

Approximation by Weighted Arithmetic Mean of Weighted Geometric Average =Can Effective Exchange Rate Be Approximated without Function Calculator?= Takeshi OGAWA (Associate Professor, School of Economics, Senshu University)*

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Abstract

This presentation is based on the area of *Education for Economics*. Usually, weighted geometric averages are very useful concepts in economics, for instance, Cobb-Douglas functions. Especially, **effective exchange rates** in international finance or international macroeconomics, have some importance. 1. Japanese Diet (A committee of House of Representative) picked up real effective exchange rate in front of BOJ governor in June 2015, and the Japanese market moved after the discussion. 2. The most country of trade volumes against Japan is changing from USA to People's Republic of China. 3. The currencies circulated more in the world than Japanese yen (JPY) are multiple, at least US dollars (USD) and euro (EUR). 4. IMF added Chinese yuan (RMB) to the 5th SDR, and the current rank of Chinese yuan (RMB) in SDR becomes No.3, which is a little higher than that of Japanese yen (JPY) and Pound sterling (GBP). Unlike in the past Japanese traditional international finance, **the importance to teach effective exchange rate becomes higher in underground lectures of international finance**, or international macroeconomics and so on. To infiltrate the concept of effective exchange rate, it is also important for underground students to derive effective exchange rates in some exercise of numerical calculation. Especially, it is also important to be able to **make a test of numerical calculation of effective exchange rate in quizzes** or routine tests. It is required function calculators to derive weighted geometric averages like effective exchange rate, but many underground students in middle or bottom level's private universities don't have functional calculators, whereas weighted arithmetic mean can be calculate with orthodox calculators or manual calculations. Weighted arithmetic mean and weighted geometric average are different concept in mathematics, so they are taught as different concepts in orthodox lectures. However, linear approximation of weighted geometric average makes weighted arithmetic mean in the area that the sum of weights are one. *If effective exchange rate can be calculate with weighted arithmetic mean approximately, many underground students in school of economics can calculate effective exchange rate*, which has more importance. This research verified the difference of both weighted average. Like several percentages, in the area of orthodox numerical calculation questions for effective exchange rate, the difference becomes very small, which means that the approximation to weighted arithmetic mean is useful for calculation of effective exchange rate. The following example is imaged as **nominal effective exchange rate of Mex\$ to main international currencies like US dollars (USD), euro (EUR), Japanese yen (JPY), and pounds sterling (GBP) from November 8th 2016 to November 9th 2016. During the time, Mr. Donald John Trump became US presidents.**

$$\left\{ \begin{array}{l} \left(\frac{20.4}{18.3} \right)^{0.57} \cdot \left(\frac{22.9}{20.2} \right)^{0.21} \cdot \left(\frac{0.199}{0.174} \right)^{0.14} \cdot \left(\frac{25.5}{22.7} \right)^{0.08} \cong 1.123407 \dots, \\ 0.57 \cdot \frac{20.4}{18.3} + 0.21 \cdot \frac{22.9}{20.2} + 0.14 \cdot \frac{0.199}{0.174} + 0.08 \cdot \frac{25.5}{22.7} \cong 1.123461 \dots, \end{array} \right.$$

JEL classification codes: A22, F39, C02

Keywords: Weighted Geometric Average, Weighted Arithmetic Mean, Effective Exchange Rate

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