THE "SIR" IMPACT OF DEMONETIZATION ON INDIAN ECONOMY- MEASURE OF RAPIDITY OF GROWTH

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ABSTRACT
The concept of demonetization and its contribution to economic growth has become one of the most attractive topics for discussion in all political, academic and other decision-making forums of the current times. The critics of demonetization are absolutely right about the adverse impact of the policy, considering the short-term period. The real impact of demonetization, however, must be weighed in the long-run and not in the short-run. Considering the negative impact of demonetization on the economy is only nominal and short-term, it is necessary to attach statistical substantiation to vouchsafe that the long-term impact of demonetization on the growth of the economy is increasing and sustainable. It is in this context the current research holds its significance.
Research is conducted to assess the "SIR" impact of demonetization on Indian Economy. "SIR" stands for Sustainability, Innovation and Rapidity. Accordingly the research is divided into three parts as: "The "SIR" impact of demonetization - statistical evidence testifying the contribution of demonetization to long-term sustainable economic growth in India", The "SIR" impact of demonetization-Measure of Innovation", "The "SIR" impact of demonetization-Measure of Rapidity of Economic Growth". While the first part of our research are presented at the International conferences conducted in Punjab titled "Recent Trends in Technology and its impact on Indian Economy", on 24th October 2017 , the measure of rapidity of growth in India during the post demonetization scenario, has been described in the present paper. The exponential principle which is used to measure the rapidity of growth highlights that the GDP in India during post-demonetization period will grow at a rapid rate of 2.4% which is close to 3 to 6 percent, the benchmark set by economists and Analysts for rapidity of growth for developing economies.

Keywords:
Statistical Evidence, GDP, Demonetization, Sustainable, Vouchsafe, Benchmark

INTRODUCTION

The concept of demonetization and its contribution to economic growth has become one of the most attractive topics for discussion in all political, academic and other decision-making forums of the current times. The critics of demonetization are absolutely right about the adverse short-term impact of the policy. It has caused major inconvenience to a vast majority, particularly to those who have the least financial resources. Of course, it will shave off some amount of GDP growth for anywhere between a quarter and three to four quarters because of the economic disruption it has caused in different sectors of the economy. According to some critics, this alone is sufficient to damn demonetization. After all, the short-run is all that matters because in the long run we are all dead, as the noted economist Keynes put it. While that proposition may be true for individuals, it certainly is not true for nations. There is also a medium-term which is longer than an electoral cycle or two. Medium-term is certainly longer than a quarter or two but shorter than a generation which runs over 30 or 40 years. India has a very long future, even if individuals do not. The critics of demonetization are absolutely right about the adverse short-term impact of the policy. The real impact of demonetization must be weighed in the medium or long-term run and not in the short-run. Though, it is acknowledged theoretically that the negative impact of demonetization on the economy is only nominal and short-term, at least by some optimists, it is noteworthy that no statistical evidence is given to vouchsafe that the long-term impact of demonetization on the growth of the economy is increasing and sustainable. It is in this context the current research holds its significance.

Research is conducted to assess the "*SIR*" impact of demonetization on Indian Economy. "*SIR*" stands for Sustainability, Innovation and Rapidity. The research is aimed at measuring the long-run impact of the latest demonetization drive on "Sustainability, Innovation and Rapidity of Indian economy. While the first part of our research are presented at the International conferences conducted in Punjab titled "Recent Trends in Technology and its impact on Indian Economy", on 24th October 2017 , the measure of rapidity of growth in India during the post demonetization scenario, has been described in the present paper.

STATEMENT OF THE PROBLEM

"What cannot be measured cannot be managed". This saying holds true for any new growth initiative loaded with potential and uncertainty, as it does for any mature and successful businesses. To fully understand the progress from a new growth initiative, there is every need to measure the speed or rapidity of performance. Speed is the rate of change of distance with time. In order to calculate the speed of an object we must know how far it's gone and how long it took to get there. "Farther" and "sooner" correspond to "faster". This kind of "faster" represents the speed or rapidity of growth. While there are number of methods available for measuring the rapidity of speed of growth, one such method is exponential growth. Exponential growth is exhibited when the growth rate of the value of a mathematical function is proportional to the function's current value, resulting in its growth with time being exponential. Exponential decay also can occur in the same way when the growth rate is negative.

In exponential growth, growth rate stays the same regardless of size, making the parameter grow faster and faster as it gets larger. Exponential growth produces "J" shaped curve indicating the upward trend in the growth as the growth matures. To measure the speed at which the economy is growing during post-demonetization period, we have used this exponential principle.

OBJECTIVE OF THE STUDY: MEASURING THE RAPIDITY OF ECONOMIC GROWTH

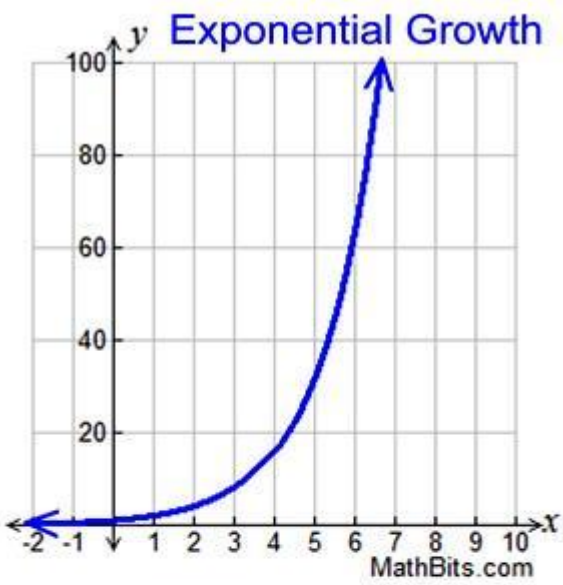
This part of the study aims at measuring the rapidity of economic growth during post-demonetization period in India.

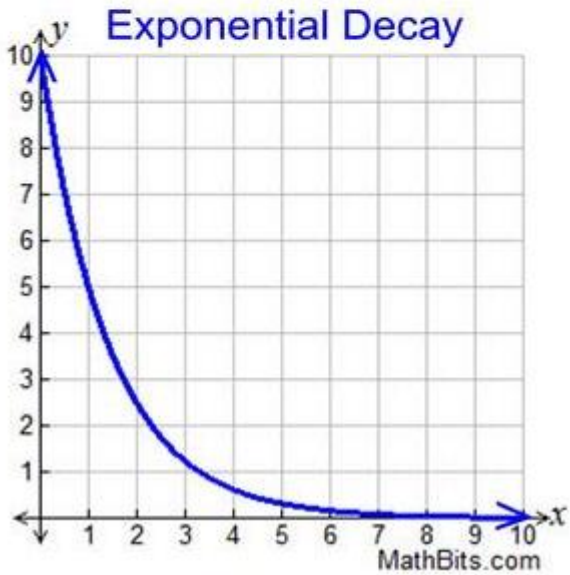
METHODOLOGY

The purpose of this part of research effort is to judge the speed at which the forecasted GDP is growing during post-demonetization period in India. For measuring the rapidity in growth, exponential principle has been used. Exponential functions grow by common factors over equal intervals. As such, exponential functions are used to model a wide range of real-life situations such as population, bacteria, radioactive substances, temperatures, bank accounts, credit payments, compound interest, electricity, medicine, tournaments, and so on. In exponential growth, the quantity increases slowly at first, and then changes very rapidly. The rate of growth becomes faster as time passes. This rapid growth is what is meant by the expression "increases exponentially". Similarly in exponential decay, the quantity decreases very rapidly at first, and then more slowly. The rate of change decreases over time. The rate of decay becomes slower as time passes. The following two function formulae representing exponential growth and exponential decay have been used for measuring the rapidity of economic growth**.**

I. Exponential Growth: $y = a(1 + r)^x$ ***and*** **II. Exponential Decay:** $y = a(1 - r)^x$

In the above function "a" represents initial value (the amount before measuring growth or decay); while "r" indicates growth rate or decay rate (most often represented and expressed as a decimal) and x is equal to the number of time intervals that have passed. In reality, exponential growth cannot continue indefinitely. Eventually, there would come a time when there would no longer be space to sustain the growth. Exponential growth refers to only the early stages of a process and to the speed of the growth. Any quantity that grows (or decays) by a fixed percent at regular intervals is said to possess exponential growth or exponential decay features, as is depicted in the following diagrams:



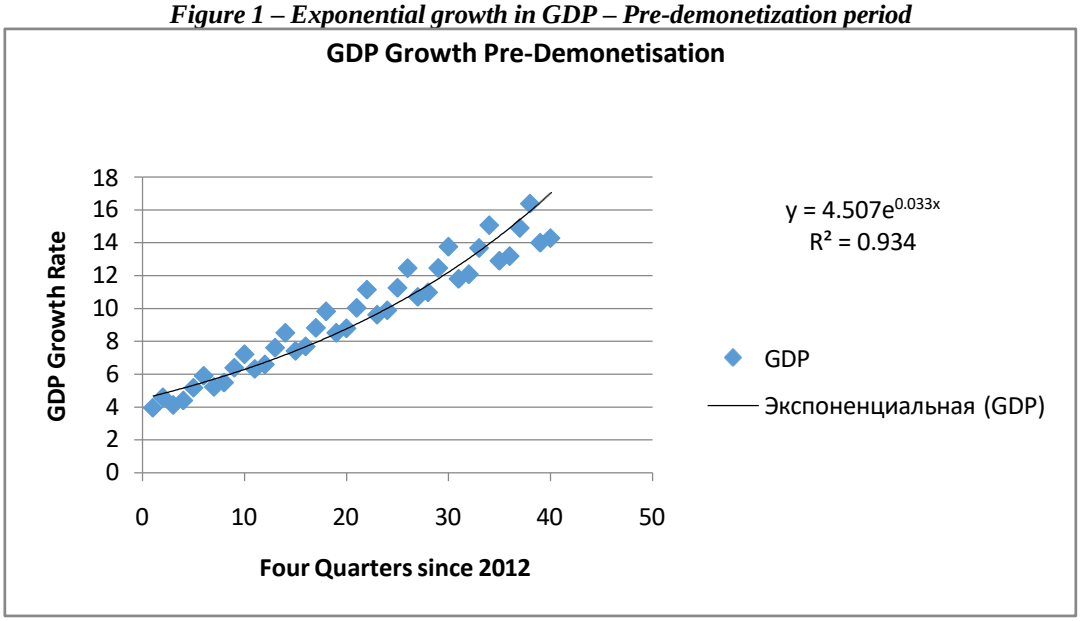


Using the above exponential methodology rapidity of economic growth is measured for GDP and GVA values, two of the four parameters chosen for the study. The GDP and GVA values forecasted for the first part of the current research constitute the basis for measuring the rapidity of economic growth in India, during the post-demonetization scenario.

The formula for exponential growth of a variable x at **t**he growth rate r, as time t goes on in discrete intervals (that is, at integer times 0, 1, 2, 3 etc.), is where x_0 is the value of x at time 0. For instance, with a starting value of 50 and a growth rate of r = 5% = 0.05 per interval, the passage of one interval would give 50(1.05)^1, or simply 50×1.05; two intervals would give 50(1.05)^2, or simply 50×1.05×1.05; and three intervals would give simply 50×1.05×1.05×1.05. In this way, each increase in the exponent by a full interval can be seen to increase the previous total by another five percent. (The order of multiplication does not change the result based on the associative property of multiplication.) Since the time variable, which is the input to this function, occurs as the exponent, this is an exponential function. This contrasts with growth based on a power function, where the time variable is the base value raised to a fixed exponent, such as cubic growth.

Computation of exponential growth of GDP – Pre- demonetization period:
Considering time period as X variable and GDP as Y variable, using exponential equation, exponential graphs are generated in excel. The exponential equation used for measuring the rapidity of growth in the study is: Q (t)=Q_O(1+r)^t. The following figure-1 reflects the exponential growth of GDP prior to announcement of demonetization in India.

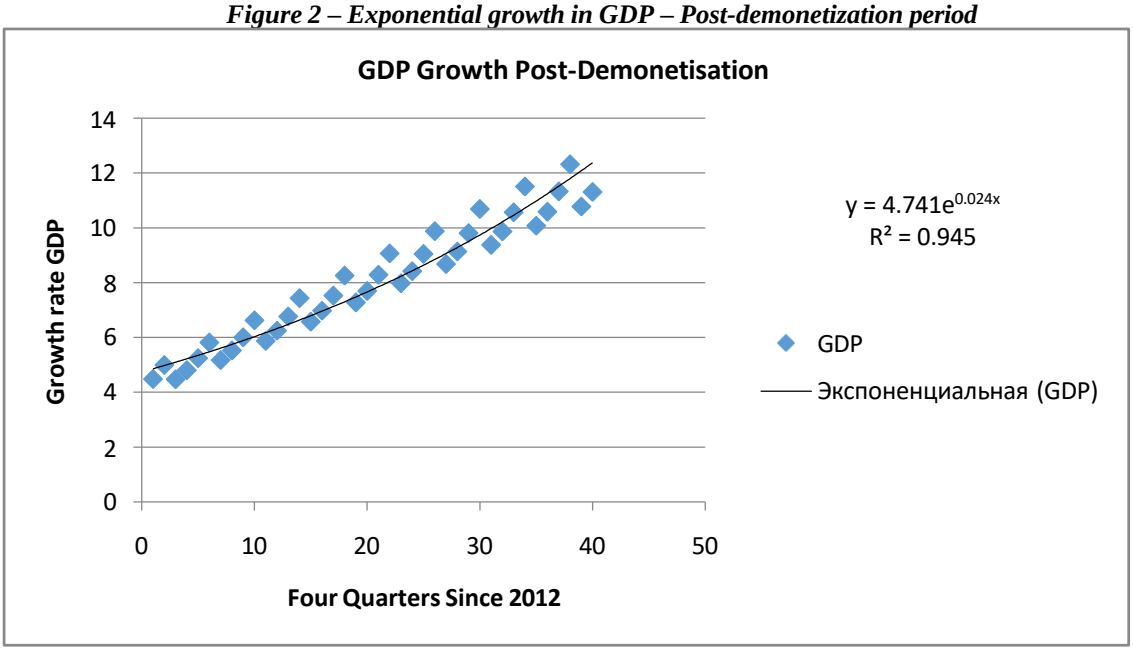
Figure 1 – Exponential growth in GDP – Pre-demonetization period



e^0.0332=1.033757	
Initial value	4.5074
growth rate	3.30%

Exponential growth refers to the situation where growth compounds continuously at every instant of time. Accordingly, it is sometimes called „instantaneous growth **. The exponential growth rate of GDP is 3.30 % during pre-demonetization period. R^2 in the above figure represents** Coefficient of determination. It indicates how many points fall on the regression line. In our graph R^2 value is 0.934 or 93.4 percent. It means that 93.4 % of the variation of GDP values around the mean are explained by the x-value, which is time in our study. In other words, 93.4 % of the values fit the model.
Computation of exponential growth of GDP – Post- demonetization period: Considering time period as X variable and GDP as Y variable, using exponential equation, exponential graphs are generated in excel. The exponential equation that is used for measuring the rapidity of growth in the study is: Q(t)=Q_O(1+r)^t. The following figure 2 reflects the exponential growth of GDP Post to announcement of demonetization in India.

Figure 2 – Exponential growth in GDP – Post-demonetization period



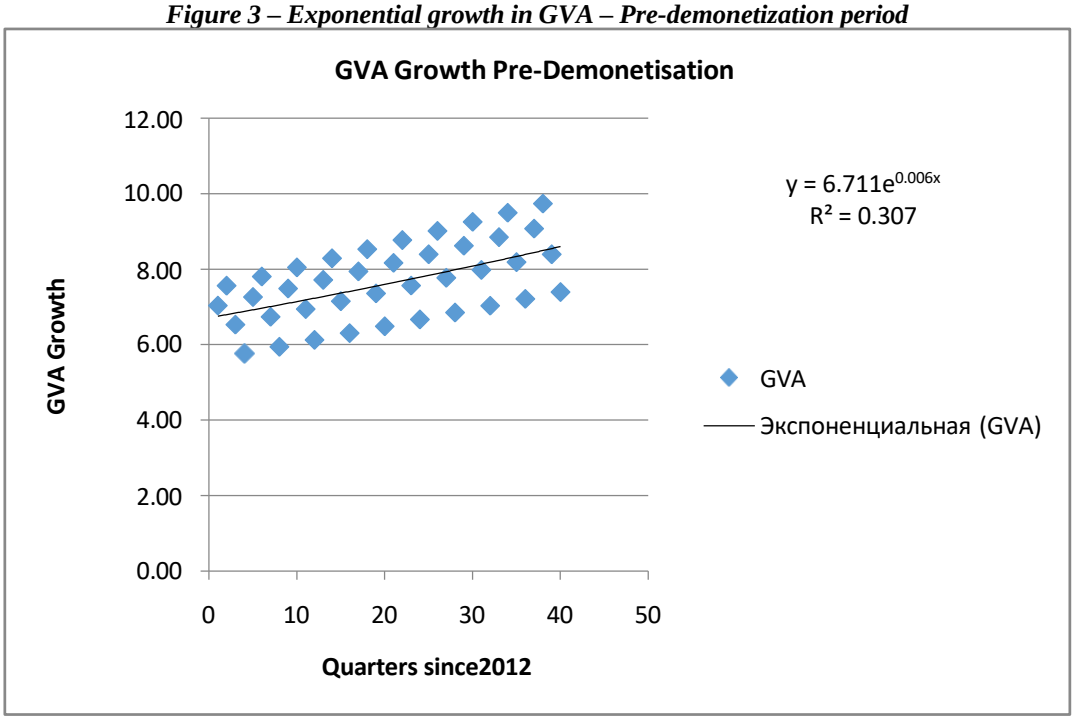
e^0.0024=1.02429	
Initial value	4.741
growth rate	2.40%

The exponential growth of GDP with respect to post demonetization period is 2.40%. This growth rate is calculated based on the GDP forecasts made in the current research pertaining to post demonetization period, using the time forecast method. Exponential growth 2.4% indicates that as we increase in input by x, the output increases by 2.4 power x (2.4^x). With our input as demonetization and the output as GDP, the exponential growth rate in GDP during post-demonetization period is 2.4%. Economic growth is expressed in percentage terms, implying exponential growth.

Computation of exponential growth of GVA – Pre- demonetization period:

Following the procedure adopted for measuring the exponential growth of GDP, exponential growth of GVA also is measured in two phases as pre-demonetization and post-demonetization periods. The following figure 3 depicts the exponential growth of GVA pre-demonetization period.

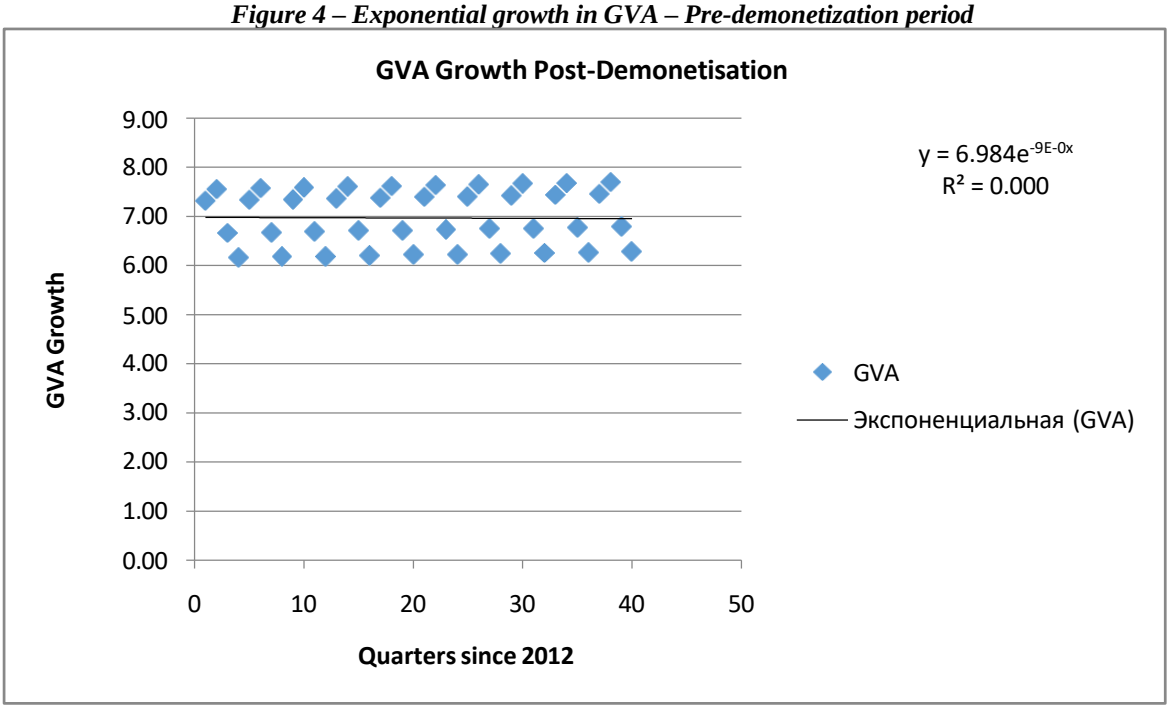
Figure 3 – Exponential growth in GVA – Pre-demonetization period



e^-9E-0=1	
Initial value	6.984
growth rate	0.00%

Computation of exponential growth of GVA – Post- demonetization period: The exponential growth of GVA during post demonetisation period is 0.60 percent with R^2 being zero in value. $\mathbf{R}^2$ is a statistic that will give some information about the goodness of fit of a model. In regression, the $\mathbf{R}^2$ coefficient of determination is a **statistical** measure of how well the regression line approximates the real data points. An $\mathbf{R}^2$ of 1 indicates that the regression line perfectly fits the data. ***R-squared*** is a statistical measure of how close the data are to the fitted regression line. 0% indicates that the model explains none of the variability of the response data around its ***mean***. 100% indicates that the model explains all the variability of the response data around its ***mean***.

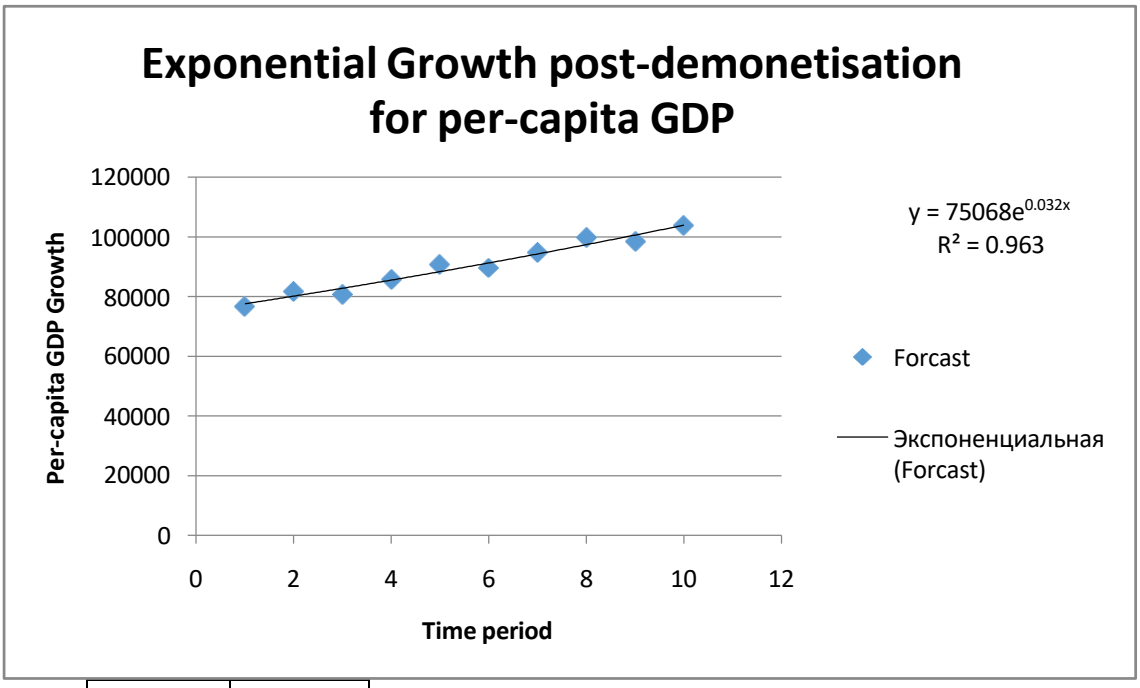
Figure 4 – Exponential growth in GVA – Pre-demonetization period



e^-9E-0=.000123	
Initial value	6.711
growth rate	0.60%

Exponential growth of Per capita GDP during post-demonetization period:
Considering the values forecasted for per capita GDP in the current research, as attempt is made to ascertain the rapidity of growth of the same during the same period. The results of the rapidity of growth pertaining to per capita GDP are depicted in figure 5, below. U.S GDP per capita has grown at an exponential rate of approximately two percent since World War 2.

Figure 5:



e^.032	1.032518
initial value	75068
growth rate	3.25%

CONCLUSION

Few people are overreacting to a short spasm of pain thinking that demonetization is a precursor to a larger illness whereas it may just be the side-effect of a strong medicine necessary to cure the disease. The healthy GDP growth rate is one that is sustainable so that the economy stays in the expansion phase of the business cycle as long as possible. As the GDP represents the entire economic output for the past year, the rapidity of its growth indicates how much more the economy produced in the current period than in the previous quarter. The ideal rate which is also the healthy rate for an economy is between 2-3 percent as economists agree that the optimal GDP growth rate is greater than 2 percent but less than 4 percent for developed economies and 3 to 6 percent for developing economies. This bench mark is also supported by Sri Vamseakrishna B who is an Analyst (US Economy) presently working with Deutsche Bank, who had worked with CRISIL Global Research & Analytics, prior to joining the current job.

Indian economy is on the threshold of expanding at 8% per annum at the least for many years as it enters the promising phase of recovering from the teething troubles of the new tax regime and demonetization at a time when macroeconomic indicators are among the best in the world, top Indian and foreign business leaders and key ministers said at the glittering ET Awards ceremony conducted on 28th October 2017. The country will see a spurt in domestic and foreign investment along with creation of millions of jobs if the government makes it easier for entrepreneurs to do business and bankers get well-structured, sound projects to appraise, panellists at the ET Awards ceremony said.

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