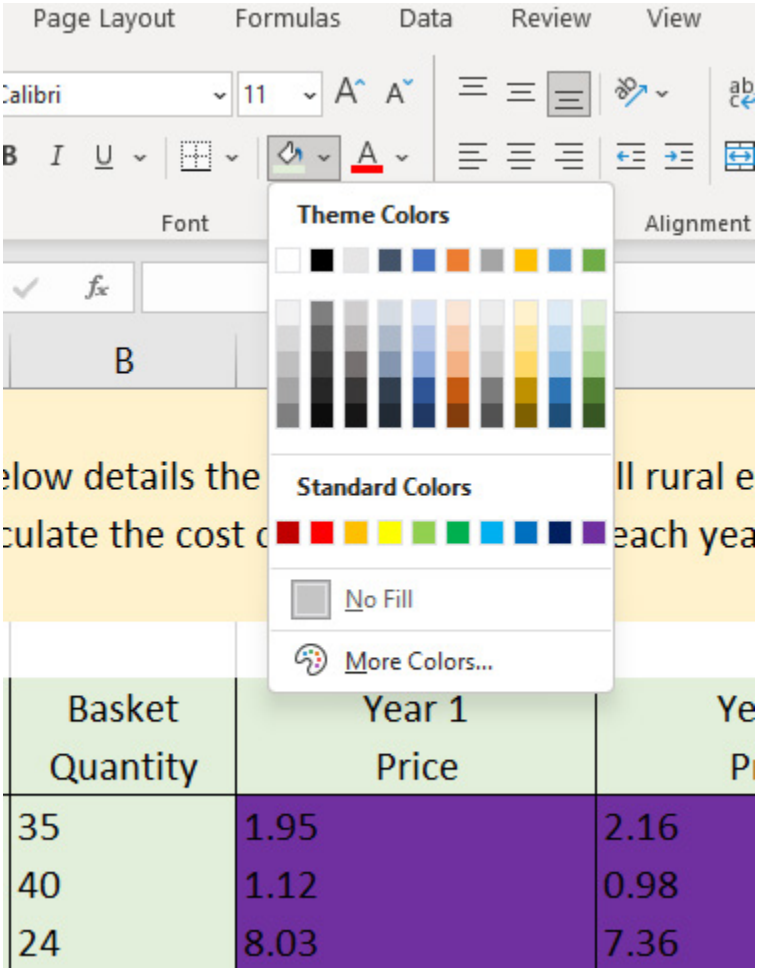
Figure 6 shows the same question without the formulas displayed, which shows the different data formats. Prices and basket costs are reported as currency, and inflation is reported as a percentage. Instructors can grade on the appropriate formatting. This adds emphasis to appropriate displays of data.

Figure 6

	A	B	C	D	E	F	G	H
1	The table below details the CPI basket for a small rural economy. Complete the table below.							
2	Use the =SUMPRODUCT function to calculate the cost of the CPI basket for each year. Using							
3	Year 1 as the base year, calculate the CPI for each year.							
4								
5								
6		Basket	Year 1	Year 2	Year 3	Year 4		
7	Product	Quantity	Price	Price	Price	Price		
8	Wool (in lbs)	35	$1.95	$2.16	$2.12	$1.95		
9	Berries (in lbs)	40	$1.12	$0.98	$0.95	$1.01		
10	Steak (in lbs)	24	$8.03	$7.36	$8.24	$8.49		
11	Sweaters	15	$11.89	$13.44	$13.84	$14.95		
12	Potatoes (lbs)	55	$3.98	$4.12	$4.45	$4.36		
13								
14		Basket Cost		CPI	Inflation Rate			
15	Year 1	$703.02		100	-			
16	Year 2	$719.64		102.36	2.36%			
17	Year 3	$762.31		108.43	5.93%			
18	Year 4	$776.46		110.4464	1.86%			
19								

Instructors can use color to make assignments more eye-catching, but some colors have unique purposes. Figure 7 provides a closer look at the CPI problem and the available colors in the Fill Color menu. The bottom row of Standard Colors has a functional purpose in Scoreboard. The remaining Theme Colors can be used for aesthetics. In the example shown, the yellow question text and the green table of data were selected from the Theme Colors. The price data in the table uses the Standard Color purple. The purple color reflects the 'value shifting' function. When multiple assignments are made for a class, each new assignment will randomly change the price data in this table by up to 5% in either direction. This is a straightforward mechanism to make infinitely unique assignments for complete classes. The full list of colors is outlined further in the Scoreboard main file.

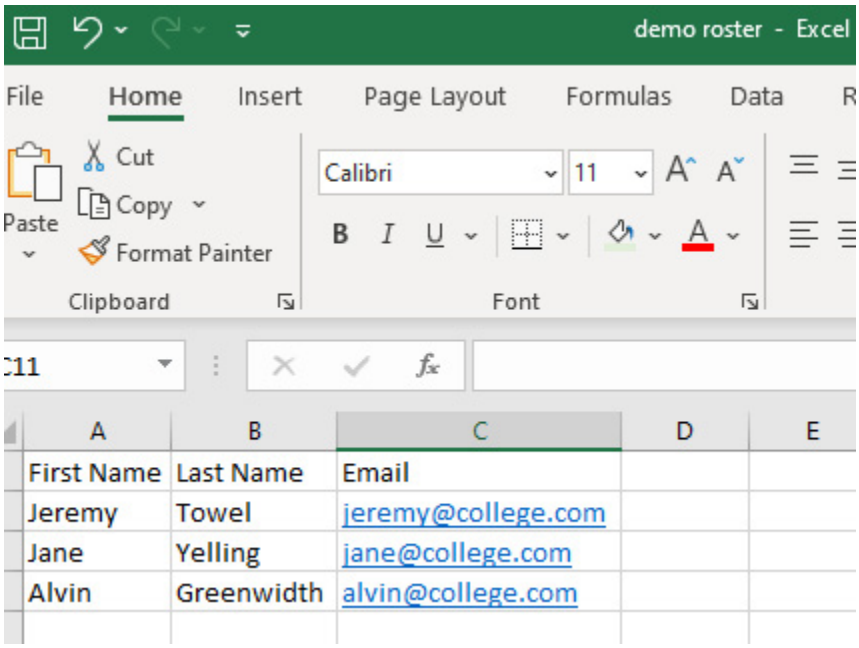
Figure 7



4.3 – Roster Organization

To generate individual assignments from an answer key, instructors must create a roster in Excel. The roster should be organized with three columns: first name, last name, and email. Most learning management systems will allow instructors to download this information quickly. Figure 8 illustrates one such roster of fictional economics students.

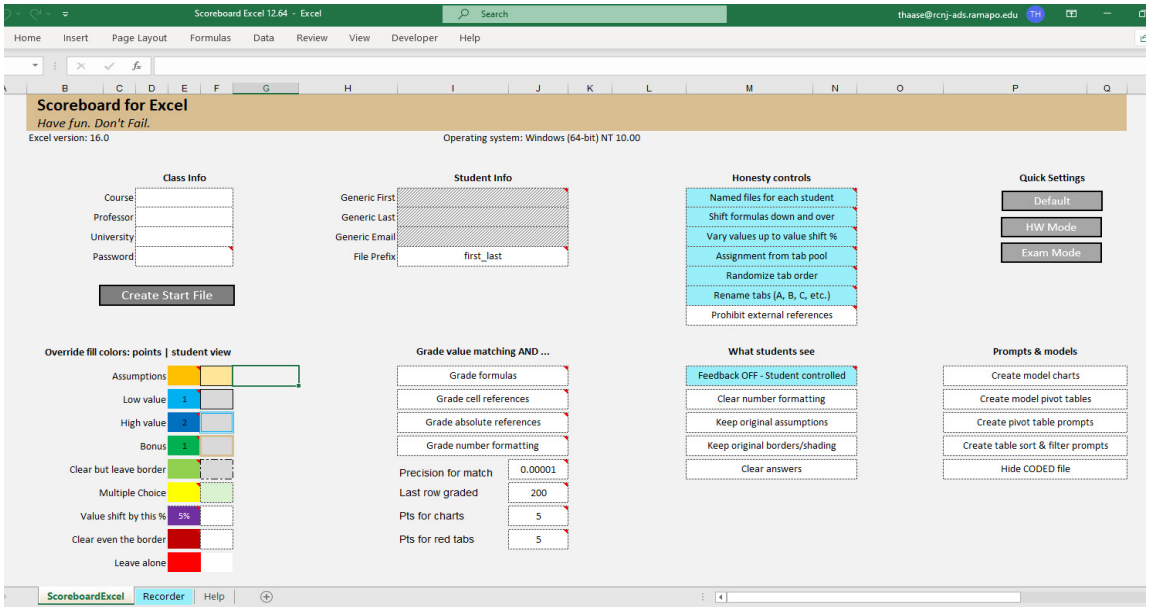
Figure 8



4.4 – Creating Assignments in Scoreboard

Opening up the downloaded Scoreboard file will bring you to the main interface shown in Figure 9. There are many settings here, and we urge everyone to tinker with the options. Moving the cursor over the boxes with red triangles will produce a pop-up explanation. The quick settings on the far right hasten selecting settings ideal for homework and exams. The default setting will clear every selection. This walkthrough focuses on the task of creating individual assignments for the entire class using the CPI answer key.

Figure 9

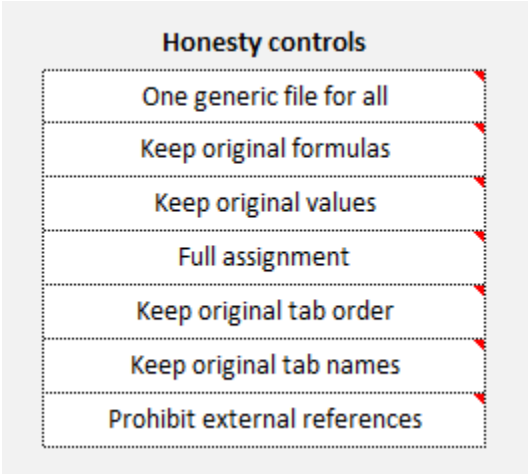


Starting from left to right, we begin with class info and student info, shown in Figure 10. All other descriptors will appear on each assignment except for the password and file prefix. Instructors can enter the course information, their name, and their school. The password you enter here will be used for future grading. Student info should only be entered if the instructor is making one general assignment for everyone to use. For example, the 'class task file explained in the integration overview is one such file. The name ''class task' gets entered into the first and last name. File prefix is a pulldown menu where instructors can select how the files are saved. First_last will save each file using the student's first and last name; the other option is by email.

Figure 10

Figure 11 displays a closer look at the honesty controls available to the instructor. The top box allows the instructor to choose between a generic file for everyone or individual assignments. Individual assignments require the roster shown in Figure 8. The second box lets faculty choose between keeping original formulas or "shift formulas down and over," which is what we choose. This function will move each student's assignment by a random number of rows and columns. Unused rows and columns will then be shrunk. This creates assignments that visually look the same but with different cell locations for formulas. This makes copying more difficult.

Figure 11

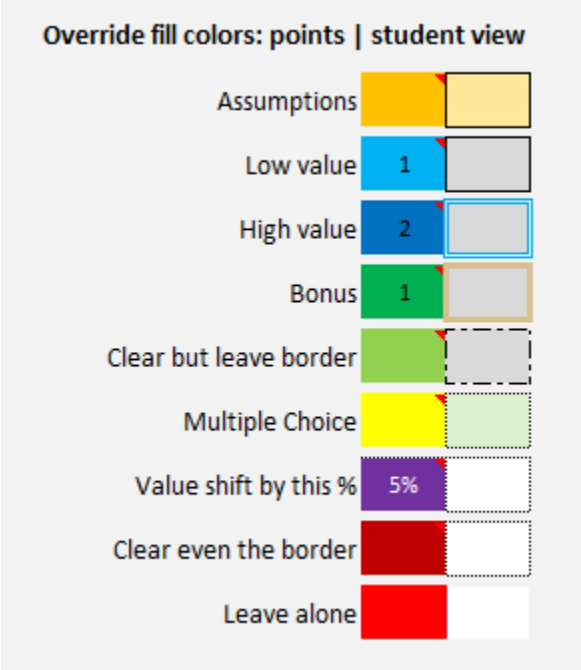


Keep original values lets the faculty keep all data values the same, or "vary values up to shift%". This function activates the purple-colored price values from the CPI assignment, and each student will have slightly different price data to work with. The full assignment tab is used to define the answer key as a complete assignment or a tab pool. Full Assignment is used in this example. Keep original tab order can be changed to randomize. If the sequence of questions is important, you can preserve the order or randomize the assignment order for another layer

of security. Keep original tab names can be selected, or they can be renamed to tabs A, B, C, and so on. Prohibit external references prevents copying from one workbook to another. The settings used in this example can be quickly chosen by selecting the "hw mode" button under quick settings shown in Figure 9.

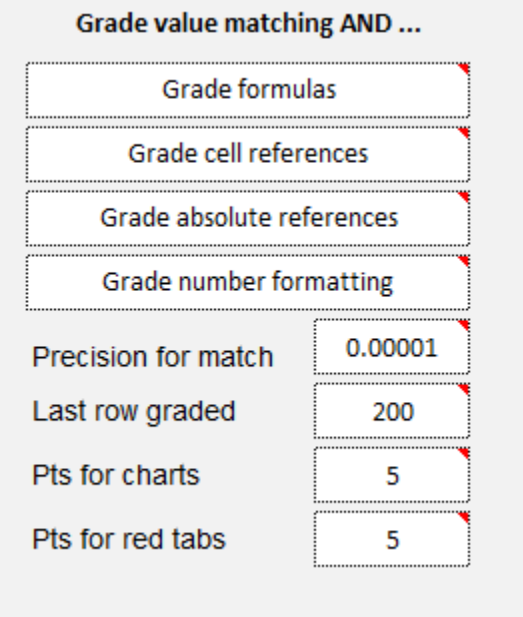
Figure 12 displays the standard colors you can use to color cells and their meanings. Explanations will display if you move your cursor over them. For this example, we only use the purple color with the price data. Here, we see the automatic percentage associated is 5%. This means the price data that is colored purple will adjust by up to 5% lower or higher. Instructors can enter different values here if they wish. Notable options are the points awarded for the blue and green colors. By coloring certain answers light or dark blue, you can alter how many points they are worth. This can be useful for emphasizing important concepts.

Figure 12



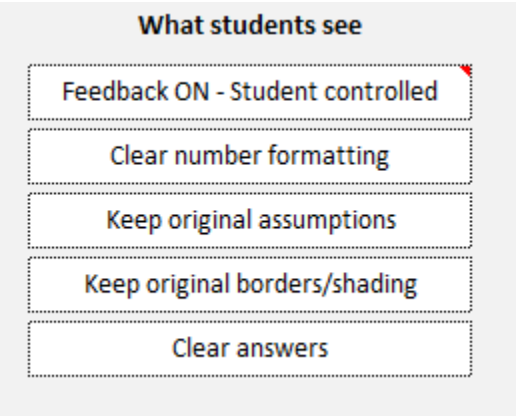
Scoreboard will grade entered answers based on the value of other criteria selected by the faculty. These options are shown in Figure 13. The default is to grade for the correct answer, using the correct formula, cell references, and formatting. All of these can be selected and disabled if the faculty desires. Disabling formulas, for example, will grade correct answers based on the value only and not the entered formula. Grading number formatting will require the currency format for the CPI basket cost, and the percentage format for the inflation calculations. We have found it useful to use this in class and on homework, but disable it for exams.

Figure 13



The last setting of interest is 'what students see.' This is displayed in Figure 14. For simplicity, we only focus on the first box. This allows the faculty to choose how feedback is provided. Feedback can be enabled or turned off. There are options for the student to turn on the feedback, or it can be forced off (used for exams). There is also a taunting feedback option, which adds some silly flair to the feedback. For the CPI assignment example, we choose 'feedback off' – student controlled.

Figure 14



When finished selecting settings, you can create the assignments, which are called 'start files'. Figure 15 shows the entered class information for this example. The 'hw mode' quick setting is used, and the simple password 'econ1234' is used. Selecting ''create start file' will begin the process. The first window that opens will direct the user to select their coded answer key file. This is the completed assignment made by the instructor. The second window directs the user to select their course roster. The final step is to choose the location for the created assignments. Scoreboard will produce a window once the assignment creation is complete. According to

Figure 16, this CPI assignment with the roster of three students took 29 seconds to complete.

Figure 15

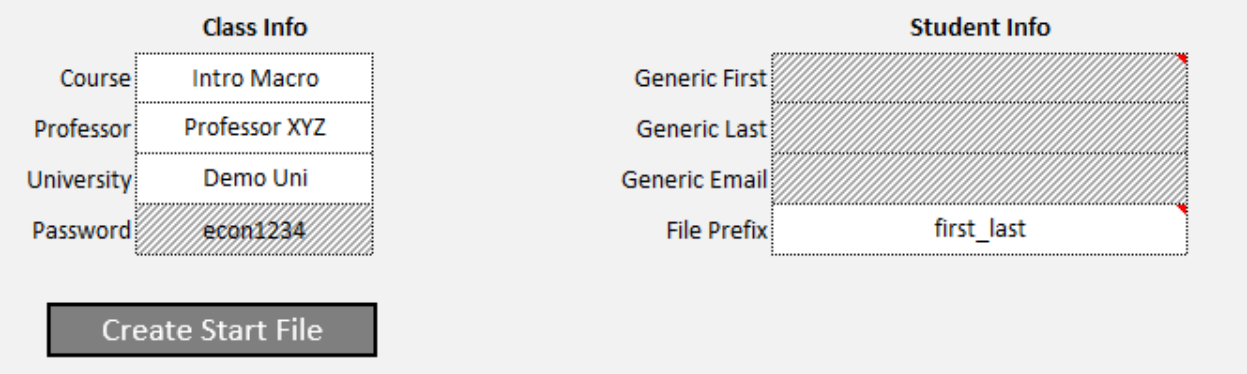
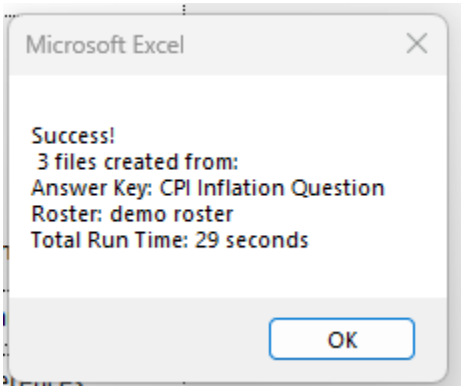


Figure 16

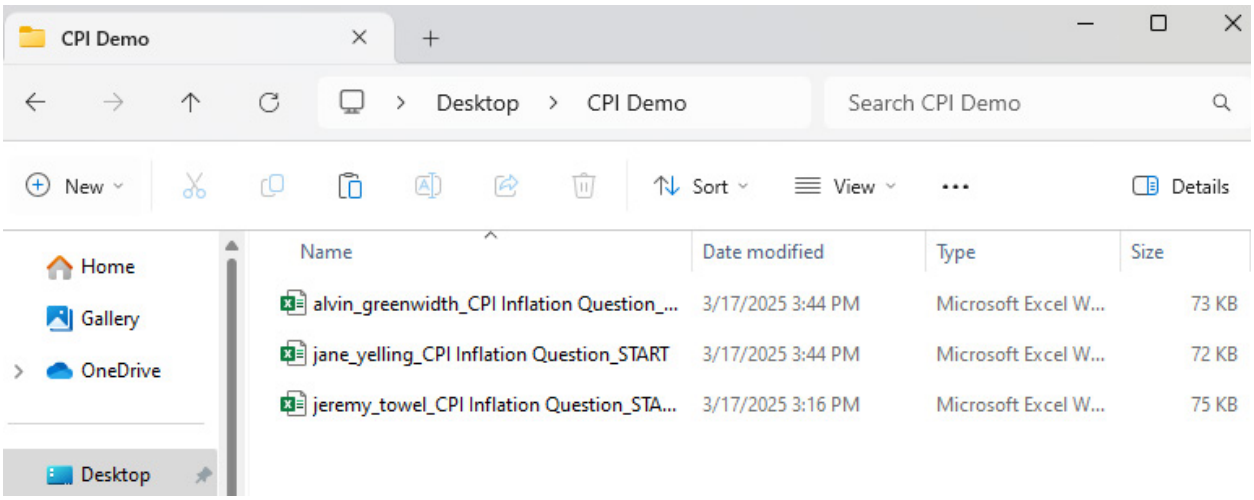


Faculty can then distribute these assignments as they choose. Using the course's learning management system is an efficient way to locate assignments in one place. The instructor in this example uses Canvas. They created folders for assignments in their school's cloud storage and linked the folder to Canvas for students to download. They then make an assignment in the learning management system requiring a file upload. This is where the students send their assignments when completed.

4.4 – Reviewing the Assignments

Figure 17 displays the student assignments in the directory made for this example. The assignments are named for each student based on the roster input and the chosen file prefix setting.

Figure 17



Figures 18 and 19 display the same inflation question for two students: Jeremy and Jane. Figure 18 represents Jeremy's assignment. We can see the gray boxes where students enter answers; these are the formulas that were entered in the answer key. In the top right, the feedback off option is visible. This can be selected and turned on from this interface.

Figure 18

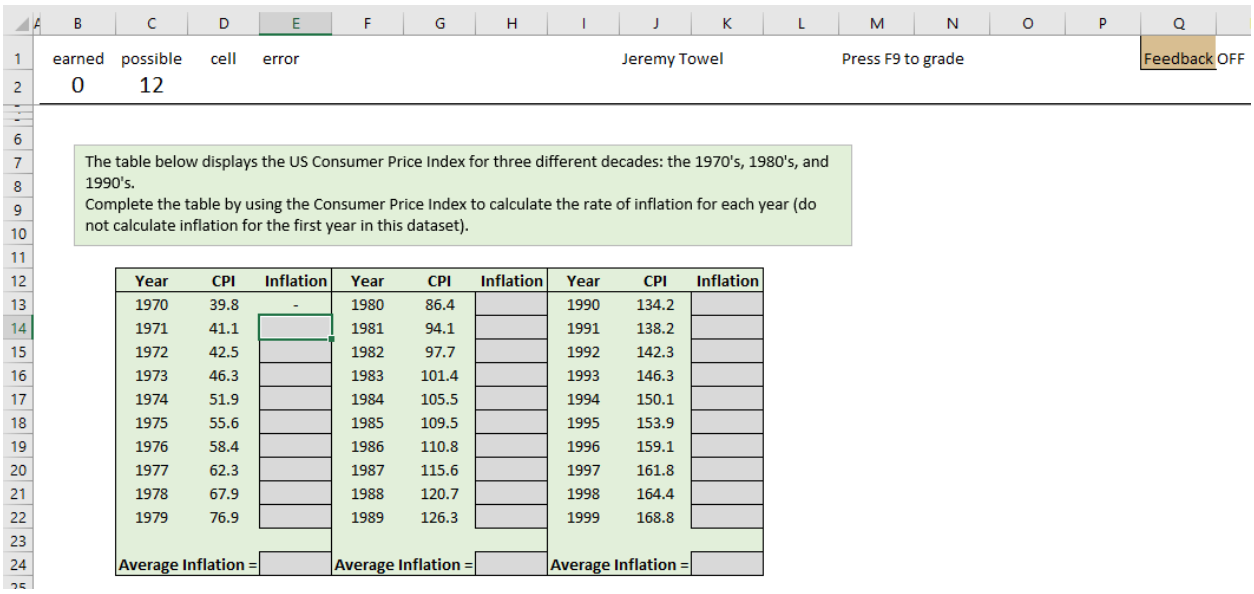
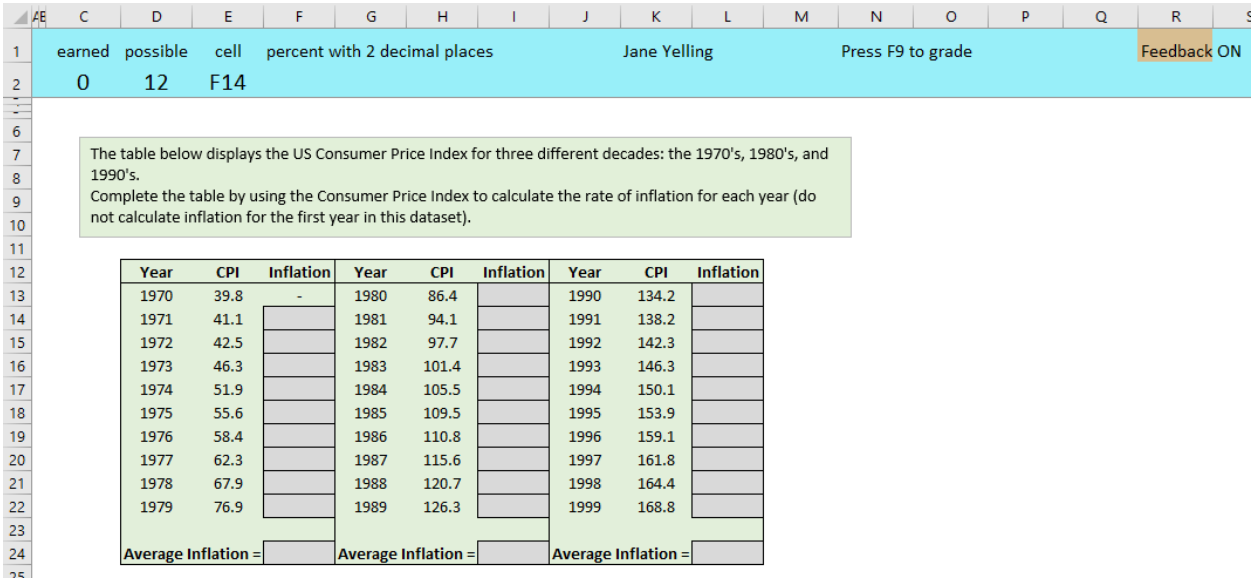


Figure 19



	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	earned	possible	cell	percent with 2 decimal places					Jane Yelling			Press F9 to grade				Feedback ON
2	0	12	F14													

The table below displays the US Consumer Price Index for three different decades: the 1970's, 1980's, and 1990's.
Complete the table by using the Consumer Price Index to calculate the rate of inflation for each year (do not calculate inflation for the first year in this dataset).

Year	CPI	Inflation	Year	CPI	Inflation	Year	CPI	Inflation
1970	39.8	-	1980	86.4		1990	134.2	
1971	41.1		1981	94.1		1991	138.2	
1972	42.5		1982	97.7		1992	142.3	
1973	46.3		1983	101.4		1993	146.3	
1974	51.9		1984	105.5		1994	150.1	
1975	55.6		1985	109.5		1995	153.9	
1976	58.4		1986	110.8		1996	159.1	
1977	62.3		1987	115.6		1997	161.8	
1978	67.9		1988	120.7		1998	164.4	
1979	76.9		1989	126.3		1999	168.8	
Average Inflation =			Average Inflation =			Average Inflation =		

Figure 19 represents Jane's assignment, in which we have turned the feedback on. The values for the CPI in Jane's assignment are the same as Jeremy's, but the formula shift setting renders them unidentical. For Jane, the answer for 1971 inflation is to be entered in cell F14, whereas the same answer for Jeremy is in cell E14. Every formulaic answer will be slightly different between the two students.

Figures 20 and 21 show the CPI basket question for Alvin and Jane. This question used the purple cell color to shift the price values. Both students have the same question using the same basket of goods, but the price values differ. As such, each student will have different basket costs and different CPIs, yet the process to solve remains the same.

Figure 20

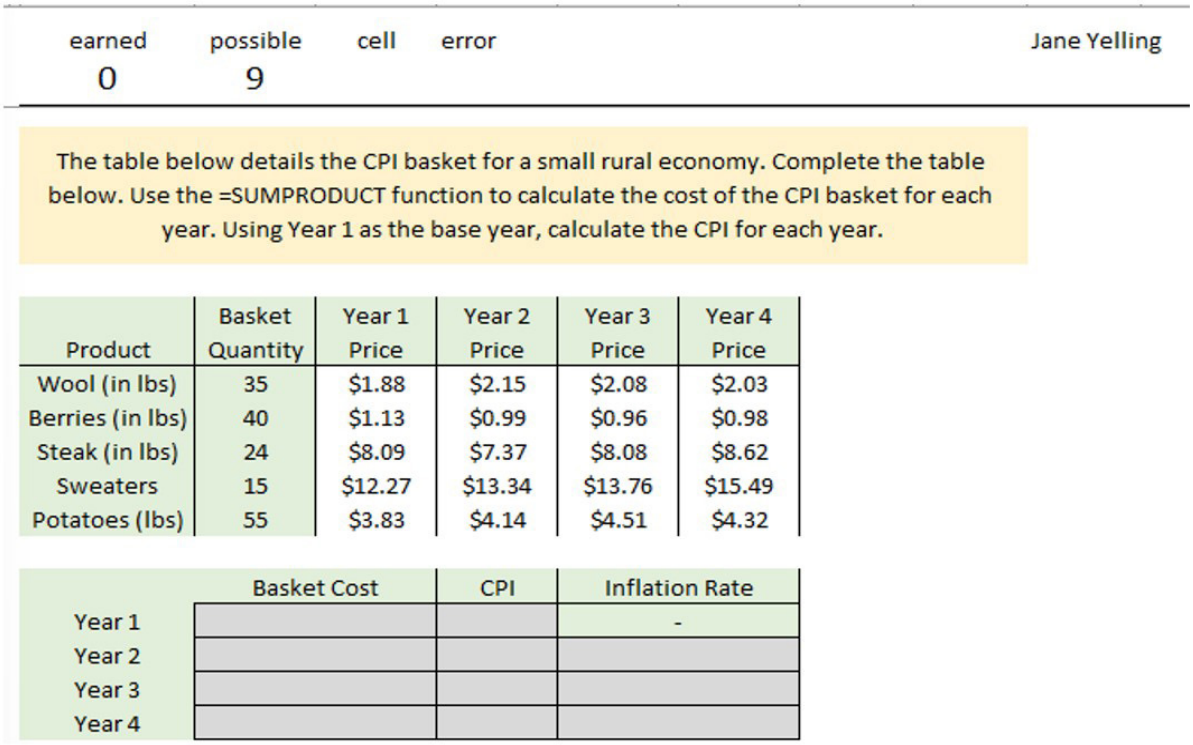
earned	possible	cell	error	Alvin Greenwidth
0	9			

The table below details the CPI basket for a small rural economy. Complete the table below. Use the =SUMPRODUCT function to calculate the cost of the CPI basket for each year. Using Year 1 as the base year, calculate the CPI for each year.

Product	Basket Quantity	Year 1 Price	Year 2 Price	Year 3 Price	Year 4 Price
Wool (in lbs)	35	$1.94	$2.17	$2.14	$1.96
Berries (in lbs)	40	$1.11	$0.98	$0.94	$0.99
Steak (in lbs)	24	$8.03	$7.30	$8.10	$8.32
Sweaters	15	$12.00	$13.14	$13.76	$15.07
Potatoes (lbs)	55	$4.06	$4.08	$4.52	$4.33

	Basket Cost	CPI	Inflation Rate
Year 1			-
Year 2			
Year 3			
Year 4			

Figure 21



earned	possible	cell	error	Jane Yelling
0	9			

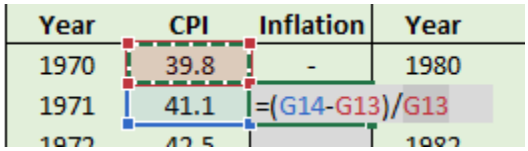
The table below details the CPI basket for a small rural economy. Complete the table below. Use the =SUMPRODUCT function to calculate the cost of the CPI basket for each year. Using Year 1 as the base year, calculate the CPI for each year.

Product	Basket Quantity	Year 1 Price	Year 2 Price	Year 3 Price	Year 4 Price
Wool (in lbs)	35	$1.88	$2.15	$2.08	$2.03
Berries (in lbs)	40	$1.13	$0.99	$0.96	$0.98
Steak (in lbs)	24	$8.09	$7.37	$8.08	$8.62
Sweaters	15	$12.27	$13.34	$13.76	$15.49
Potatoes (lbs)	55	$3.83	$4.14	$4.51	$4.32

	Basket Cost	CPI	Inflation Rate
Year 1			-
Year 2			
Year 3			
Year 4			

Suppose Alvin begins solving his CPI question. Figure 22 illustrates the cell operation for calculating inflation in 1971. This formula is the traditional textbook formula.

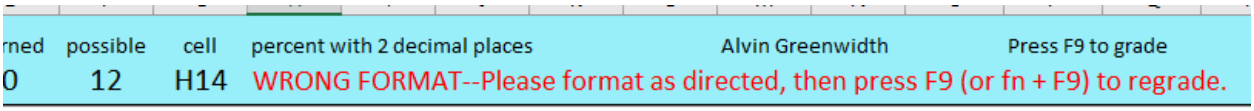
Figure 22



Year	CPI	Inflation	Year
1970	39.8	-	1980
1971	41.1	=(G14-G13)/G13	
1972	42.5		1982

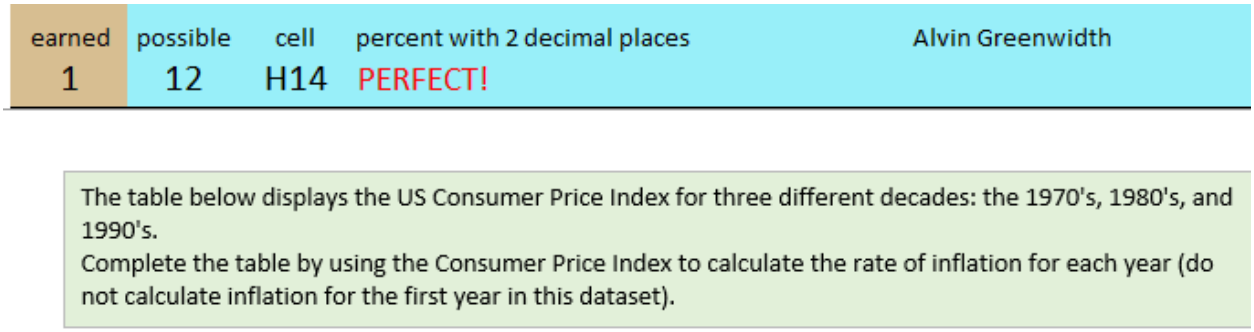
Upon entering his answer, the cell is highlighted yellow. This indicates that the answer is correct, but the formatting is wrong. The feedback present in the top bar provides the clue percent with two decimal places. There are also instructions at the top right of the screen for re-grading.

Figure 23



If Alvin changes the format of the answer to a percentage with two decimal places, he can successfully re-grade. This is done by selecting the F9 button or Function+F9 on the keyboard. The successful adjustment is displayed in Figure 24. When this is completed, the correct answer will turn green, and the earned point will appear in the top bar.

Figure 24



Copying formulas across similar cells is permissible and encouraged. This highlights another efficient usage of Excel in multiple calculations. By clicking the lower right corner of the first answer and dragging it down, Alvin can apply the formula to the next answer while preserving the format. This is shown in Figures 25 and 26.

Figure 25

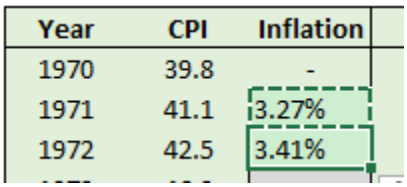
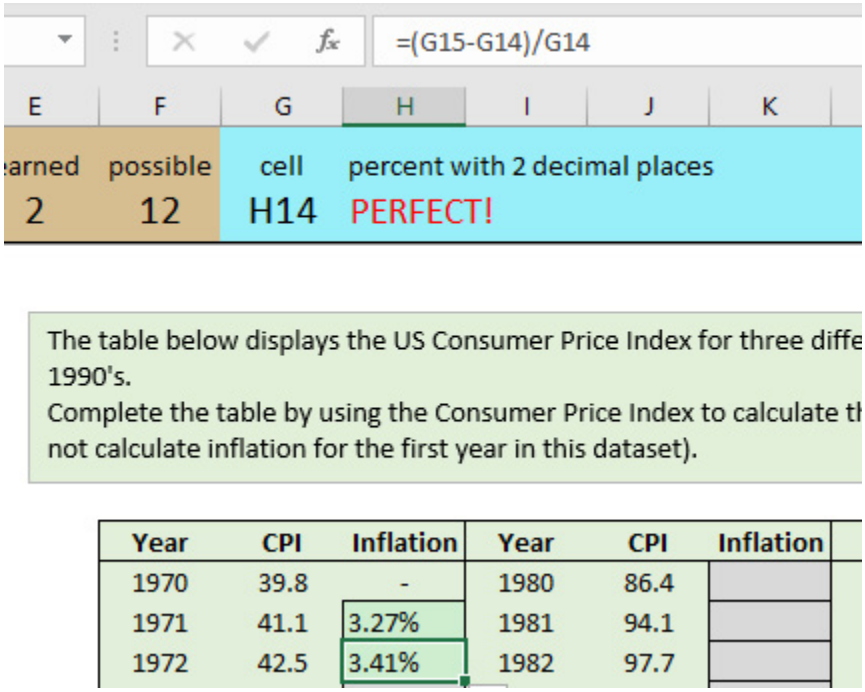


Figure 26



Suppose Alvin would rather calculate inflation by hand. If he types 3.41% into the cell for 1972 inflation, the cell turns pink, indicating it is incorrect. This example is illustrated in Figure 27. The feedback specifies that a formula is missing, suggesting he revisit his answer with formulas. If the cell operation is not important and the instructor only cares for the correct answer, the 'grade cell references' setting shown in Figure 13 should be disabled at assignment creation.

Figure 27

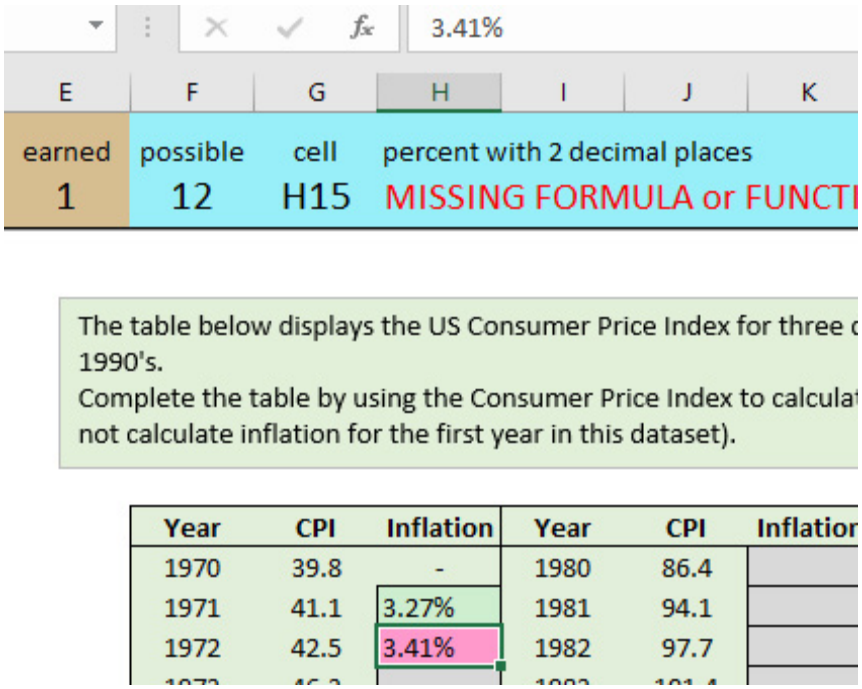


Figure 28 shows Alvin's CPI basket calculation. In this example, he entered the requested formula but still made an error. The message that appears is that the value is too high; please try again.

Figure 28

earned	possible	cell	currency/accounting with 2 decimal places
0	9	F18	Value too high, please try again.

The table below details the CPI basket for a small rural economy. Complete the ta
below. Use the =SUMPRODUCT function to calculate the cost of the CPI basket for e
year. Using Year 1 as the base year, calculate the CPI for each year.

Product	Basket Quantity	Year 1 Price	Year 2 Price	Year 3 Price	Year 4 Price
Wool (in lbs)	35	$1.94	$2.17	$2.14	$1.96
Berries (in lbs)	40	$1.11	$0.98	$0.94	$0.99
Steak (in lbs)	24	$8.03	$7.30	$8.10	$8.32
Sweaters	15	$12.00	$13.14	$13.76	$15.07
Potatoes (lbs)	55	$4.06	$4.08	$4.52	$4.33

	Basket Cost	CPI	Inflation Rate
Year 1	711.85		-

If Alvin does try again, it should be easy to spot where the error was made. If the student reflects on their notes, they should recall that the calculation for the CPI basket for year 1 is the prices from year 1 multiplied by the basket quantities and summed. By clicking on his incorrect answer, Excel visualizes what he had selected. This is shown in Figure 29. It is obvious that the year 2 prices were mistakenly selected, allowing Alvin to adjust his calculation.

Figure 29

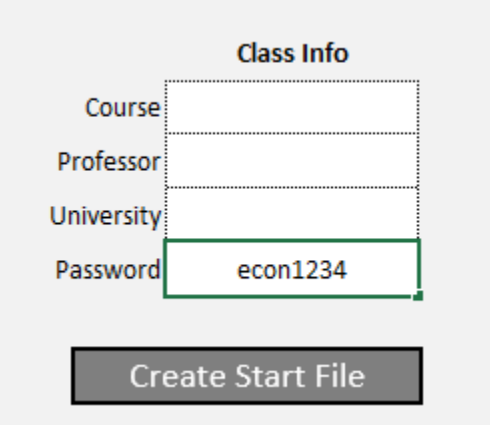
Product	Basket Quantity	Year 1 Price	Year 2 Price	Year 3 Price
Wool (in lbs)	35	$1.94	$2.17	$2.14
Berries (in lbs)	40	$1.11	$0.98	$0.94
Steak (in lbs)	24	$8.03	$7.30	$8.10
Sweaters	15	$12.00	$13.14	$13.76
Potatoes (lbs)	55	$4.06	$4.08	$4.52

	Basket Cost	CPI	Inflation
Year 1	=SUMPRODUCT(F11:F15,H11:H15)		-

4.5 – Grading Assignments

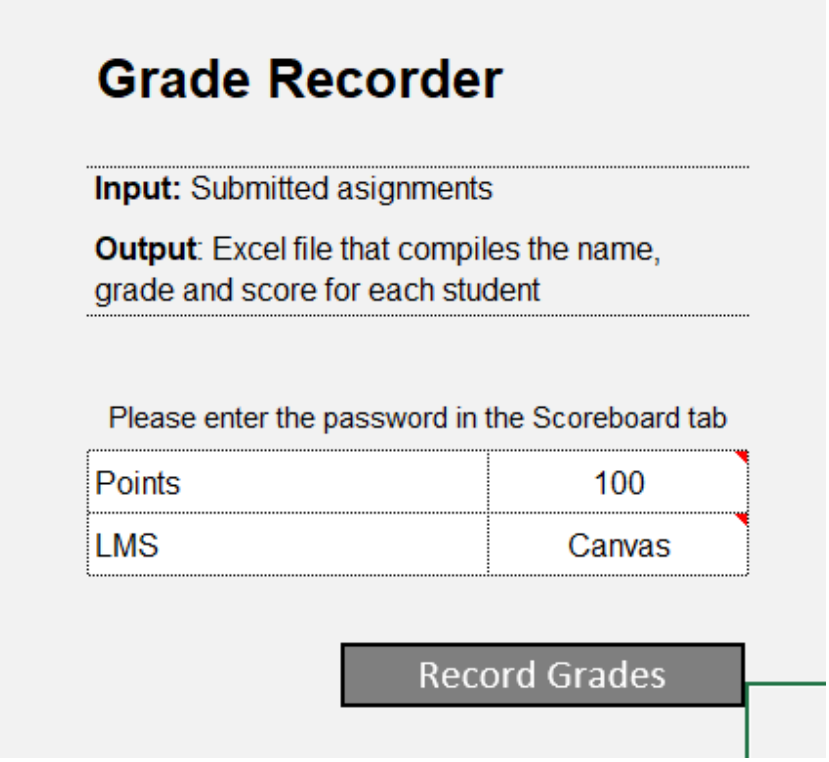
Once the deadline has passed, instructors should download the class assignment from their learning management system. If the folder is compressed, unzip it so the files can be accessed. To begin grading, open up the Scoreboard master file and enter the password created when the assignment was made. This is illustrated in Figure 30.

Figure 30



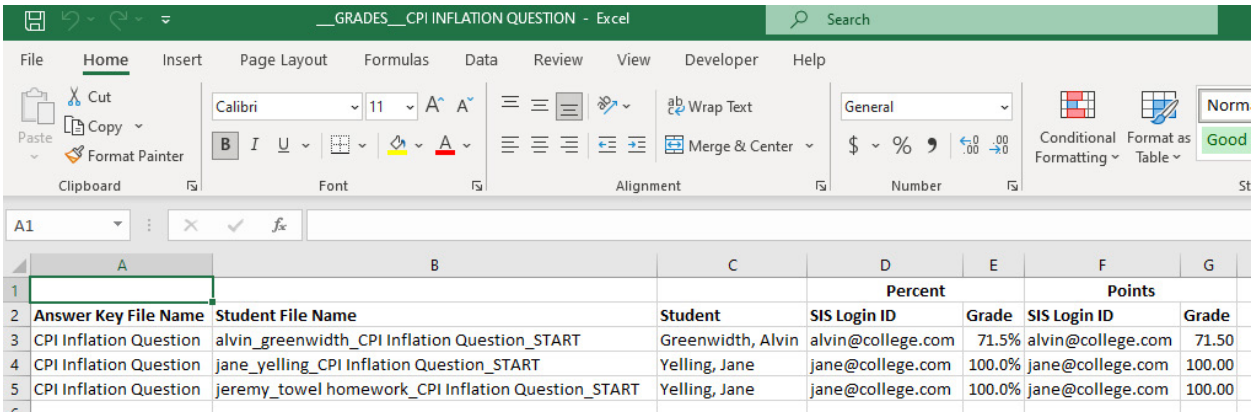
Select the Recorder tab at the bottom. Figure 31 displays the selection criteria. Instructors can define the number of points the assignment is worth and select their learning management system for output that better matches their learning management system's gradebook. Select record grades to begin. The first window will ask you to select the assignments to grade; the second prompt will let you choose where to save the gradebook that is generated.

Figure 31



Before we discuss the gradebook output, let us make some assumptions. Assume Alvin completed his assignment with some errors. Jane diligently solved her entire assignment flawlessly. Jeremy asked Jane for help, and she sent him her file as a guide. Jeremy saved Jane's file and renamed it as his own. Instances like this will look like Figure 32.

Figure 32



	A	B	C	D	E	F	G
1				Percent		Points	
2	Answer Key File Name	Student File Name	Student	SIS Login ID	Grade	SIS Login ID	Grade
3	CPI Inflation Question	alvin_greenwidth_CPI Inflation Question_START	Greenwidth, Alvin	alvin@college.com	71.5%	alvin@college.com	71.50
4	CPI Inflation Question	jane_yelling_CPI Inflation Question_START	Yelling, Jane	jane@college.com	100.0%	jane@college.com	100.00
5	CPI Inflation Question	jeremy_towel homework_CPI Inflation Question_START	Yelling, Jane	jane@college.com	100.0%	jane@college.com	100.00

The gradebook in Figure 32 shows Alvin's performance in row 3. Rows 4 and 5 have different student file names but the same listed student, Jane. Each unique student file is associated with the student it was created for, and renaming files will not change that. This signals two things: one student is submitting someone else's work, and students should be warned not to share their files. From this point, grades can be entered into online gradebooks, copied to other spreadsheets the faculty might use, or merged/uploaded into the learning management system.

5. Concluding Remarks

Scoreboard for Excel can be used in many applications. One author has employed it as described above and incorporated it with exams. The student reception has been positive. The practical use of spreadsheet programs is a valuable skill applicable to various courses, internships, and jobs. The game-like nature of earning points and receiving feedback is motivating and fun. The adaptability of this program can be applied to many quantitative course applications. Besides GDP, CPI/Inflation, and employment, other areas where it has been used in intro macroeconomics courses include economic growth (rule of 70, long-run average growth, compound growth); reserve banking (t-accounts with a defined percentage of reserves held); aggregate expenditures (MPC calculations, multiplier calculations, and equilibrium GDP). Faculty can create a vast array of unique assignments using this program, requiring minimal time spent on grading, which ultimately allows for more time to discuss and teach economics.

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