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ANALYSIS OF GROWTH, BREAKS AND FLUCTUATIONS OF INDIA'S SERVICE SECTOR OUTPUT: AN EMPIRICAL CRITIQUE

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ABSTRACT

This article takes a comprehensive investigation into some empirical issues regarding endogenous estimation of growth, structural breaks and fluctuations of India's service sector output during the time period 1960-61 to 2013-14. Although the methodology for evaluating the deterministic growth of a time series is well established, those for determining breaks and fluctuations around the growth path are based on seemingly different aspects of breaks and fluctuations and are diverse in nature. To opt for a unified methodology in these two aspects some of the existing tools and techniques are combined together. The resulting estimates reveal that India's service sector consists of six structural breaks in different policy regimes in the considered time interval and the persistent high growth rate of the service output resulting from the introduction and implementation of new economic policies has eventually come to a halt in the last few years.

Keywords: Growth, Structural Breaks, Fluctuations, Endogenous Breaks Estimation, Time Series, Unit Root.

INTRODUCTION

'If you torture the data enough, nature will always confess'- Ronald Coase [How Should Economists Choose?]

India's service sector is considered to be the growth engine of Indian economy during last few decades. Its output has grown in a perpetual and fascinating way. To understand the growth transition in Indian economy the nature of progress of its tertiary sector over time is needed to be studied rigorously. Growth and fluctuations are two common elements of almost all time series macroeconomic variables. These two elements make a series non-stationary. Growth in macroeconomic series of production, income or expenditure occurs mainly from the human propensity to save and invest. It also occurs from the economic policies pursued by the government or by the planning authority. Fluctuation, on the other hand, is mainly the result of inherent cyclical behavior of the individuals in a market-based economy. It also occurs due to

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disturbances of several types. Structural breaks in the growth path are resulted from changes in policy regimes and thus break has also now been treated as a common element in long-run macroeconomic series. The methodology used in the existing literature for estimating the rate of growth in a time series is well established. But to estimate fluctuations and breaks the existing tools and techniques are needed to be customized. This paper aims to serve that purpose with evidences from India's service sector output.

The whole article is sub-divided into four consecutive sections namely; Section I: Methodological Issues and Data Sources, Section II: Results and Findings, Section III: Concluding Remarks, Section IV: Bibliography.

Section I: Methodological Issues and Data Sources:

Methodological Issues; Growth of a time series variable is generally estimated from the semi-log-linear trend regression given by,

$$\ln Y_t = a + bt + e_t$$

Where, 'b' stands for the constant rate of exponential growth, 'ln' stands for natural logarithm, 'Y_t' is the dependent variable, 't' stands for time and 'e_t' is the random error term.

Fluctuation is viewed as the average fluctuation of the data around the trend regression line, measured by deviation of the observed values from the estimated values (obtained from the semi-log-linear regression as mentioned above) and are denoted by 'e_t'. A relative average fluctuation of the data from the logarithmic trend is normally captured by the RSS based measure of fluctuation given by the formula,

$$F_{RSS} = \frac{1}{T}\sum_{t=1}^{T}|e_t| \Big/ \overline{\ln Y_t} \qquad \text{or} \qquad \sqrt{\frac{1}{T}\sum_{t=1}^{T}{e_t}^2} \Big/ \overline{\ln Y_t}$$

For interpretational convenience they are expressed in percentage term. It can be easily verified that this index is also equal to CV($\ln Y_t$) multiplied by $\sqrt{(1-R^2)}$ (where R^2 is the coefficient of determination in the regression of $\ln Y_t$ on t). A measure of fluctuation in the form $CV(\ln Y_t)\sqrt{(1-\bar{R}^2)}$ is used by Cuddy-Della Valle (Cuddy-Della Valle [1978] and Della Valle [1979]) with the argument that CV($\ln Y_t$) measures the amount of variation in $\ln Y_t$, a part of which is due to trend (the proportion of the part is accurately given by $\bar{R}^2$ as argued by them) and the rest is due to fluctuation. However, in this article, $CV(\ln Y_t)\sqrt{(1-R^2)}$ is used instead of $CV(\ln Y_t)\sqrt{(1-\bar{R}^2)}$ because, R^2 reveals the true observed explanatory power of the independent

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variable. On the other hand, Coppock (Coppock [1962]) has measured the year to year fluctuation in a time series by the formula,

$$F_{COPPOCK} = Exp(S.D.(\ln(\frac{Y_{t+1}}{Y_t})))$$

If the series Y_t experiences a constant growth then the ratios between Y_{t+1} and Y_t or the differences between $\ln(Y_{t+1})$ and $\ln Y_t$ become constant and the standard deviation (S.D.) of these differences becomes zero or the antilog of the standard deviation becomes one. Any fluctuation from the constant growth path makes the standard deviation greater than zero or its antilog greater than 1. Ray (1983) uses this measure for explaining fluctuation in Indian agriculture in the post independence period. F_{RSS} is based on the extent of fluctuations of $\ln Y_t$ from the long run growth path which means F_{RSS} incorporates both short cycles of year to year fluctuation given by $F_{COPPOCK}$ and long cycles generated through business cycles or breaks. However, these two measures are not directly comparable. To make them comparable Coppock's measure can be modified through rationalization of S.D.$(\ln(Y_{t+1}/Y_t))$ by $2(\overline{\ln Y_t})$. The adjusted Coppock measure is thus given by,

$$F'_{COPPOCK} = (SD(\ln(\frac{Y_{t+1}}{Y_t}))) / (2(\overline{\ln Y_t}))$$

F_{RSS} and $F'_{COPPOCK}$ are comparable and the average length of a full cycle present in the data can be estimated by,

$$2(F_{RSS}/F'_{COPPOCK})^2$$

A detail theoretical discussion on this adjustment to dissolve incomparability between these two major fluctuation measurements can be obtained from Mondal and Mondal Saha (2008).

Before the estimation of structural breaks, it is appropriate to examine whether the series is stationary or not. If the parameters of a series such as mean, variance, covariance vary over time then the series is considered to be a non-stationary series. If the mean of a series is varying over time but the variance and covariance is constant then the series can be transformed to stationary series by taking first difference of all the values. In the semi-log-linear regression $\ln Y_t = a + bt + e_t$ if the random error term is stationary then the series is variance and covariance stationary. In that case, if $\Delta \ln Y_t$ is stationary then the series is called trend stationary. And if e_t is non-stationary but $\Delta \ln Y_t$ is stationary then the series is called difference stationary. There are a number of standard procedures and readymade software nowadays available to perform unit root test. Dickey Fuller test, augmented Dickey Fuller test, Philips Perron test are some popular test

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procedures among them. In this article the Dickey Fuller unit root test will be applied to test stationarity of the data. However, in the presence of structural breaks unit root test result may be misleading. Presence of breaks in the growth path of a time series variable overcomplicates the data. Zivot and Andrews (1992) have shown this type of findings with an example of the effect of oil crisis on the GDP of United States. Evidence on the peculiarity of data due to presence of breaks can be obtained from the works of Friedman on his permanent income hypothesis where he excluded the war periods (1917, 1918 and 1942 to 1945) to avoid this kind of spuriousness. If the structural breaks are identified and eliminated properly, in most of the cases the series becomes stationary at level.

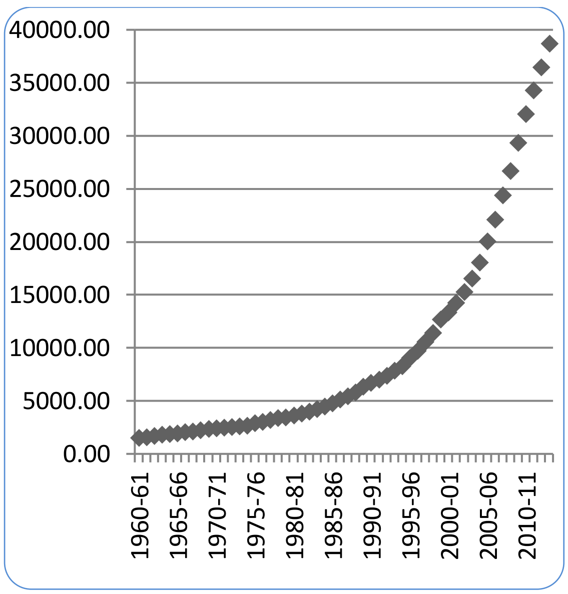
One of the most familiar approaches to estimate structural break in a time series regression model is to perform a Chow Test. This procedure tests for a statistically significant difference in the parameter across two time periods. However, in recent years, this approach has come under scrutiny [Hansen (2001)]. Though this test procedure endogenously identifies break dates in a series it is able to identify only one break at a time. "Of course, the method may be applied repeatedly to estimate more than one break, but this is cumbersome and the procedure is non-standard" [Balakrishnan and Parameswaran (2007)]. The methodology of endogenous break estimation following Perron (1989), Bai-Perron (1998, 2003), Perron & Jhu (2005) rests on a multiple regression model which estimates 'm' parameters for (m+1) regimes. The break points (say $T_1,T_2,...,T_m$) are treated to be unknown and the goal is to determine the location and number of breakpoints. The whole estimation is based on ordinary least square technique. This procedure is used to estimate sequentially the optimum number of break points starting from one to maximum allowed for each and every minimum length restriction. The next step is to determine the optimum minimum length of the regimes and thereby most favourable number of break points in the series. Bayesian Information Criterion (BIC) has been demonstrated to be superior to other information criteria for statistically selecting the most preferred model among a finite set of alternative models [Wang (2006)]. The model with the minimum BIC is treated as the ultimate one. This is no doubt a standard procedure and probably unsurpassable until one looks for a continuous growth path of the concerned variable even in the presence of breaks. The endogenous break estimation technique prescribed by Bai and Perron generates discontinuity at each and every point of break and Growth rates for those years of discontinuity can't be acquired. Boyce [Boyce (1986)] has set an algorithm to join the successive regimes by expanding them so that there arise only a kink at each and every point of break and no discontinuity. But, it may happen that there actually exist a one year sub-period between two successive regimes. Then that can better be exhibited by joining two successive regimes in the growth path obtained from Bai-Perron technique with a one-year length straight line (the sub-period). The straight line may be upward rising or downward slopping due to upward or downward shift of the growth path. There may also exist a downward and then upward shift of the growth path causing a V-shaped zone (a spike) in between two successive regimes. To allow for all these possibilities a modification of conventional Bai-Perron method is required such that the successive regimes are connected with the help of Boyce's algorithm where the connection may be by a kink or by a one-year sub period (double kink) or by two one-year sub periods joined like V (triple kink) [Mondal D (2016) "Growth, Break and Fluctuation in Macro Variables", Mimeo]. Besides, in the existing literature there has been no provision for truncated regimes (smaller in length than full regimes). Two regimes at the two edges may not achieve the length of a full regime as the time period that a researcher takes into account solely depends on him. If the provision for truncations at the two very ends are not allowed then that algorithm will drag the first break up to the minimum full length of the first regime and all the breaks thereafter will surely be misallocated. This problem may occur from the end point as well (in that case the last break will be misallocated first and all the breaks thereafter). This type of misallocation can only be understood if the break dates established before and after modification (allowing truncations) are examined carefully and the corresponding BIC values are compared. However, this article allows the possibility of these two major modifications (allocation of single or double kinks and truncations of regimes at the two edges) by using the Further Modified Bai-Perron (FMBP) technique to estimate break dates. Only the presence of spikes will be identified through the 'Final methodology' which is also a modified version of the conventional Bai-Perron technique. It is noteworthy that prior to FMBP, a Modified Bai-Perron (MBP) technique was developed where the modifications were regarding the **a)** allocation of one year sub-period in each and every break so that the discontinuities are eliminated and **b)** allocation of the possibility of truncated regimes at the two ends. But MBP needed further modification because forceful allocation of one year sub-period in each and every break point wrongly specifies the break dates in the series. FMBP is the modification of conventional Bai-Perron technique of endogenous break estimation which incorporates these three major moderations; **a)** continuity of the growth path is maintained despite of the presence of breaks **b)** possibility of 0 or 1 year sub-period (i.e. single or double kinks respectively) in between two successive regimes is entitled and **c)** the two regimes at the two edges are permitted to be truncated. It should be noted that spikes are not endogenously determined in FMBP to avoid unnecessary chaos of allocating too many different sets of equations in a single model and also to avoid the loss of efficiency and promptness of the whole procedure. Presence of spikes is determined by using the 'Final methodology' where two sub-periods (each of one year duration) are assigned in between two successive regimes in the traditional Bai-Perron framework. The spikes that are found are then allocated exogenously in the growth path and the rest of the estimation is carried on by applying FMBP. For computational convenience the large set of algorithms are designed by using computer programming language FORTRAN. Further information on this topic can be gathered from Mondal D (2016) "Growth, Break and Fluctuation in Macro Variables" (Mimeo).

Data Sources; The data of all the variables used in this article are taken from Central Statistical Organization's National Accounts Statistics (NAS). All the variables are used in real terms where the base year is 2004-05.

Section II: Results and Findings;

India's service sector output shows a smooth upward trend over the period 1960-61 to 2013-14 as shown in diagram1. .

Diagram 1: Exponential growth path of India's service sector output during the time period 1960-61 to 2013-14



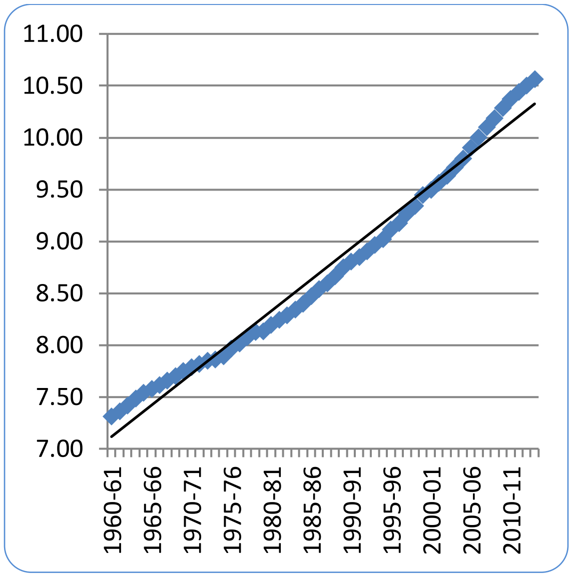
Source: author's own calculation

The diagram shows that the growth of the series is exponential in nature (common nature of almost all time series variables). So, the log values of the service output are now regressed on time (t) to estimate the annual average growth rate following the semi log linear regression;

$$\ln Y_t = a + bt + e_t$$

Where 'b' is the trend growth rate, 'Yt' is the service output and 't' denotes time. The annual average growth rate of India's service sector output during the concerned time period is found to be 6.0545% (significant at 1% level). In diagram2, the red line is the trend line and the blue points are the logarithmic values of service output. It shows that the growth path has cut the trend line twice denoting that the time interval 1960-61 to 2013-14 is a part of a long cycle (much longer than a business cycle)

Diagram 2: Data points (log values of the series) and trend line of India's service sector output during the time period 1960-61 to 2013-14



Source: author's own calculation

The result of Dickey Fuller unit root test shows that the series is stationary at second difference (at 1% level of significance). To ensure if there is enough fluctuation left in the series to make it non-stationary after eliminating trend, the trend stationarity test is performed and the test result shows that the series is not trend stationary at 1% or 5% level of significance. That means the presence of fluctuations and breaks in the data is not negligible and needs careful attention. The value of RSS based measure of fluctuation (F_{RSS}) is found to be 0.015655. That means 1.5655% of the total variability of the lnYt series is due to fluctuation from trend and this includes all types of fluctuation. The value of Coppock measure of fluctuation ($F_{Coppock}$) is found to be 1.02091 which is slightly greater than 1 and that means a part of the variability of lnYt series is due to year to year fluctuation. The value of adjusted Coppock measure ($F^{/}_{Coppock}$) is found to be 0.001243. This value seems to be surprisingly low causing the average length of the full cycle to be around 317.3031 years. Hence, the prediction of existence of a long cycle in the service sector output is true and the observed period of 1960-61 to 2013-14 seems to be a part of a full cycle and this ensures the fact that the role of breaks in trend in this series cannot be ignored. Again the coefficient of variation in the service output has been found to be 0.109333 of which trend alone explains 85.6811%. The rest of the variability is explained by the breaks and fluctuations. Therefore, value of F_{RSS} indicates that the main component, in service sector output, after trend, is structural breaks.

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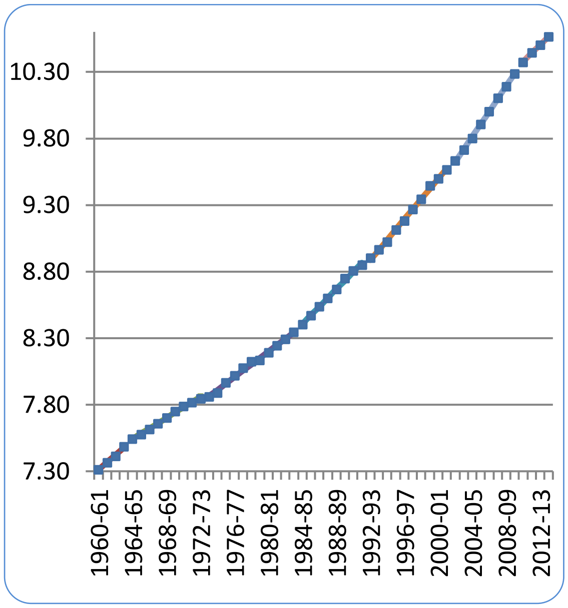
Diagram 3: Discontinuous growth path of India's service sector output during the time period 1960-61 to 2013-14 obtained from the application of Bai-Perron's methodology of endogenous break estimation



Source: author's own calculation

The discontinuous growth path of the service output obtained through Bai-Perron's endogenous break estimation technique is displayed in diagram3. Different policy regimes and their corresponding growth rates with P-values are presented in table1. There are altogether seven distinct policy regimes and therefore six structural breaks in the growth path. Growth rate is found to be maximum at 9.4799% during the time period 2003-04 to 2009-10 and all the growth rates are found to be statistically significant at less than 1% level of significance.

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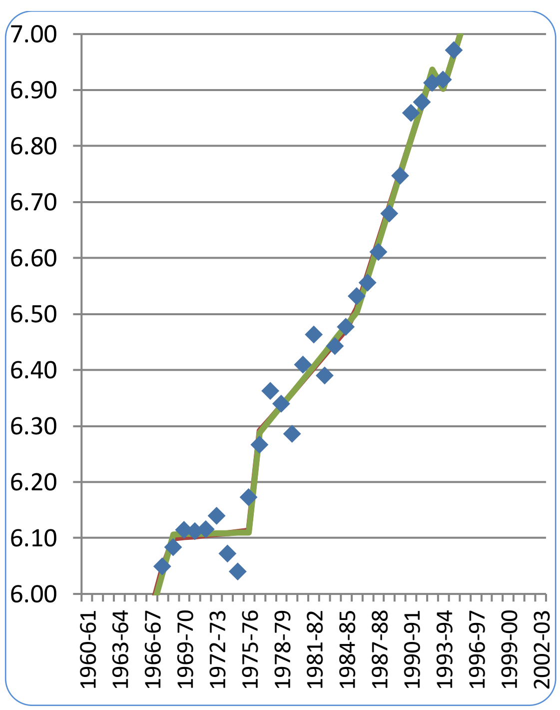
Table 1: Growth rates and corresponding P values of different policy regimes obtained from the application of Bai-Perron's methodology of structural breaks estimation

year	1960-61 to 1963-64	1965-66 to 1972-73	1974-75 to 1983-84	1985-86 to 1991-92	1993-94 to 2001-02	2003-04 to 2009-10	2011-12 to 2013-14
growth rates	5.5765%	3.9543%	4.7807%	6.5788%	7.6302%	9.4799%	6.2717%
p values	3.15E-14	5.24E-28	2.61E-36	1.49E-33	7.38E-42	8.68E-40	7.61E-16

Source: author's own calculation

To understand the inadequacy of MBP and Boyce's methodology in identifying the break dates properly two other time series macroeconomic variables are studied separately. First, the output of India's construction sector during the time period 1960-61 to 2002-03 is taken into consideration and the break points present in that data are estimated through MBP and Boyce's technique one by one.

Diagram 4: Wrong specification of breaks due to application of Modified Bai-Perron technique on Indian construction output data over the time period 1960-61 to 2002-03



Source: author's own calculation

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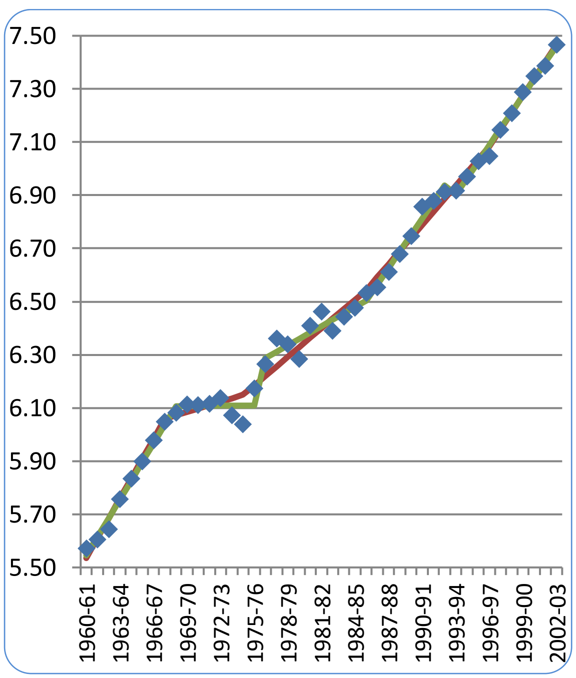
The blue points are the logarithmic values of the construction output at different points of time, the green line is the indigenous growth path of the variable which consists of two single kinks (at years1968-69 and 1985-86) and two double kinks (in between years 1975-76 and 1976-77 and in between years 1992-93 and 1993-94). The red line shows the path fit through Modified Bai-Perron methodology. If the red line is observed very minutely, it can be found that MBP has forcefully allocated double kinks where it ought to fit single kinks. It has fit a one year sub-period in between years 1967-68 and 1968-69 to allocate the single kink at 1968-69 and similarly, a one year sub-period in between years 1984-85 and 1985-86 to allocate the single kink at 1985-86. As a result the growth rate of the sub-period in between years 1967-68 and 1968-69 is underestimated and the growth rate of the sub-period in between years 1984-85 and 1985-86 is overestimated. In diagram4 the green and red line seems to merge but if the BIC values are compared, a significant improvement can be noticed. -268.37054 is the BIC for MBP technique and it improves to -275.24722 when FMBP technique is applied.

Diagram 5: Wrong specification of breaks due to application of Boyce's technique of endogenous break estimation on India's construction output data over the time period 1960-61 to 2002-03

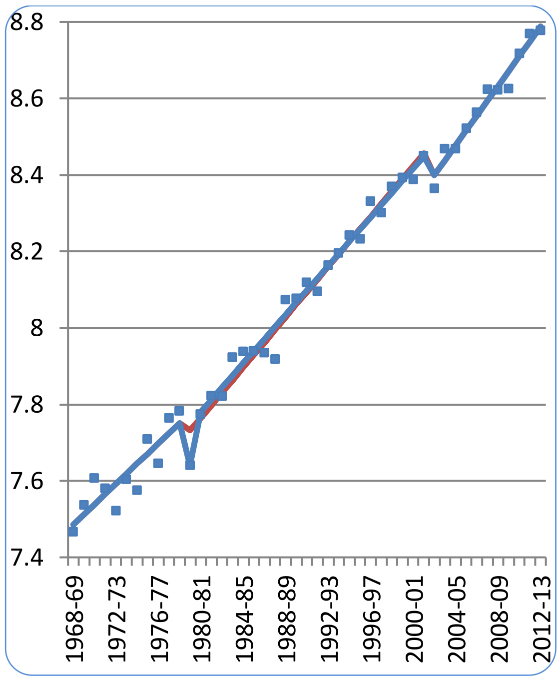


Source: author's own calculation

Consider diagram 5, Boyce's technique of endogenous break estimation applied on the same data set has assigned single kinks forcefully at each and every break point (the red line) causing the growth path shift and swing massively and randomly. It has allocated single kinks at years

1967-68, 1974-75, 1986-87 and 1997-98 which has nothing to do with the original breaks. To analyze misspecification of breaks in the presence of spikes in the data, the output of India's agricultural sector during the time interval 1968-69 to 2012-13 is considered and the breaks are examined using MBP and Boyce's method one by one.

Diagram 6: Wrong specification of breaks due to presence of spike when Modified Bai-Perron technique is applied on Indian agricultural output during the time period 1968-69 to 2012-13



Source: author's own calculation

In diagram6, the blue dots are the log values of actual data and the blue line shows the indigenous growth path of the variable where the presence of a spike (the V shaped area) in between years 1978-79 and 1980-81 is prominent. The red line is the prediction through MBP technique which forcefully assigns a one year sub-period in between years 1978-79 and 1979-80 causing an overestimation of growth rate of the next regime. The double kink in between years 2001-02 and 2002-03 is almost accurately identified. This is the distinct feature of MBP method that whatever be the nature of break, it will always set a one year sub-period to allocate them.

In diagram7 the red line indicates the prediction of the growth path of India's agricultural output from 1968-69 to 2012-13 through Boyce's technique which forcefully assigns single kinks at both the break points. That causes an underestimation of growth rate in the regime approaching the spike, an overestimation of growth rate in the regime right next to the spike. This is the

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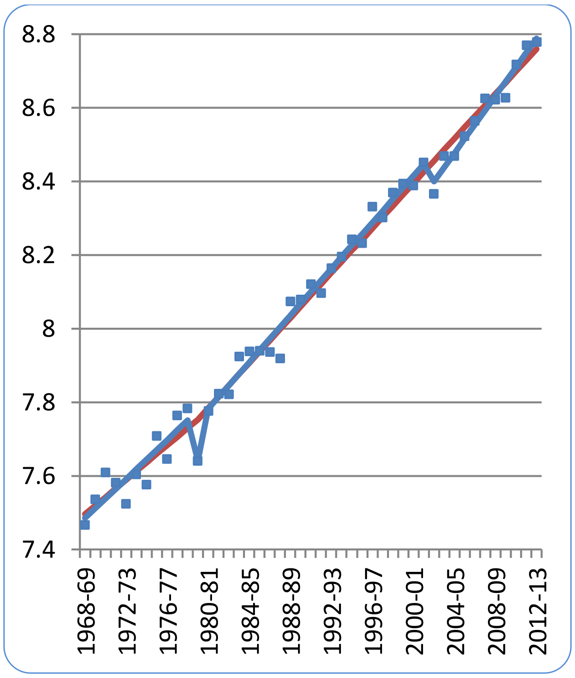
unique property of Boyce's method of endogenous break estimation that it fits single kinks at each and every point of break ignoring the original formation.

Diagram 7: Wrong specification of spike due to application of Boyce's technique of endogenous break estimation on Indian agricultural output during the time period 1968-69 to 2012-13



Source: author's own calculation

So, there is a necessity to appraise the existing estimation procedure. As discussed previously, to ensure the existence of spike in the service output the 'final methodology' (which is also a modified version of the conventional Bai-Perron technique) is applied first. And this has ensured that there exist no spikes in India's service output. Hence, there is no requirement to allocate spikes exogenously in the model and FMBP can therefore be applied directly. FMBP allows a particular minimum length for the full regimes and another minimum length for the truncated regime and that generalization gives rise to the problem of selecting the appropriate combination of the two types of minimum lengths so that the breaks are detected most efficiently and accurately. At first, the combination of minimum 3 years duration for the truncated regimes at the two ends with minimum of 7, 8 and 9 years for normal regimes are examined separately. The BIC values that are obtained are respectively -462.31952, -459.92130, -455.13550. So, the optimum combination is the one with the minimum of 3 years for the truncated regimes and minimum of 7 years for the normal regimes. Again the combination of minimum 4 years for the truncated regimes at the two ends and minimum of 7, 8 and 9 years for the normal regimes are examined. The BIC values that are obtained are; -456.09201 for both 7 and 8 years of minimum duration (this means allowing 7 years duration doesn't make any improvement) and -442.33972 for 9 years of minimum duration of normal regimes. So, the 7-3 combination (truncated regimes-normal regimes) is the optimum one among all the above combinations. However, the minimum lengths of 6 and 5 years for normal regimes could not be appraised in this article due to some limitations regarding the program used. And minimum length above 9 years will always provide a greater BIC value.

Table 2: Different regimes and sub-periods in the growth path of India's service sector output with corresponding growth rates and P values obtained by applying FMBP technique

serial no	regimes and sub-periods (length in years)	time period	growth rates	p values
1	5	1960-61 to 1964-65	5.8126	9.611E-25
2	8	1965-66 to 1972-73	3.9858	8.326E-32
3	1	1973-74	0.5984	0.4914066
4	10	1974-75 to 1983-84	4.7627	5.815E-42
5	8	1984-85 to 1991-92	6.5364	3.888E-43
6	1	1992-93	2.5603	0.0038437
7	11	1993-94 to 2003-04	7.5118	1.032E-52
8	7	2004-05 to 2010-11	9.4746	2.553E-48
9	3	2011-12 to 2013-14	6.1384	6.513E-20

Source: author's own calculation

The different break dates, regimes, sub-periods and the corresponding growth rates and P values obtained from the 7-3 combination are shown in table2. The whole time period consists of 5 full regimes, 2 one year sub-periods and 2 truncated regimes at the two ends. Service sector has grown most rapidly during the seven-year regime (2004-05 to 2010-11) with an average growth rate of 9.4746%.

All the growth rates are statistically significant at less than 1% level of significance except that of the first sub-period (1973-74). This means that growth rate during that time period was not significantly greater than zero and the economy was trapped in a stagnant situation for one year.

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To identify the most probable reasons behind the occurrence of the two one year sub-periods in 1973-74 and 1992-93 the FMBP methodology is applied to all the components of service sector (construction, trade, hotel, transport and communication, finance, insurance, real estate and business services, community, social and personal services) one by one with 7-3 combination of minimum length of normal and truncated regimes. Then the break points of service output as a whole and the break points of its components are studied concurrently. During 1973-74 there is found to be a one year downfall in finance causing its growth rate to fall drastically from 4.19% to 0.08% and then in the next regime it has improved to 5.14%. Again, a one year drastic fall in trade output during the same period is identified where its growth rate has a fall suddenly from 4.22% to 0.7%. Looking at the history of policy changes in India's trade and finance sector it has been recognized that this is nothing but the initial setback in response to the first promotion of trade liberalization during fourth five year plan (1969-70 to 1973-74). And this setback in trade and finance output has led to a setback in the service output as a whole. On the other hand the one year drastic downfall in service output growth during 1992-93 is mainly the initial set back in response to the new economic policies introduced in 1991. As, there has been no statistical testing procedure yet available to test if these are the true reasons or not the only way out is to rely solely on the review of the history of policy changes.

In diagram 8, the red line is the locus of the predicted log values of service output obtained from the FMBP estimation technique which almost perfectly fits the actual logarithmic values of the series (the blue points). This clearly indicates that, FMBP is able to detect the structural breaks efficiently and accurately without generating any discontinuity in the growth path. The predicted log service output is stationary at level. That means the prediction through FMBP also eliminates the unit roots present in the series.

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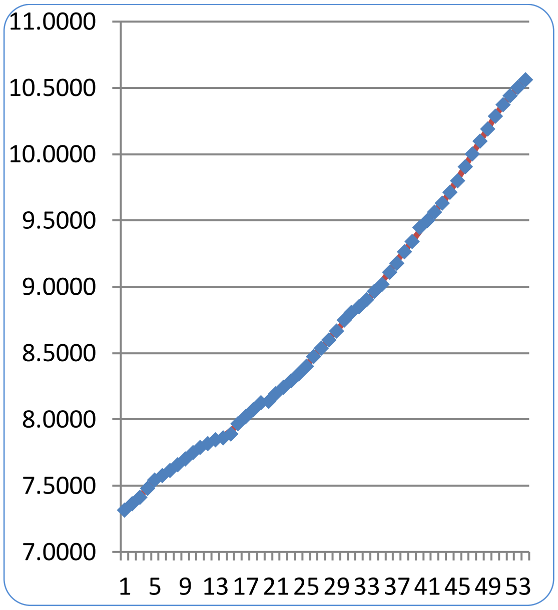
Diagram 8: Growth path of India's service output during the time period 1960-61 to 2013-14 fit on the predicted values obtained from FMBP technique



Source: author's own calculation

Lastly, F_{RSS} is again calculated on the basis of the residual sum square obtained from the final regression after identification of break points in the series. And the value is found to be 0.001096 which is slightly less than $F^{/}_{Coppock}$ (0.001243) calculated earlier. This is quite reasonable because, during the elimination of the breaks some of the year to year fluctuations are also eliminated (for example, those two one year sub-periods in 1973-74 and in 1992-93 mainly show year to year fluctuations and they are eliminated). However, it may happen that this break-eliminated F_{RSS} is greater than $F^{/}_{Coppock}$. This is possible only when those eliminated effects of year to year fluctuation is over surpassed by the effect of incorporation of other cycles like business cycle. Lastly if they are equal, that means the only type of fluctuation left in the series after the elimination of breaks is the year to year fluctuations.

Section III: Concluding Remarks;

India's service sector output has grown perpetually with 6.0545% annual average growth rate over the time period 1960-61 to 2013-14. Fluctuations of all type cumulatively explain a very negligible part of the overall variability. After trend, break is the prime element in generating variability in the data. The whole time period consists of six structural breaks and therefore seven distinct phases, of which five are full length regimes, two are truncated regimes at the two ends. Growth rate was apical during the phase starting from year 2004-05 and ending at year 2010-11.

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From the analysis it can be concluded that the growth path of India's service output is quite smooth except the fact that in 1973-74 and 1992-93 it has faced two one-year stagnations. However, the soaring growth of India's service sector since liberalization has eventually slowed down as there has been no effective execution of the actions required to keep it soaring uninterruptedly.

Section IV: Bibliography;

Bai, J. & P. Perron (2003), "Computation and Analysis of Multiple Structural Change Models", Journal of Applied Econometrics, 18(1).

Bai, J. and P. Perron (1998). "Estimating and Testing Linear Models with Multiple Structural Changes"Econometrica, 66, pp.47–78.

Boyce, J. K. (1987), Agrarian Impasse in Bengal – Institutional Constraints to Technological Change, Oxford, Oxford University Press.

Chand, Ramesh and S.S.Raju (2009), "Instability in Indian Agriculture During Different Phases of Technology and Policy", Indian Journal of Agricultural Economics, Vol.64, No 2, April-June, pp.283-288.

Coppock, J. D. (1962), International Economic Instability: The Experience after World War II, London, McGrawHill

Dandekar, V.M. (1994). The Indian Economy 1947 - 92, Volume 1, Agriculture, Ch.6, Sage Publications India Pvt. Ltd., New Delhi.

Das P S (1978) 'Growth and Instability in Crop Output in Eastern India' EPW (4367023)

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the Estimators for Autoregressive Time Series With a Unit Root. *Journal of the American Statistical Association,7 4,* , 427-431

Gordon, J., & Gupta, P. (2004). Understanding India‟s Services Revolution. *IMF Working Paper WP/04/171, September*

Mondal D (2016) "Growth, Break and Fluctuation in Macro Variables", Mimeo.

Mondal, D. (2008), "On the test of significance of linear multiple regression coefficients", *Communications in Statistics: Simulation and Computation,* Vol. 37, No. 4 (August).

Nagaraj, R. (2009). Is Services Sector Output Overestimated? An Inquiry. *Economic and Political Weekly, Vol. 44, No. 5, January 31.*

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Pulapre Blakrishnan, M Parameswaran (2007)"Understanding Economic Growth in India: A Prerequisite" EPW(July14, 2007)

Purba Roy Choudhury, Biswajit Chatterjee (2016) "Growth in India's Service Sector; Implications of Structural Breaks". Journal of Quantitative Economics(2016).

Rao, V.M. (1996),"Agricultural Development with a Human Face: Experience and Prospects", Economic and Political Weekly, 29(16-17), April 16-23.

Ravindra H Dholakia, Amey A Sapre (2011) "Estimating Structural Breaks Endogenously in India's Post Independence Growth Path: An Empirical Critique" Journal of Quantitative Economics, Vol (9) No.(2) July 2011.

Zivot, E., & Andrews, D. (1992). Further evidence of great crash, the oil price shock and unit root hypothesis. *Journal of Business and Economic Statistics, 10,* , 251-270.

