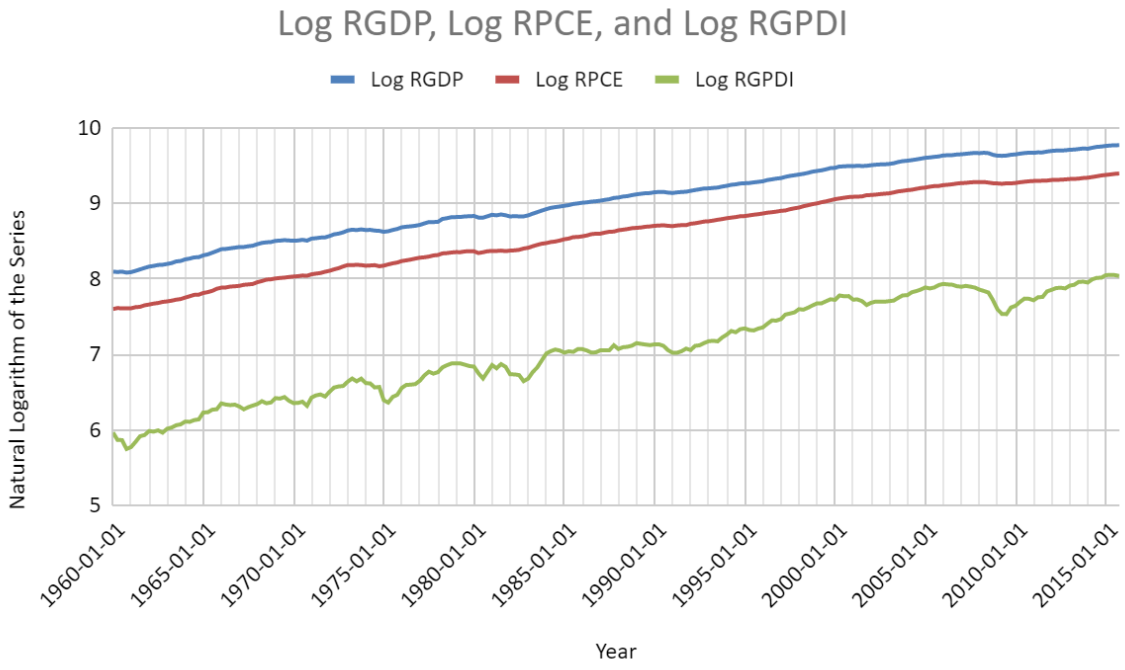
GDP Growth Rate

The assignment obtains data from FRED, including the following series during the period 1960Q1-2015Q4 in the United States:

- Real Gross Domestic Product (RGDP)
- Real Personal Consumption Expenditures (RPCE)
- Real Gross Private Domestic Investment (RGPDI)

a) The natural logarithm of each series against time is shown in graph below



Log RGDP and Log RPCE see approximately constant growth rates overall with comparatively smaller movement in Log RPCE. On the other hand, Log RPDGI witnesses the biggest changes during each period as well as over the years. The graph shows a significant relationship between economic conditions and economic agent's behavior. To be more specific, personal consumption is essential to sustain life, so with a rise in income, consumption also increases, but only by a small amount. Investment, however, tends to increase in a growing fashion that is much greater than that of the proportional rise in income. Since the more is earned, the more is saved, rather than consumed. As can be seen in the graph, during recession in 1960-1961, 1973-1975, 1980-1982, and 2008-2009 in the U.S, RGPDI falls remarkably while RGDP and RCPE maintain their trend.

b) The average growth rate of each series over the entire sample period are approximately the same with Average RGDP Growth Rate being the lowest and Average GPDI Growth Rate being the highest:

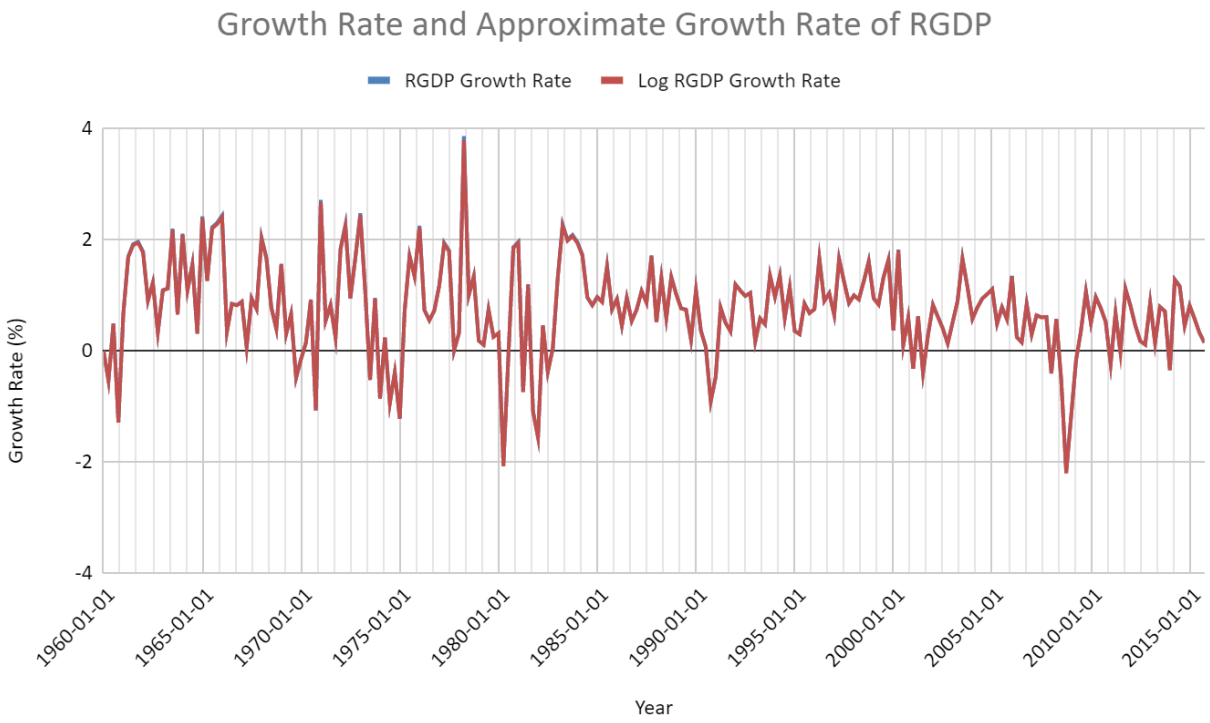
Average RGDP Growth Rate = 0.75 %

Average RPCE Growth Rate = 0.82 %

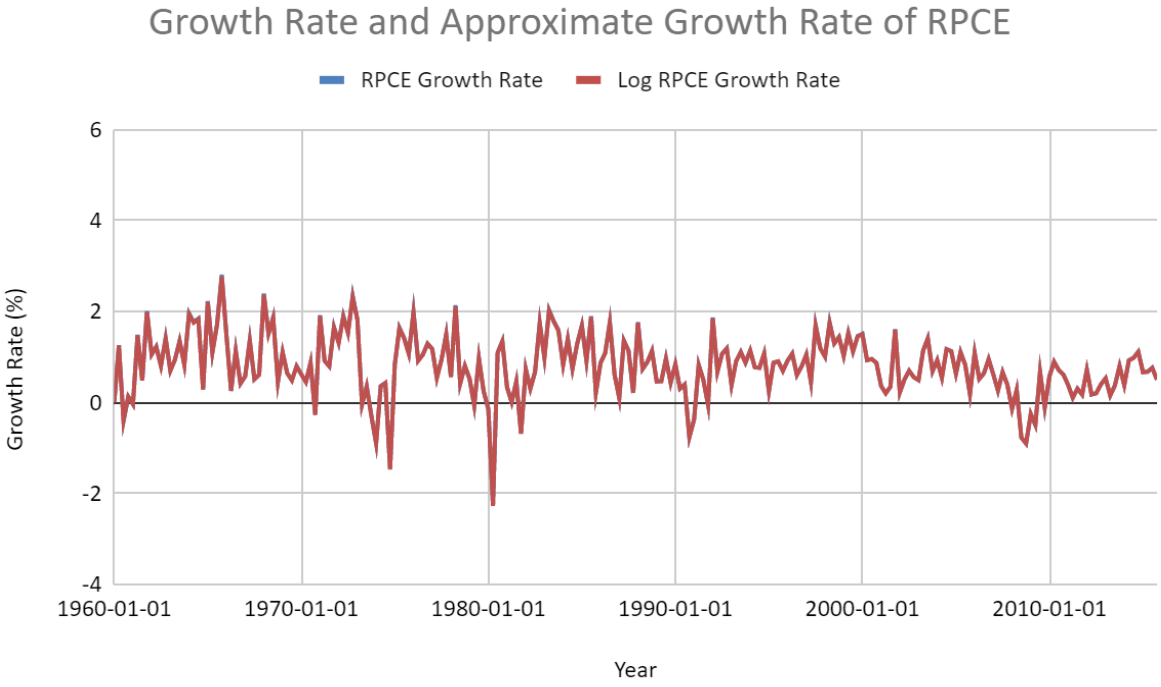
Average GPDI Growth Rate = 1.01 %

c) The growth rate (from part b) and the approximate growth rate (the first difference of the natural logs) against time is shown in 3 graphs below

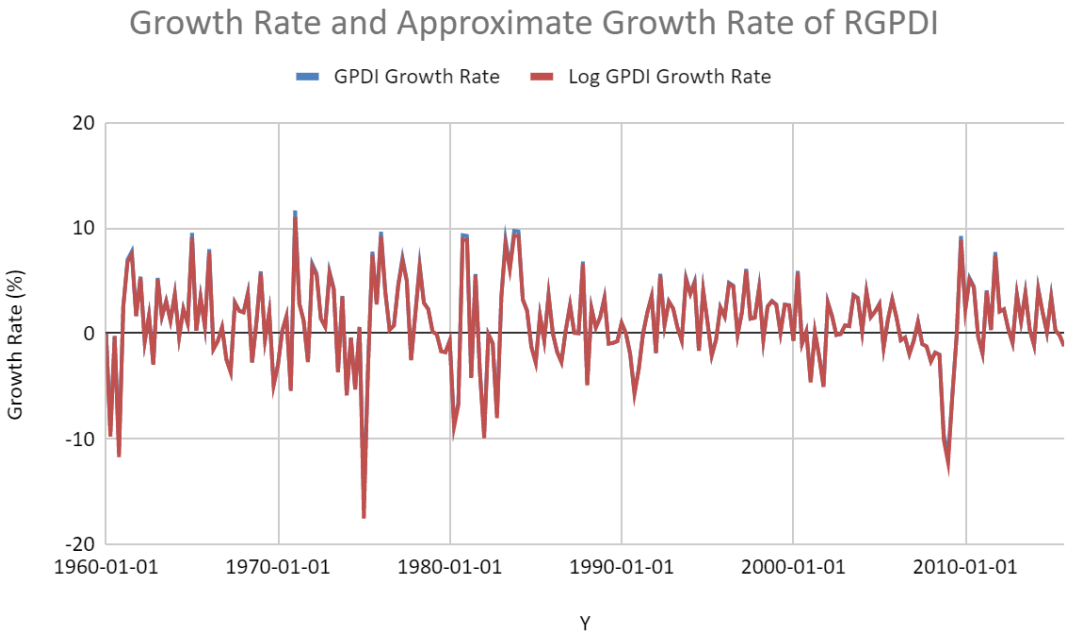
- Real Gross Domestic Product



- Real Personal Consumption Expenditures



- Real Gross Private Domestic Investment (RGPDI)

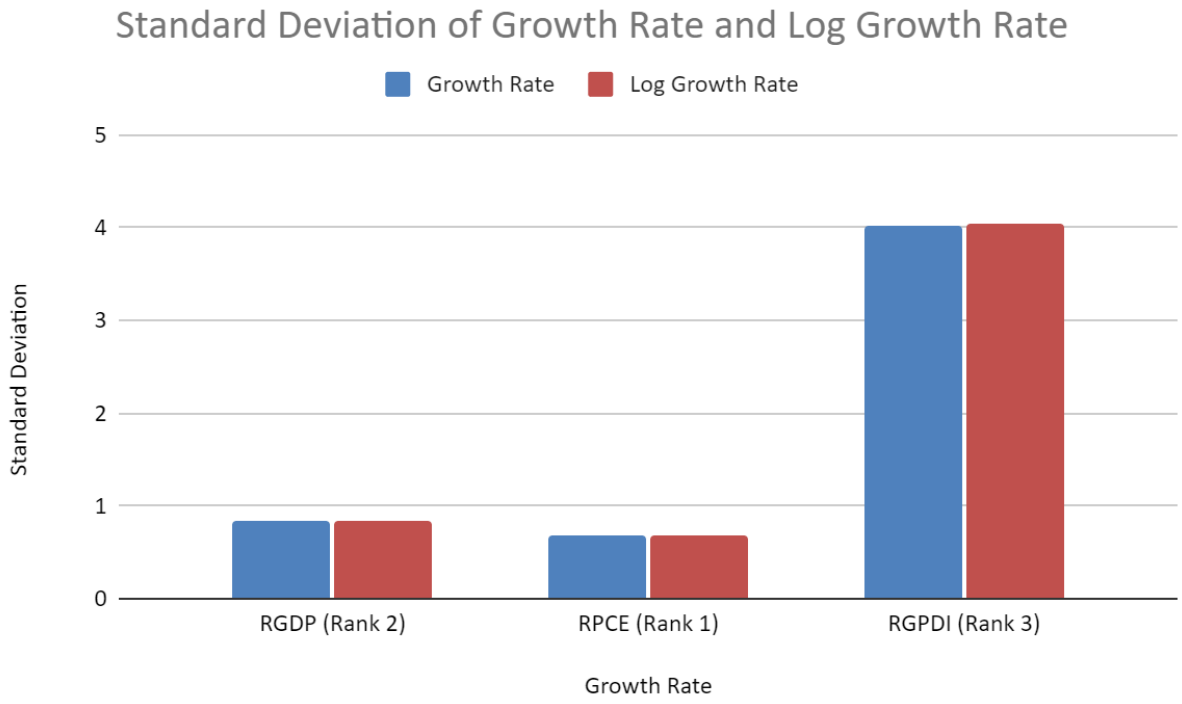


The difference between the growth rate and log growth rate is barely noticeable, so the approximation is highly accurate.

d) The time series standard deviations of the growth rates of the three series in parts b) and c) are

	RGDP		RPCE		GPDI	
	RGDP Growth Rate	Log RGDP Growth Rate	RPCE Growth Rate	Log RPCE Growth Rate	GPDI Growth Rate	Log GPDI Growth Rate
Standard Deviation	0.8398137558	0.8344794622	0.681642721	0.6772453666	4.01845812	4.033315279
Rank	2		1		3	

Similar to the approximation in the growth rate, the standard deviation of which yields the same result that leads to the same rank in magnitude of the three series. As explained in part a), RPDI fluctuates the most, so its standard deviation is correspondingly highest.



e) The average real US GDP growth by decade are

$$ARG_{1960\text{-}1969} = 1.04$$

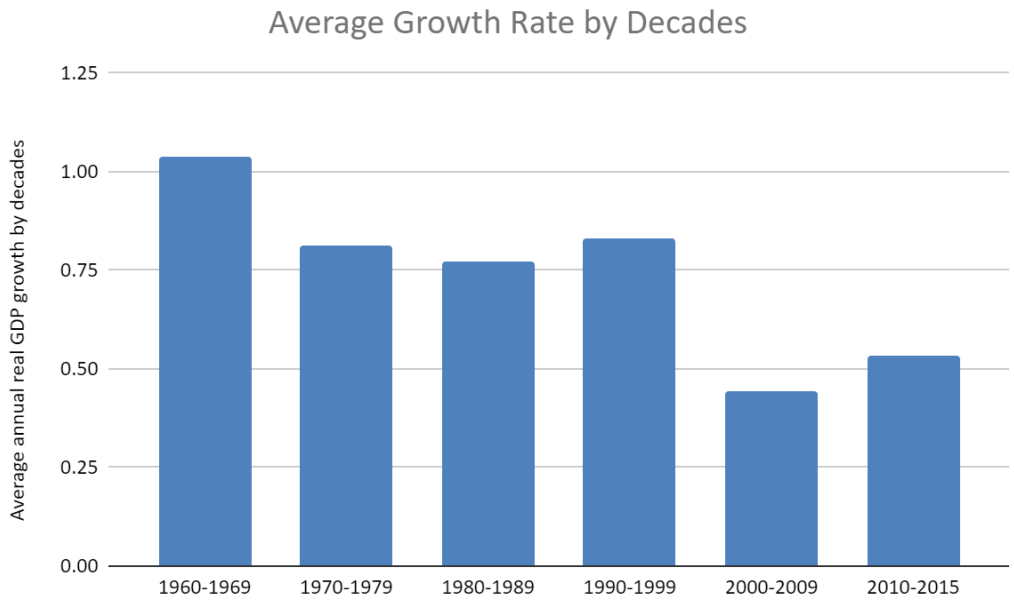
$$ARG_{1970\text{-}1979} = 0.81$$

$$ARG_{1980\text{-}1989} = 0.77$$

$ARG_{1990\text{-}1999} = 0.83$

$ARG_{2000\text{-}2009} = 0.45$

$ARG_{2010\text{-}2015} = 0.53$



Overall, the average real US GDP growth by decade has declined from 1960 to 2015, so it supports the argument stated by the authors in the book.