Enhancing EVIEW Programming Development in Economic Practice Classrooms 4.0 through a Deviation from Proportional Growth (DPG) Analysis

Van Chung Nguyen

*Abstract***:** *Enhancing Eview program development as well as extended programs in economic analysis in the 21st century is extremely necessary for university students during practical business lessons. Furthermore, Eview program development will help students apply their theoretical knowledge to make inferences based on logic and trends from given sets of data as well as complete their course project. This article conducts extensive program analysis of Eview software to help students gain the ability to aggregate and analyze big data to meet the extremely diverse economic development seen nowadays. The article builds a specific segment program based on DPG analysis for a case of four developed countries and builds up 32 specific steps for students to complete all stages from theory to practice. It also examines student feedback on their experience in learning in the economic practice classrooms 4.0 at 32 Business school in Vietnam.*

*Keywords***:** *Economic; Eview programing; Practical class; 21st century; Classroom 4.0*

I. INTRODUCTION

In the field of economic research, quantitative methods are most commonly used by researchers. However these methods are quite complex, and are supported by various software application to process data in the most accurate way. Eview software is considered the most effective way due to it simple, flexible and effective characteristics. This software is not only the choice of many students and lecturers, but it is also useful for professional researchers. Today, in Industry 4.0, students and lecturers need to have many of skills in using research software to complete their projects. According to Fisk (2017), there are two important trends related to Education 4.0. First, students will be exposed to more project-based learning. Students are required to apply their knowledge and skills in completing a number of short term projects. Second, students will be exposed to data interpretation in which they are required to apply their theoretical knowledge to numerical data and use their reasoning skills to make inferences based on logic and trends from given sets of data.

The manual part of mathematical literacy will become irrelevant as computers will perform the statistical analysis and predict the future trends. In business practice Classroom 4.0 students also need to extent programming skills for software to be able to analyze big data correctly. Dunwill (2016) pointed out that the advancement of technologies keeps on changing and transforming teaching methods and the learning process. Some of the common changes that have been embraced by institutions include lecturers posting student grades and online assignments, as well as student use collaborative software/applications to complete group tasks (Hussin, 2018). In this article, we propose an extensive programming section for teaching in practical classes for business students.

II. LITERATURE REVIEW

In the 1990s, teaching and learning economics in the practice room was quite limited and less popular (Siegfried and Round, 2001). Application of economics in practical lessons is less appreciated, especially the technical aspects (Becker and Watts, 1998). In Vietnam, this cycle tends to be slower than in developed countries by about 20 years. When the technical sectors are quite active, the economic studies are quite limited since they are still very theoretical and little practiced. Therefore students were not excited by their business classes. From the 1990s onward, a number of authors tended to write economics books focused on practical exercises, e.g., Keenan and Maier, 1995; Porter and Riley, 1995; Bergstrom and Miller, 1997. Typically, some authors have written about economics including intensive applications of economics such as Chenery (1960) with a title related to inter industry economics. The study of economic applications to national policies becomes extremely necessary, especially in the pre-industrialization period. Those research studies gave valuable lessons for countries with slower-growing industries. Among them is Chen (1989) who wrote about DPG (Deviation from Proportional Growth) analysis and the patterns of industrial development in Japan and Taiwan.

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In his paper, Chen carefully analyzed the correlation between economic sectors to help policy makers find the most effective way for their nation to develop where the economy is a leading sector. Effective economic sectors are mentioned by the author as a metaphorical life buoy for all industries. Many complex methods of technical analysis allow economists to find new things.

However, with the growing amount of data in the 21st century, application of information technology to economic analysis is necessary. It is a huge obstacle for economics students who are only strong in the theory, but not in analytical programming. Therefore, the demands of economic students in the 21st century are extremely challenging. It is difficult to create practical classes for economics. Therefore, in this article, we propose an Eview methodology of teaching practical skills to economics students.

III. METHODOLOGY AND DATA COLLECTION

3.1. Scoping and Study site

This study aims to improve the practical capacity of business students. Alternatively, helping students to use information technology for data analysis software in economics to meet the requirements in the 21st century will involve artificial intelligence and Technology 4.0. In order to analyze an increasingly large amount of data in economics, business students have to have extensive programming knowledge using specialized software. Finally, the scope of this study is promoting creativity of students in accurate economic predictions in the 21st century.

3.2. Sampling and Data Collection

In this study we use data from the World Input – Output Database (WIOD). Although, almost countries in the world have national input-output tables, it is hard to make comparisons between countries because there is imbalance among those countries when compiling national level. Data from the World Input-Output Database (WIOD) is extremely reliable and highly consistent. It covers forty-three countries. However, in this study we examined four developed economies, Australia, Japan, Korea and Taiwan.

Each output table has a total of 35 sectors with a matrix size of 35x35, which is very large. It is difficult for students to analyze such data using normal methods. This article will help economic students to become familiar with big data analysis using data from the WIOD. Furthermore, we try to simultaneously apply C programming in Eview to extend software to create excitement and more effective work while doing research in economics practice class.

To measure the student's ability to apply methods in practice, we use a sample size of 123 students then let them do their own projects. Additionally, we also conducted direct interviews with these 123 students after the course.

3.3. Methodology

According to Chen Kuang-hui and Kiyoshi Fujikawa, (1992) a version of DPG analysis can be used to quantitatively identify patterns of growth in terms of "Deviations from Proportional Growth". This is presented and applied to the I-O data of Japan, Korea and Taiwan during the period 1980 1990. A deviation from proportional growth still plays an important role to help policy makers find

bottlenecks in their economy to help them address the rapid growth of the world economy. In the era of 4.0, incorporating information technology into this method will help researchers as well as university students to handle this information in the most accurate and fastest way. In this article, we use programming in the Eview extension software as a tool to help students promote their creativity in the 4.0 era.

Based on the input output tables of 43 countries, we selected four developed countries with similar economic structures, then analyzed 35 economic sectors from 1995 to 2009 using DPG analysis to help student understand the economic development process. However, this is an extremely large dataset that conventional economic methods cannot handle. Therefore, we conducted research using a combination C language programming and extension programming in Eview to address this problem. This programming also helps students complete their projects more easily.

In this article, we use some typical methods and a specific simulation case to improve the application. We used information technology programming to solve some problems in economics with increased accuracy in a business practice Classroom 4.0. There are four specific methods used in the lesson. They are a graphical method, a time series method of using graphs, calculation of inflation values and a conversion to base price applying C programming and Eview programming extension software.
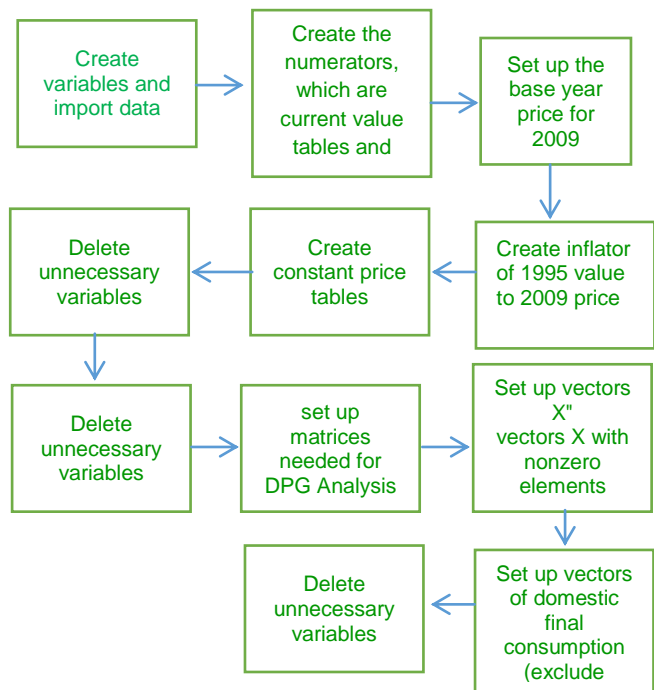

Fig.1. Eview programming extension software diagram

Figure 1 depicts the Eview programming extension software diagram to show students how to conduct a project. In this paper we used DPG analysis simulation to compare economic development of four countries with 35x35 dataset matrices. There were 35 sectors represented for each nation's economy. Following the diagram, students have to create variables and import data, then create the numerators, which are current value tables and denominators.

This is the previous year's price. The next step is to set up the base year price as 2009 and create constant price tables. The students also need to delete unnecessary variables. The next very important step is to set up the matrices needed for DPG analysis and set up X" and X vectors with nonzero elements. Then, they set up vectors for domestic final consumption excluding investments and stocks.

The final step is to delete unnecessary variables to clear the program.

Table 1: 32 specific steps help students complete all stages from theory to practice.

Steps	Content	Steps	Content
Step1.	'create variables and import data	Step17.	create inflator of 1996 value to 2009
Step2.	import data for the year 2005:	Step18.	create inflator of 1995 value to 2009
Step3.	create the numerators, which are current value tables and denominators, which are previous year price tables for each year	Step19.	create constant price tables
Step4.	set up the base year price to 2009	Step20.	delete unnecessary variables
Step5.	create inflator of 2008 value to 2009 price	Step 21.	set up matrices needed for DPG Analysis
Step6.	create inflator of 2007 value to 2009 price	Step 22.	set up intermediate matrices, A matrix
Step7.	create inflator of 2006 value to 2009 price	Step 23.	set the variables' names (already exist, only useful for next commands)
Step8.	create inflator of 2005 value to 2009 price	Step 24.	set up vectors X"
Step9.	create inflator of 2004 value to 2009 price	Step 25.	vectors X with nonzero elements
Step10.	create inflator of 2003 value to 2009 price	Step 26.	set up import coefficient matrices
Step11.	create inflator of 2002 value to 2009 price	Step 27.	set up vectors of final domestic consumption (excluding investments, stocks and exports)
Step12.	create inflator of 2001 value to 2009 price	Step 28.	set up numbers of fully imported and domestic consumption (excluding investments, stock and exports)
Step13.	create inflator of 2000 value to 2009 price	Step 29.	set up diagonal matrices of import coefficients for final consumption
Step14.	create inflator of 1999 value to 2009 price	Step 30.	set up diagonal matrices of import coefficients for investments
Step15.	create inflator of 1998 value to 2009	Step 31.	set up matrices of change in stocks and exports
Step16.	create inflator of 1997 value to 2009	Step 32.	delete unnecessary variables

The Eview programming extension software diagram is shown in Figure 1 to give students an overview of the process. In Table 1 we show 32 specific steps that students

use to complete all stages from theory to practice. During the student work in the practical classroom, we realized that more specific directions improve student understanding and the quality of their projects. The 32 steps in Table 1 are an important bridge to help students program the Eview extension software to use big data in their projects.

IV. RESEARCH RESULTS AND DISCUSSION

4.1. Results obtained from the main program

After completing the program, we obtained the results shown in Figure 2 below.
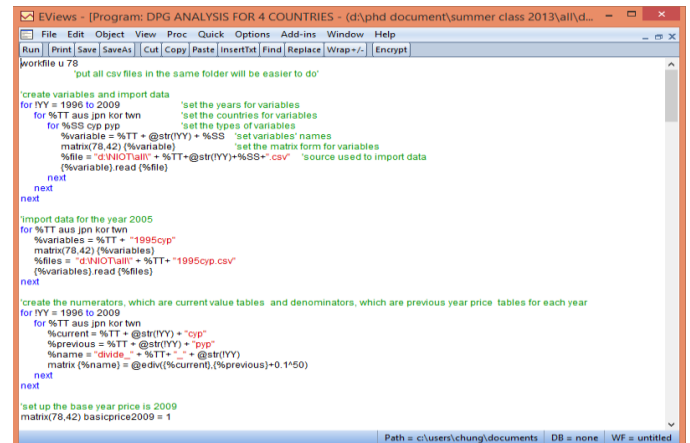

Fig.2. Eview programming: DPG analysis for four countries

The program starts with the command line "work file u 78" then proceeds to create variables and enter data. The data must be a csv (comma separated variable) file. Next, students follow the 32-step sequence shown in Table 1. C programming knowledge is needed to write this type of program. Other programming languages such as java are helpful, as well as knowledge of economics.

After finishing the programming, the students run their programs and call the resulting data as shown in Figure 3 below.
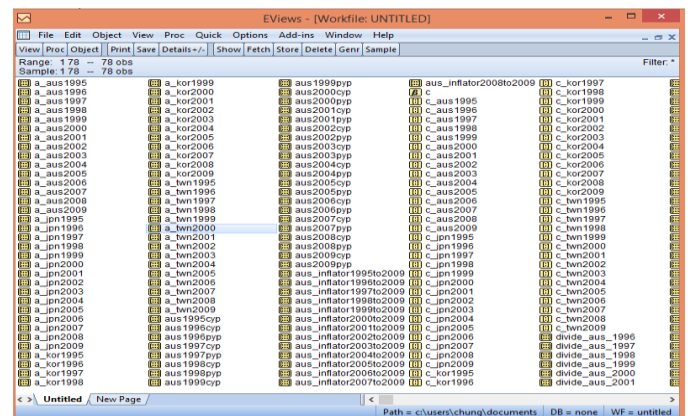

Fig.3. Eview workfile

Various commands used in the Eview Program window will show different results as shown in Figure 3. Figure 3 present very complicated results. In fact, students sometime cannot understand how to use or process the results in the practical classroom. To solve this problem, we provided an efficient solution that graphically compares results.

Therefore, users must open each file in the workfile window and then click on a graph button. In the graph window, users can select a viewing method the matches the content to be analyzed.

4.2. Comparing results over time

In fact, during the practical classes, many students were still confused about analyzing business situations with big data and handling the results,

even though the software provided them with results. To overcome this problem, we compared results over time to help students organize the results in reasonable way for analysis. We used the data obtained from World Input-Output Database and a combination of the methods above to compare graphical results over time for the four countries studied in the current work. The results are shown in Figures 4-7 for the economic development of Taiwan Australia, Japan and Korea, respectively. Each economy had 35 sectors and the data was for 1995. Figure 8 gives a color coded key to reveal the sector that each line represents.
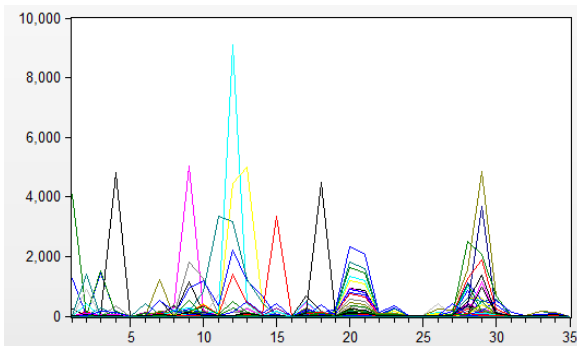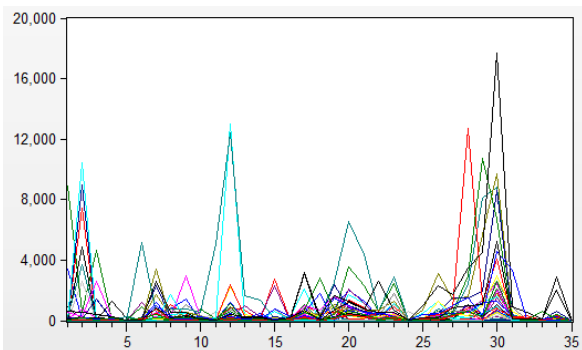

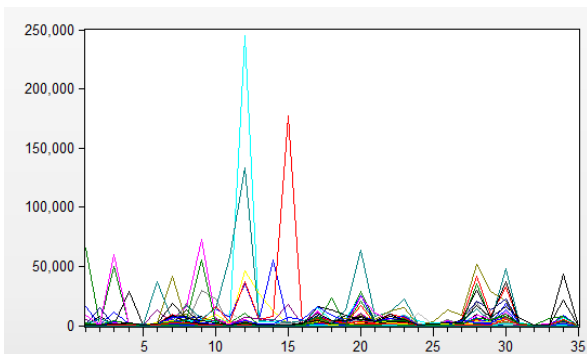**Fig.4. Taiwan economy - 1995**

Fig.5. Australia economy – 1995
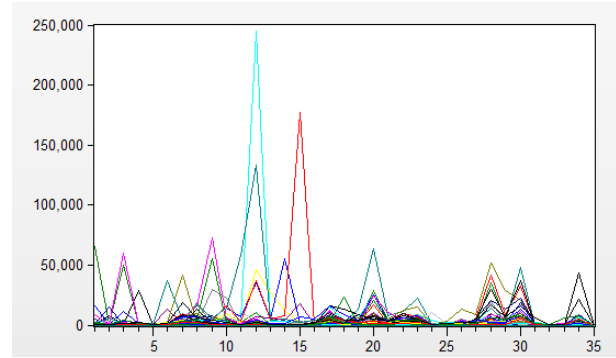

Fig.6. Japan economy - 1995
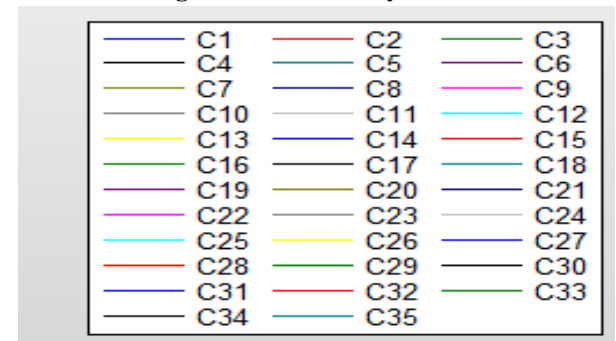

Fig.7. Korea economy - 1995

Fig.8. 35 Sector representations

4.3. Calculating the value of inflation

Many universities are shifting from theoretical teaching methods to more practical ones. However, it has been difficult for small and medium size universities, especially those in remote areas. Educational policy makers are working to transition from theory to practice to meet the requirements of Education 4.0. However, there is still a big gap between the practice in schools and work outside of school. Therefore, we try to help economics students to gain practical experience by themselves while they still enrolled in their university. One of biggest problems when economic student do their projects in Classroom 4.0 is that they do not know how to calculate inflation using Eview programming. That is the reason we emphasize calculation of the yearly inflation value for these four countries, thereby helping students approach reality in a more comprehensive way. To calculate the inflation values from 1995 to 2009, we calculated inflation values by year according to the structure shown in Table 2.

Table 2: Create inflator programming

S1	create inflator of 2007 value to 2009 price	for %TT aus jpn kor twn
		    %varia = %TT + "_inflator" +"2007to2009"
		    matrix {%varia} = @emult(divide_{%TT}_2008,{%TT}_inflator2008to2009)

S2	create inflator of 2006 value to 2009 price	for %TT aus jpn kor twn
		    %varia = %TT + "_inflator" +"2006to2009"
		    matrix {%varia} = @emult(divide_{%TT}_2007,{%TT}_inflator2007to2009)

S3	create inflator of 2005 value to 2009 price	for %TT aus jpn kor twn
		    %varia = %TT + "_inflator" +"2005to2009"
		    matrix {%varia} = @emult(divide_{%TT}_2006,{%TT}_inflator2006to2009)

S4	create inflator of 2004 value to 2009 price	for %TT aus jpn kor twn
		    %varia = %TT + "_inflator" +"2004to2009"
		    matrix {%varia} = @emult(divide_{%TT}_2005,{%TT}_inflator2005to2009)

Sn	create inflator of yearn value to 2009 price	for %TT aus jpn kor twn
		    %varia = %TT + "_inflator" +"yearnto2009"
		    matrix {%varia} = @emult(divide_{%TT}_2005,{%TT}_inflatoryearnto2009)

4.4. Converting to base price

Converting base price is an extremely practice when comparing data over time.

However, it is still not easy for students to use conventional methods with big data. We propose an alternative to conventional calculations using Eview programming with big data. However, the user must fluently use both economic and technical knowledge. This is very necessary because students as well as researchers will very easily make errors if they do not use the base price. To do this, we wrote an Eview program as follows:

Table 3: Set up the base year price program

S1	'set up the base year price is 2009	matrix(78,42) basicprice2009 = 1

S2	create inflator of 2008 value to 2009 price	for %TT aus jpn kor twn
		    %varia = %TT + "_inflator" +"2008to2009"
		    matrix {%varia} = divide_{%TT}_2009

S3	'create constant price tables	for !YY = 1995 to 2008
		  for %TT aus jpn kor twn
		    %current = %TT + @str(!YY) + "cyp"
		    %inflator = %TT + "_inflator" + @str(!YY) + "to2009"
		    %variable = "rv_" + %TT +"_" + @str(!YY) + "at2009price"
		    matrix {%variable} = @emult({%current},{%inflator})

4.5. Student Feedback

After completing the Eview programming development course in economic practice Classrooms 4.0 through a DPG analysis, a survey was administered. We also evaluated students on the basis of their actual project. The purpose of the evaluation was to get the students' feedback on their experience as well as evaluate complete project abilities of the students after finishing the course. All 1230 students from 32 business school in Viet Nam participated in the survey and evaluation. In terms of Eview programming, 82% of the students found the learning of the Eview programming very interesting and 18% found it as average. Of these, 52% student could write the main program well and apply it to other projects. 28% of the students could write the program, although with some errors. 10% student could not apply this method to other projects. In terms of comparing results over time, 72% of the students found learning Eview programming very interesting and 28% found it as average. Of these, 42% of the students could compare results over time and apply this to other projects. 38% of the students could compare results over time, but with some errors. 10% of the students could not apply this program to other projects. In terms of calculating the value of inflation and converting to base price, 62% of the students found learning how to calculate inflation and converting to base price very interesting and 38% found it as average. Of these, 42%

students were able to calculate the inflation rate, convert to base price and apply their knowledge to other projects. 38% of the students could calculate the value of inflation, but not correctly. 10% of the students could not apply this programming method to other projects.

V. CONCLUSION

Researching customer satisfaction plays an extremely Programming for economic analysis in the 21st century is extremely important for university students during practical lessons in economics. It will stimulate interest and understanding of economics better than an entirely theoretical approach of years past. In this article, we build a specific program segment for the case of four countries with developed economies that entails a total of over 30 specific steps for students to complete as they progress from theory to practical results. The technique uses graphical methods to help students gain the ability to observe data and compare results and more easily combine them to achieve understanding and make practical inferences. With big data, sorting and comparing data over time will help students easily understand the results. With the data of four countries analyzed from 1995 to 2009, it was necessary to compare the results by this method using Eview programming. Additionally, the method of calculating the inflation value is relatively difficult, but it is extremely important to obtain more accurate results over time to compare the economies of several nations. Finally, the conversion to base price combining with calculating inflation is used when determining the level of inflation. The base price should be set in a reference year to compare the results of all different sectors and different economies.

In this study, we developed 32 specific practical steps for economic practice in a Classroom 4.0. This will help solve one part of the difficulties in moving from theoretical teaching methods to practical ones in the 4.0 industrial era. This study was conducted at 32 Business school in Viet Nam, however it usable by other universities with similar problems. The study also shows that a combination of economics and information technology is extremely important in the 21st century for 4.0 Industry. The methods used in this work created a significant impact upon the student learning process as well as completing projects on campus. The study also shows that the support of lecturers and statistical software maximizes the creativity of students in practical economics classes. We offer some conclusion below:

- Universities should build their own smart programs based on available software to reduce costs, especially for small and medium universities in the 4.0 Technology era.
- Motivation of learners can be increased, especially for students of economics, through practical programs.
- Lecturers need to design their lessons to make them more effective, taking advantage of the opportunities that the 4.0 revolution brings.
- It is necessary to help learners guide their learning process and coordinate their abilities to use their results.
- Teaching should involve using real projects so that learners can create high-quality products even while they are still in their classrooms.

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