

## Drivers of IT Spending in Indian Market: An Aggregated Time Series Analysis

### 6.0 Introduction

At the heart of the IT revolution is the application of personal computers (PC) and therefore, growth in PC sales is a very good indicator of IT expansion in the country. A knowledge of the relationship between PC sales and domestic and global economic activities can provide important insights into the potential growth of the IT sector in the country. This chapter makes an effort to search an econometric model, which can significantly explain growth in PC market over time, in India and at the same time predict future prospects with reasonable accuracy. All the data relevant to PC sales have been acquired from the IDC as a separate subcontract, while other data for the study has been taken from published sources.

Any econometric analysis of this kind requires a fairly long time series data. Unfortunately, PC sales data is available for a limited period from 1995Q4 to 2003Q3. Therefore, this econometric exercise becomes highly demanding in nature. The model must be parsimonious with acceptable statistical properties. Therefore, an attempt has been made to

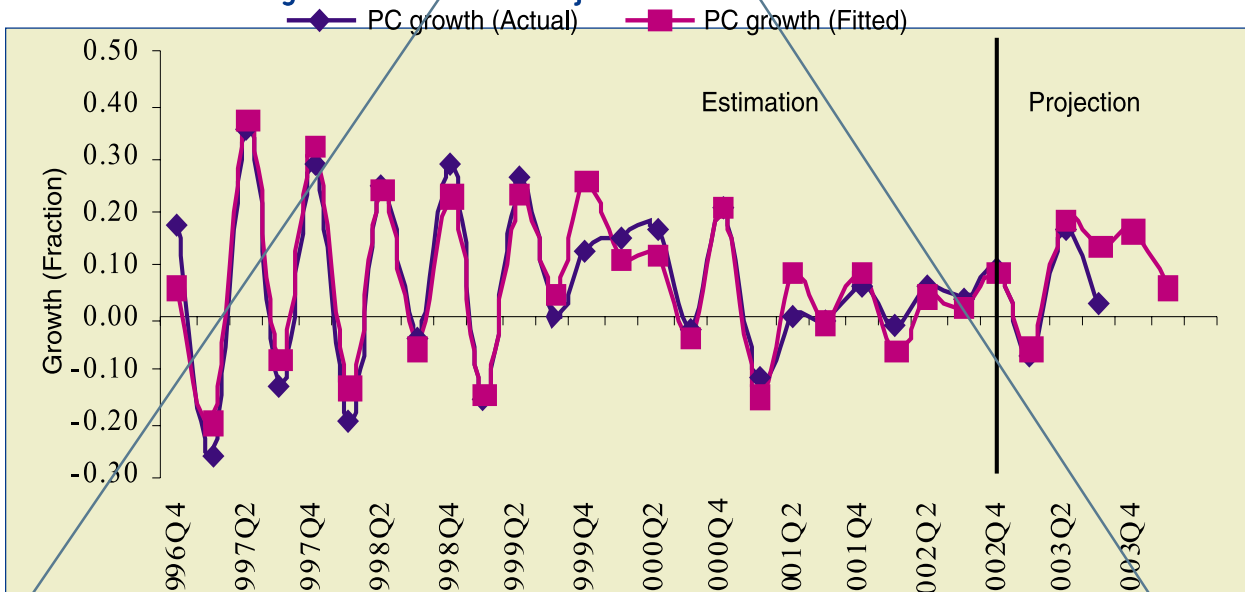
estimate a dynamic model in error correction framework, which allows building in long-term behaviour as well as short-term dynamics.

### 6.1 Estimated model

It is conjectured that the global and domestic economic conditions affect demand of the domestic IT sales while suppliers optimise benefits by adjusting their delivery schedules depending upon the price situation in the PC market. The model search is conducted using a large number of possible variables for long-term and short term effects. However, the following discussion is limited to the variables included in the final model. The estimation period is 1995Q4 to 2002Q4. Data for 2003Q1-Q3 is used for predictive test of the model.

The estimated model is presented in Box 1, which explains 90 percent of the variation in growth in the PC market wherein statistical properties are acceptable. The fitted and the actual values of the PC growth are plotted in Figure 6.1.

**Figure 6.1: Fitted and Projected Growth in PC Sales in India**



The plot also includes ex-post predictions for 2003-04 Q1-Q3, which is tested against the actual value and found to be statistically satisfactory. There are also ex-ante predictions for 2003-04 Q4 and 2004-05 Q1 with assumed values of eight and six percent Y-o-Y growths in real GDP of India; 4 percent Y-o-Y

growth in real GDP of USA for 2004Q2 and almost no change in prices. The model indicates that the PC sales would have risen by 16 per cent during the fourth quarter of 2003-04 and 5.5 per cent during first quarter of 2004-05 over the previous quarters respectively.<sup>1</sup>

### Box 1: Estimated Model

All variables are taken in their logs. A “D” before the variable represents that the variable is taken in first difference. A “DL” before the variable means it is first difference of lagged variable and therefore is growth in fraction. Lags, as usual are represented in parenthesis.

PCN = PC sold; Y = real GDP of India at factor cost; YUS = Real GDP of United States (base 2000); PCOM = PC price index with 1996Q1 price as 100; S1 dummy for quarter 1.

$$DLPCN = -63.3705 - 1.3264 LPCN (-1) + 0.7396 LPCN (-2) + 0.7294 LPCOM (-1) - 0.0476 S1 +$$

(-5.40) (-6.88) (5.06) (3.02) (-1.27)

$$7.64241L YUS (-1) + 0.3373 DLY (-1) - 0.7599 DLPCOM (-1) - 0.2265 DLPCN (-1)$$

(5.43) (2.79) (-2.26) (-1.69)

R-Squared = 0.90 R-Bar-Squared = 0.85; S.E. of Regression = 0.063; F-stat. F (8, 17) 18.16[.000], DW-statistic = 1.94; T-statistics in parenthesis

Serial Correlation CHSQ(4) = 3.98[0.41]; Functional Form CHSQ(1) = 5.85[0.02];

Normality CHSQ(2) = 0.91[0.63]; Heteroscedasticity CHSQ(1) = 0.05[0.83];

Predictive Failure\*CHSQ(3) = 1.44[0.71]

#### Long run effects:

- One percent growth in real GDP of the United States causes 13.04 percent growth in PC sales in domestic market in India.
- One percent increase in PC price induces an increase in PC supply by 1.24 percent

#### Short-run effects

- Each percentage point increase in PC price inflation reduces growth in PC sales by 0.62 percentage points over two quarters. Or, every percentage point fall in PC price inflation increases sales growth by 0.62 percentage points over two quarters.

Each percentage point increase in quarterly growth of Indian GDP increases growth in sales of PC by 0.30 percentage points over three quarters. The short-term coefficient is indicative of the fact that domestic income elasticity is significant and people have preference to acquire PC as their income increases.

The price index for PC is based on prices in US-Dollar, so the exchange rate effects are also built in. The real gross domestic product of the United States (US\$ billion, base 2000) (YUS) is a proxy for the real world economy and the real gross domestic product of India at factor cost (Rs crore<sup>2</sup>, base 1993-94)

(Y) is a proxy for national income of India. The PC price index is calculated from the IDC data on PC sales and the total value of the sales. YUS is taken from the web site of the Department of Commerce (United States) and GDP of India is taken from the CSO documents.

<sup>1</sup> This analysis suffers from some limitations as this exercise is done with extremely small data set somewhat compromising the acceptable norms of time series analysis. This has also reduced the scope of adding more variables in the model. Therefore, the forecast may not be sustainable for more than few quarters and re-estimation of coefficients may be desired depending upon the performance. As more and more data is accumulated, new variables also may have to be added to improve the model.

<sup>2</sup> 1 crore is equal to 10 million.

## 6.2 Macroeconomic Drivers of PC (Proxy of IT) Sales over Time

### United States GDP

Economic developments in the United States have long run effects on PC sales in India due to several reasons. PC sales in India are related to factors such as the IT boom, developments in communication systems, the changing outlook of people and the education system where schools have introduced computers as essential curricular activity raising demand on parents to buy PCs at the earliest opportunity. How do changes in the US economy affect domestic sales of PCs in India? Consider the market for the Indian IT sector. It is certainly export driven, the bulk of which goes to the United States. Therefore, a growing US economy will have more demand on the Indian IT sector. Further, the US economy affects all other economies due to its market size and therefore, it drives demand in the Indian IT sector through other countries as well. A growing IT sector in India, in turn, has resulted in increased demand on the domestic sales of PCs, particularly the developers and suppliers of IT related products including IT enabled services (ITES). It may be noted that such effect cannot be captured by the domestic real economy of India. Quantitatively, the elasticity of PC demand in the Indian market with respect to economic growth in the United States is 13.04 percent. Clearly, the size of the US economy is too big, which is the key reason for such an effect.

In the previous chapter it was argued that Indian States which are proactive in IT industry are also large exporters of IT products and therefore, there is a clear linkage between IT development and the external world. This is because, the domestic potential of IT penetration is not being realised due to promotional inadequacies, which has left the IT sector highly dependent on external markets.

### Indian real activity (GDP)

India's real activity affects PC sales in the short term. The lagged growth in quarterly GDP has positive effects on growth of PC sales. One percentage point increase in quarterly growth of Indian GDP increases growth in sales of PC by 0.30 percentage points over three quarters. This transient relationship is not adequate to generate a sustainable IT market in the domestic economy and calls for a careful policy formulation directed towards increasing IT penetration in all sectors of the economy.

### Computer price index (PCOM)

Computer prices have long term as well as short - term effects on the growth of PC sales. In the long run suppliers set their strategy to maximise profits, while in the short term demand is sensitive to the inflation of prices of PCs. As the price increases, demand decreases and the sales reduce in the short run. In the medium and long run, increase in productivity pushes up the labour wage, which is reflected through an increase in the PC prices. Nevertheless the general inflation in India during the sample period has been varying between 3 and 7 per cent, while PC prices have been, in general, declining. The decline in PC prices is a result of a combination of possible reasons. Possibly, wage increases in the PC segment are less than productivity increases; the international prices of components have been falling; and stiff competition from street assemblers have forced branded manufacturers to cut profit margins. With higher general inflation the real price of computers falls further, which is reflected in an increasing supply of PCs in the medium and long run.

PC sales in India are also found to be systematically lower during the first quarter of the year.

## 6.3 Policy Implication

There are important policy implications arising from this small exercise, which need to be reviewed in order to increase IT penetration in the Indian economy.

- (1) The ex-ante data indicates that the IT sector in India is highly vulnerable to the external environment. There is little support from the domestic economy.
- (2) Deepening of IT usage in the economy must increase in order to make it a long-term sustainable sector.
- (3) This also requires that the inputs to the sector be further liberalised to improve competitiveness of hardware. The structure needs to be further reviewed in favour of lowering the duty on inputs.
- (4) It is important to realise that the size of the domestic market and external market both are critical in developing high capacity production units. Without high capacity units, costs cannot be reduced to the level of competing countries.
- (5) In addition, computer assisted communication services and governance needs to be popularised to increase domestic applications.



# Information Technology in Key Verticals



# CHAPTER 6

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