Factors affecting the services sector growth in Pakistan: A time varying parametric approach

By Ambreen ZEB [a] Khadim HUSSAIN [b] Usman AHMAD [c] & Muhammad AJMAIR [d†]

Abstract. This empirical study followed time varying parametric approach (Kalman Filter) to find out relevant determinants of Pakistan's services sector's growth. To our best of knowledge, no author has made such study that could collect a number of variables from existing empirical literature and capture the impact of structural changes on relevant determinants of services sector growth in Pakistan while employing Kalman Filtering approach. Current study bridges this gap. Annual data was taken from World Development Indicators (2014) during period 1976-2014. Main findings of the study are that rolling regression estimates of explanatory variables justify the use of Kalman filtering approach. The state space Results show that foreign direct investment and gross national expenditures are positive and significant determinants of services sector growth while inflation, domestic credit to private sector, gross fixed capital formation, and remittances received and trade openness have negative impact on services sector growth. One step ahead graph inflation, domestic credit to private sector, foreign direct investment, gross national expenditures, gross fixed capital formation, remittances received and trade openness indicate that model estimated was stable as critical bounds(dotted line) in graph 2 are not crossed by central line. Based on empirical findings, it is recommended the concerned authorities to augment gross national expenditures and foreign direct investment to achieve long run services sector growth for better economic growth in country.

Keywords. Services sector, Kalman filter, Rolling regression, Inflation, Foreign direct investment.

JEL. F21, F40, N57, O13.

1. Introduction

T he service sector has become the primary contributor to the world economy. Services play a vital role in the economies of both developed and developing countries. They account for more than half of the Gross Domestic Product (GDP) of all developed economies and represent the single largest sector in the majority of developing economies (Singh & Kaur, 2014). In modern economies of these days, service sector plays several significant roles. Firstly, it indicates a major share of the developed economies and is increasingly integrated in the overall production system. Secondly, it plays a dynamic role in market integration and globalization. And thirdly, the creation of employment, value added and income is

[a†] Department of Economics, University of Sindh, Jamshoro, Pakistan.

✉. drambreenzeb@gmail.com

[b] Department of Economics, Mirpur University of Science & Technology, Mirpur, AJK, Pakistan.

✉. hussain.eco@must.edu.pk

[c] Pakistan Institute of Development Economics, Islamabad, Pakistan.

✉. usmanahmad@pide.org.pk

[d] Department of Economics, Mirpur University of Science & Technology, Mirpur, AJK, Pakistan.

☎. +989190206813

✉. ajmair@must.edu.pk

increasingly related to the good performance of the services (Maroto-Sanchez, 2010).

The major characteristic of modern economies is the expansion of a viable and dynamic services sector. The developing countries have observed the dramatic growth since last three decades. This growth trend is associated with the impressive development of the service sectors in the developing world. The transition from pure agrarian to services economy through manufacturing is the benchmark of economic development for developing countries like Pakistan. The twofold transformation from agriculture to manufacturing and from manufacturing to services is the process of economic development (Clark, 1941; Kuznets, 1957 and Fuchs, 1980).

The massive contribution of service sector raises the GDP per capita (Kongsamut *et al.,* 2001). The cause of escalating service sector in past three decades is emerging of communication and information technology (Busari, 2007). In developing countries, the role of service sector is growing and hence the role of manufacturing sector is declining by the passage of time (Szirmai & Verspagen, 2010). The expansion of the public sector, rapid urbanization and increased demand for consumer services are core reasons behind the growth of service sector (Singh & Kaur, 2014). The thriving growth of the primary and secondary activities in the economy, significantly, is dependent on services offered by banking, commerce, insurance, trade, maintenance of machinery, entertainment, and several other services labeled as tertiary activities (Soni & Parashar, 2013).

According to conventional taxonomy, an economy is comprised of three main sectors, namely, agricultural, industrial and service sectors. The agricultural sector mainly consists of farming, animal husbandry, forestry and fishery. The industrial sector is composed of mining, construction and small scale and large scale manufacturing. Hence, all other economic activities belong to the service sector. They include services provided for the agricultural sector, activities associated with the supply of water, electricity and gas, transport and communications, wholesale and retail trade, finance and insurance, business and personal services, and community and social services. Services can generally be categorized into two types, that is, the traditional and novel services. The traditional services include domestic services, petty trading, and catering and hotel services. The novel services are generally associated with communications, business and legal practice, research and education.

In Pakistan the services sector contributes to better economic conditions through trading activities and improved production qualities. The repercussion of service sector could be recognized by the pace of growth and association of this sector with other sectors of the economy. The service sector provides an alternative source of getting foreign exchange for Pakistan's economy in the absence of a vibrant exporting sector. Services sector's contribution to GDP is 59.59 percent, industrial sector has 20.88 percent and agricultural sector has 19.53 percent share (Economic Survey of Pakistan, 2016-17). The services sector solely accounts for approximately 60 percent of overall GDP of the country. Hence, it is crucial to investigate the relevant determinants of services sector growth in Pakistan.

The structure of an economy changes over time and the constancy of estimated parameters affected significantly by these structural changes. The fixed parametric approaches like Auto Regressive Distributed Lag (ARDL) are unable to take into account the impact of structural changes on estimated constant parameters (Engle & Granger, 1987; Philips & Perron, 1988; Johanson & Juselius, 1990). Therefore, it is indispensable to employ a time varying parameter approach to assess the impact of structural changes on constant estimated parameters (Gilal & Chandio, 2013). The Kalman Filter is an ideal approach to apply in this situation due to several reasons. Thamae *et al.,* (2015) prefer Kalman Filter (1960, 1963) estimation strategy over conventional estimation methods due to following advantages. First, Kalman Filter is a perfect approach to evaluate structural changes as the impact of variables used changes with time (Slade, 1989). Second, Kalman Filter is

considered to be superior than the ordinary least squares methods particularly when the parameters are not stable (Morisson & Pike, 1977). Third, this approach is prognostic and adaptive and it can be applied without checking the stationarity of time series (Inglesi, 2011).

To validate the relevance of time-varying parameter approach rolling regression methodology is applied. To reduce variation and serial correlation in selected time series annual data is used (Moosa, 1997; Viren, 2001). Parametric rolling regression is estimated through ordinary least square method during period 1976–2014 and K is set to 12 years (Moosa, 1997; Gilal & Chandio, 2013). The Kalman Filter (1960) is employed recursively by time to observe forecasts and variance of forecast. The Kalman Filter is crucial because it may be employed in real time. That is, as each value of the annual data is noticed the forecast for the next observation can be calculated (Hyndman & Snyder, 2016). Organization of study is as the section two includes literature review, section three includes methodology: data, model and estimation technique, section four discusses results and section five concludes the study.

2. Literature review

A number of studies focused on the services sector performance in different countries. For instance, Gupta (1998) and Mohan (1998) studied productivity in Indian services sector and compare it with other Asian countries. Chanda (2002) examined services trade in the world especially in Indian context and provided its implications for the WTO negotiations in services. Li & Hou (2003) presented an edited volume on China's entry in WTO and discuss its implication for the Chinese services sector. Jiang (2004) edited a book on structural changes and growth in services in comparison with other countries.

Kongsamut *et al.* (2001) found the huge contribution of services sector raise the per capita income using a sample size of 123 countries for the period 1970-80. The contribution of services sector in Pakistan has been increasing over time and report 59.59% of GDP which accounts for nearly one third of total population. Besides this it offers the strong connection among other sectors i.e. inputs to the agriculture and industrial sectors.

Gordon & Gupta (2003) examined comprehensively the services sector revolution in India. They applied simple ordinary least square (OLS) methods on annual data for period 1952-2000. They evaluate the impact of high income elasticity of demand, input usage of services for other sectors, exports of services and economic reforms on services sector growth. The results show that the growth rate of commodity producing sector, growth rate of foreign trade, growth of exports in services and trade liberalization affect the services sector growth positively and significantly.

Agostino *et al.,* (2006) studied the role of services in employment in selected European countries. They applied generalized least square (GLS) method proposed by Baltagi & Wu (1999) on panel data from 1970 to 2003 to explore the core determinants of services sector and their relevance for employment. The results show that the macroeconomic variables i.e. per capita income, private consumption and productivity are key determinants of gap between the US and European share of employment in services sector. They also found that the institutional framework play an important role in share of employment in services sector.

Wu (2005) conducted a comparative study of services sector of India and China. He applied panel data estimation techniques for period 1978-2004 using fixed effect and random effect models to discover the determinants of services sectors in both countries. The study concluded that per capita income, urbanization and foreign demand for services have positive and significant impact on growth of services sector in both countries.

Singh & Kaur (2014) applied vector autoregressive analysis using annual data for period 2000-2013 in search of the determinants of Indian services sector. The results show that the GNP per capita, foreign trade and domestic investment have

positive impact on share of services sector in GDP whereas FDI affect the share of services sector in GDP negatively.

Jain *et al.,* (2015) used ordinary least square (OLS) estimation for annual time series from 2000 to 2012 to identify the factors determining services sector in India. The findings conclude that FDI, imports, net foreign institutional investment equity have positive impact on services sector growth whereas exports, debt and foreign institutional investment affect services sector negatively.

3. Methodology

Time Varying Parametric Approach (Kalman Filter) was employed to find out the relevant determinants of services sector growth in Pakistan. A list of variables was collected from existing empirical literature to employ general to specific approach.

3.1. Data

Annual data was taken from 1976 to 2014. The data is taken from World Bank World Development Indicators. The choice of sample period is due to two reasons (a) disintegration of the country in December, 1971 and (b) data on most of the variables is available after 1975. Since data on most of the variables shows strong trend therefore, it is used in log form. Log transformation makes linear the exponential function because log function and exponential are inversely related with each other (Asteriou and Prices, 2007). Finally, log transformation allows us to interpret estimated parameters in terms of elasticities.

3.2. Model

Specific equation used in Kalman Filter is (1.1) that shows services sector's output growth and its relevant determinants. The expected relevant determinants of services sector contribution (y_t^s) to overall economic growth are: Inflation (cpi_t), domestic credit to private sector (fd_t), foreign direct investment (fdi_t), gross national expenditures (gne_t) , gross fixed capital formation (k_t), personal remittance (rem_t) and trade openness (to_t). These variables were collected from the existed empirical literature.

$$y^s{}_t = SV_{1t} cpi_t + SV_{2t} fd_t + SV_{3t} fdi_t + SV_{4t} gne_t + SV_{5t} k_t + SV_{6t} rem_t + SV_{7t} to_t + \quad (1)$$
$$+ [var = \exp(c(1))]$$

$$SV_{1t} = SV_{1t-1} \qquad (2)$$
$$SV_{2t} = SV_{2t-1} \qquad (3)$$
$$SV_{3t} = SV_{3t-1} \qquad (4)$$
$$SV_{4t} = SV_{4t-1} \qquad (5)$$
$$SV_{5t} = SV_{5t-1} \qquad (6)$$
$$SV_{6t} = SV_{6t-1} \qquad (7)$$
$$SV_{7t} = SV_{7t-1} \qquad (8)$$

Where

SV_{1t} , SV_{2t} , SV_{3t} , SV_{4t} , SV_{5t} , SV_{6t} and SV_{7t} are coefficients of inflation, domestic credit to private sector, foreign direct investment, gross national expenditures, gross fixed capital formation, remittances and trade

openness which are used as previous lags. $[\text{var} = \exp(c(1))]$ is used to show the impact of other factors including structural changes on services sector growth.

4. Results

4.1. Rolling regression: Determinants of services sector growth

Figure 1 indicates that the rolling regression estimates of foreign direct investment (fdi_t), remittances (rem_t), inflation (cpi_t), gross national expenditures (gne_t), gross fixed capital formation (k_t), domestic credit to private sector (fd_t) and trade openness (to_t) with services sector growth ($y^s{}_t$) as dependent variable show some fluctuation. Justification of the use of Kalman filtering approach is that the variables should show some fluctuations.
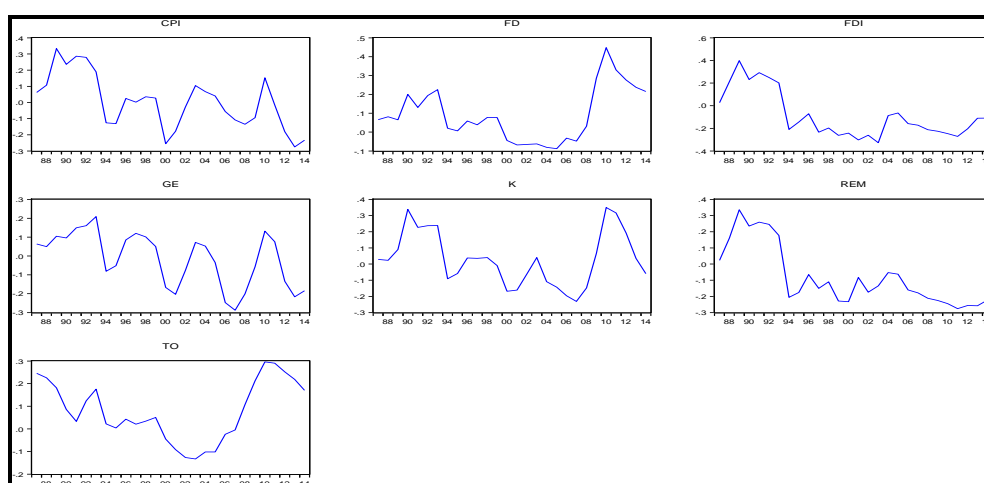
Graph 1. *Rolling Regression Estimates*

4.2. Kalman filter results: Determinants of services sector growth

Table 1 shows that inflation (cpi_t), domestic credit to private sector, gross fixed capital formation, remittances received and trade openness have negative impact on services sector growth. Foreign direct investment has positive and significant impact on services sector output growth. Positive impact of foreign direct investment is consistent with neoclassical and endogenous growth theories which emphasize that foreign direct investment promotes economic growth through physical investment (Lucas, 1988). Gross national expenditures with positive effect are the relevant significant determinants of services sector output growth at five percent significance level. Implications of results of gross national expenditures are that gross national expenditures may have positive effects on services sector output growth through capital accumulation, labor force growth and total factor productivity (tfp) growth.

Remaining variables included in estimation process could not show significant association with services sector output growth. Other factors including structural changes (C) showed significant association with services sector output growth negatively. Justification of negative impact of structural changes on services sector growth could be that reform period (decade of 90s) was much destabilized through political instability.

Table 1. *Determinants of Services Sector Growth*

	Model :1
Variables	Coefficient
C	-8.40(29.79) [a]
Cpi_t	-0.04(-3.05) [a]
Fd_t	-0.14(-2.61) [a]
Fdi_t	0.07(9.06) [a]
Gne_t	1.05(17.56) [a]
K_t	-0.12(-1.46)
Rem_t	-0.02(-1.71) [b]
To_t	-0.01(-0.14)

Note: [a] and [b] show the significance of estimated parameters at five and ten percent significance level respectively. Calculated z statistics are given in parentheses.

4.3. State space one step ahead graph: Determinants of services sector growth

Graph 2 represents one step ahead graph of determinants of service sector growth. SV^1, SV^2, SV^3, SV^4, SV^5, SV^6 and SV^7 represent inflation; domestic credit to private sector, foreign direct investment, gross national expenditures, gross fixed capital formation, and remittances received and trade openness respectively.

Graph 2 shows ± two standard error time varying parameter estimates, after recursive estimation of inflation, domestic credit to private sector, foreign direct investment, gross national expenditures, gross fixed capital formation, remittances received and trade openness with services sector growth as dependent variable. It is clear from the figure that initially, the estimated parameters show more fluctuation with increased standard errors. This is due to a small number of observations that are used for estimating additional parameter of interest. Once the information that is used for predicting t+1 observation increases, the estimated parameters stabilize and their corresponding errors are reduced.
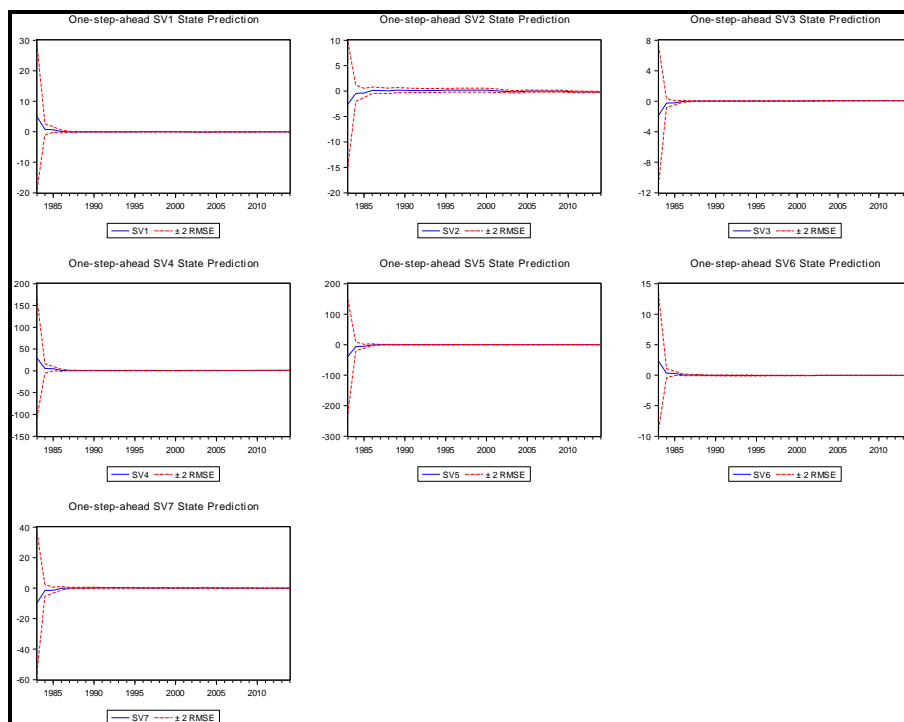
Graph 2. *One step ahead state prediction*

5. Conclusion

Main findings of the study are that rolling regression estimates of explanatory variables justify the usage of Time Varying Parametric Approach (Kalman Filter). Results show that foreign direct investment and gross national expenditures are positive and significant determinants of services sector growth while inflation, domestic credit to private sector, gross fixed capital formation, and remittances received and trade openness have negative impact on services sector growth. One step ahead graph inflation, domestic credit to private sector, foreign direct investment, gross national expenditures, gross fixed capital formation, remittances received and trade openness indicate that model estimated was stable as critical bounds(dotted line) in graph 2 are not crossed by central line. Based on empirical findings, it is recommended the concerned authorities to augment gross national expenditures and foreign direct investment to achieve long run services sector growth for better economic growth in country.

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