

Self-Professed Doom: A System Dynamic Investigation in Indian Auto Industry Slowdown

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Abstract:

The passenger car segment of Indian Auto Sector has shown a very varied picture of growth over past few years. Its decline has been attributed to various factors related to global meltdown and decline in consumer confidence in popular media and many industry reports like Crisil Research, Kotak Financials etc. However the industry's continued slump in the post 2009 period has aroused various questions. This work tests the hypothesis of whether the slump was due to endogenous factors of industry and not due to the exogenous factors like interest rate, GDP growth rate etc. The hypothesis has been checked on the publicly available parameters and data sources. This paper develops a causal diagram of the Indian Auto Industry (Passenger Car Segment) to analyze the endogeneity in the industry and evaluates the drawn Causal diagram using Vensim[®] Software. The modeling approach allows us to better understand the intricacies of the industry and understand the underlying factors which make the sector as unique as it is.

Keyword: Industry Dynamics, System Dynamics, Indian Automobile Industry, Passenger car Segment

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Introduction

None of the industries have depicted the saga of Indian story better than the Indian Automobile sector and more specifically the Passenger Car segment thereof. It has fluctuated like a see saw in recent past and more often than not the see saw has given rise to few anxious moments in the economic cordons. Indian Automotive sector grew with a very healthy pace in the decade leading up to 2008 and was considered the show case example of India growth story. The Growth rate of passenger cars segment which was continuously rising till 2008 suffered a mild shock in 2008-09 period. This decline was attributed to the shock due to global financial crisis. The passenger car segment seemed to have revived post 2009 till 2011 but post 2011 we have been witnessing a steep decline in the sales. Figure 1 below shows the stark decline in passenger car growth rate which evidently depicts the contraction in the market. This steep decline in growth rate of Indian passenger car sales with most macroeconomic data either growing, albeit moderately, or steady raises curiosity. The curiosity is for the fact that whether the decline was due to external macroeconomic factors or due to several internal reasons of industry structure. This paper is a step in direction of understanding the internal dynamics and investigates the presence of any endogenous factor which may have led to the current slowdown.



Figure 1: Annual Growth rate and No. of cars sold in India over past 5 years

This paper presents a systems dynamic model to analyze the reasons and factors for the steep decline in the Indian automotive sector. The attempt is to identify and isolate any endogenous factors for the same. The model developed in this paper is based on the systems dynamics philosophy proposed by Forrester (1994) and goes through the multiple stages of problem identification to model formulation (Sushil, 1993).

Literature Review

Krishnan (1996) postulated that it was the economic liberalization of 1991 and the end of license raj of 1993 which led to the boom in the Indian Automotive sector. This has seen a continued boom since the days of 1993 including introduction of various international brands in Indian market including, but not limited to, Toyota, Hyundai, Fiat, Honda, and Renault etc. This increased competition in auto industry led to increase in productivity of the industry and also decrease in prices which in turn led to very high rate of growth (Ray, 2012). Pradhan (2011) says that the firm performance in India for all auto firms did not show a very high decline as was prevalent in western world but the ceiling that it has hit seemed to indicate some fundamental issues in the industry. One of the important factors has been the change in investment pattern in Indian auto industry over the past decade. The investment in R&D has increased for design but decreased for technological efficiency (D'costa, 2011). Another change has been the shift in investment to diesel based vehicles over past 15-20 years (D'costa, 2011).

System dynamics modeling has been used as a natural progression to analyze the dynamic nature and reaction of the auto industry. The SD methodology analyses amongst other things the rationality of decision making (Sterman, 2000). System dynamics methods lay great emphasis on the endogenous analysis of problems. The dynamic behavior of interest solely from variables and interactions within some appropriately chosen system boundary should be analyzed for true reflection of the problem (Forrester, 1994; Forrester, 1995; Forrester, 1968). In system dynamics analysis several works have been done on auto industry. Walter et al (2010) analyzed the auto industry's reaction to increasing global emission norms.

Methodology

To investigate the reasons for the slowdown with the hypothesis that the slowdown in Indian Auto Industry is endogenous, we begin with the data collection and analysis step. Further afterwards, we analyze the data to draw patterns and inferences based on these inferences, we base our model, drawing inspiration from the market growth model which started the path for predicting endogenous issues in industries which leads to decline in particular industries.

We analyzed the data collected from various sources including Crisil Research (Industry Report, Automobile sector), KPMG, Infosys financing research, CMIE research database for automobile. The preliminary research suggested that the slowdown was majorly in the small and medium car market which is the largest in India. The small but important SUV and luxury car segment grew at a high pace even in these times. So for the purpose of analysis in

this paper, we limited the scope to small and medium cars only. There are multiple players in the small and medium car industry in India which is the most fiercely competitive which includes the market leader Maruti Suzuki Pvt. Ltd. along with Hyundai, Tata etc. To zero in on the plausible endogenous factors for the downturn, we analyzed the factors of the industry. Figure 2 shows some of these factors in graphical form. We find that the no. of dealerships of the firms has increased constantly over these years as has the capacity of these firms.

The data also suggests that the capacity utilization although has been going down along the years. This has been with increase in overall capacity which was planned in boom years pre 2008. Another aspect that was plotted was the financing aspect which was directly related to the macroeconomic factors like interest rate etc. We find that the percentage of cars financed dipped in 2009 and has been increasing ever since but still has not reached the peaks of 2007.

We also tried to analyze the used car market and its impact on the sales of new cars. We find that the used car market is rising tremendously, Over past 5 years used car sales has risen from 1 million units to 2.6 million units and is expected to rise further. This has been helped in no small measure by the efforts of major car manufacturers to enter the used car market in an organized fashion, a segment which has been dominated by unorganized sector till now. Figure 3 and 4 show the trends in used car markets and lowering holding period of new cars in India.

Causal Loop Diagram (CLD) development was based on the data mentioned above and several other data factors not mentioned above. We would now discuss the CLD presented in figure 5. In interest of space we would focus more on the causal links which show the typical behavior of the endogenous industry issues leading to the current slowdown.

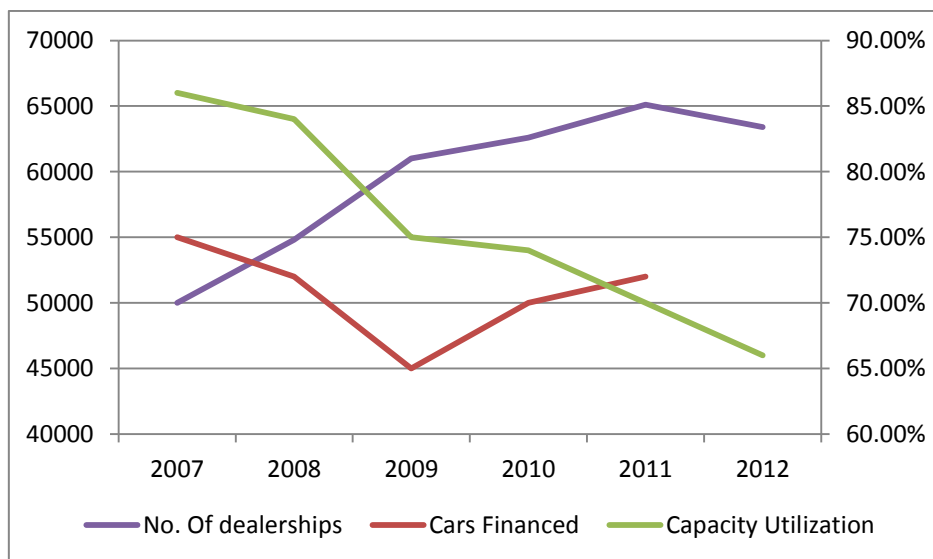


Figure 2: Plot of various causal factors of the Auto sector in India

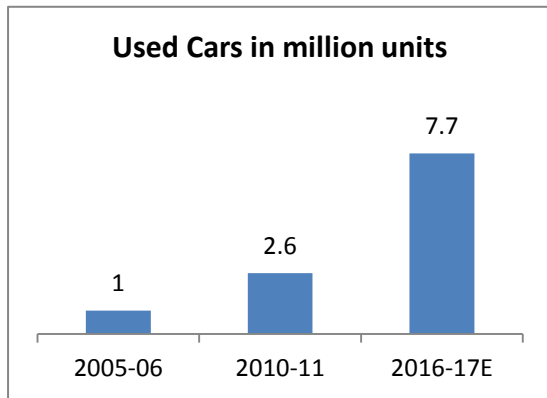


Figure 3: Plot of used car sales in India (Projected till 2016) (SIAM 2012)

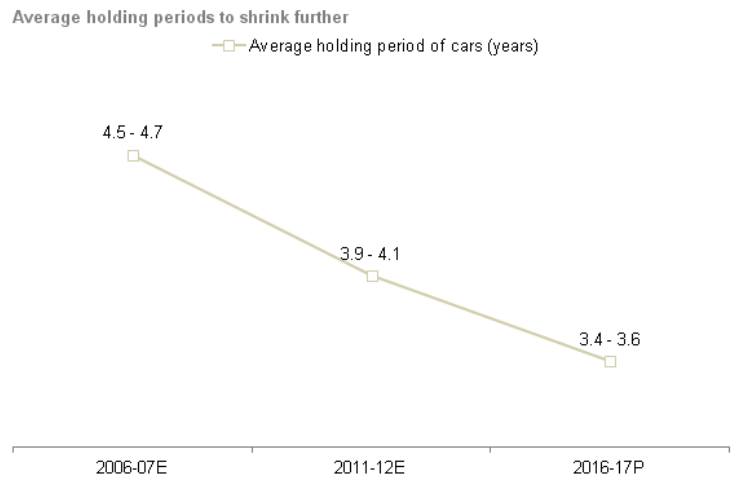


Figure 4: Average Holding period of Cars in India (SIAM 2012)

One of the important observations to emerge from the CLD is the balancing loop B1, which highlights one of the major factors that is time lag between setting up the additional capacity and the demand growth. There is a significant setting up time for new acquisition; this delay leads to higher installed capacity based on anticipated demand. The anticipated demand of 2007-08 periods led to all firms planning capacity additions which started coming in effect about 24 months later and the impact is visible in declining capacity utilization.

Results and Analysis

The model was built on the assumption of following the behavior depicted by the above data. The economic conditions are the only exogenous source of variability in the model, which for simplistic purposes is assumed to be normally distributed between 0.4 and 0.9 depicting the economic conditions where 0.4 depicts a bad economic scenario and 0.9 shows a better of scenario.

Based on the analysis done, we can report that the fall in sales is due to overselling. The sales have increased at a faster pace as compared to the rise in demands which leads to a cycle on fall in demands as well. The capacity acquisition followed the rise in demand cycle. The increase in capacity acquisition was reflected after a period of about 24-28 months after which the utilization started declining because the actual demand had peaked by that

period. Figure 6 given below shows the movement in capacity utilization as predicted by the model which closely follows the actuals.

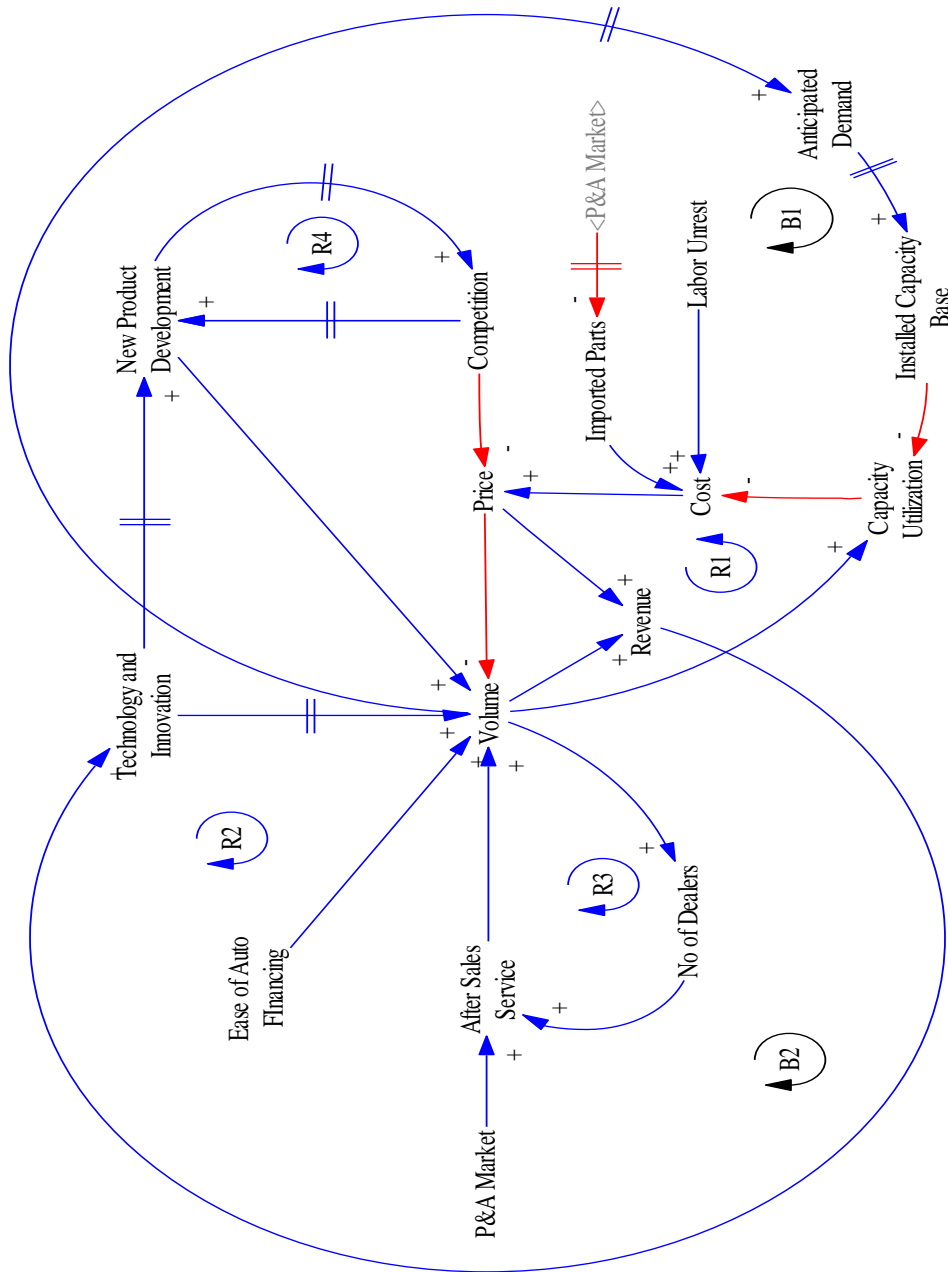


Figure 5: Causal Loop diagram drawn on Vensim[®] Software

The model developed on fundamental principles of system dynamic modeling evaluates only the endogenous factors and leaves exogenous factors alone. The exogenous factors which the model considers as a boundary are interest rate and economic factors. We find that in given endogenous factors the hypothesis of industry driven slowdown is evident.

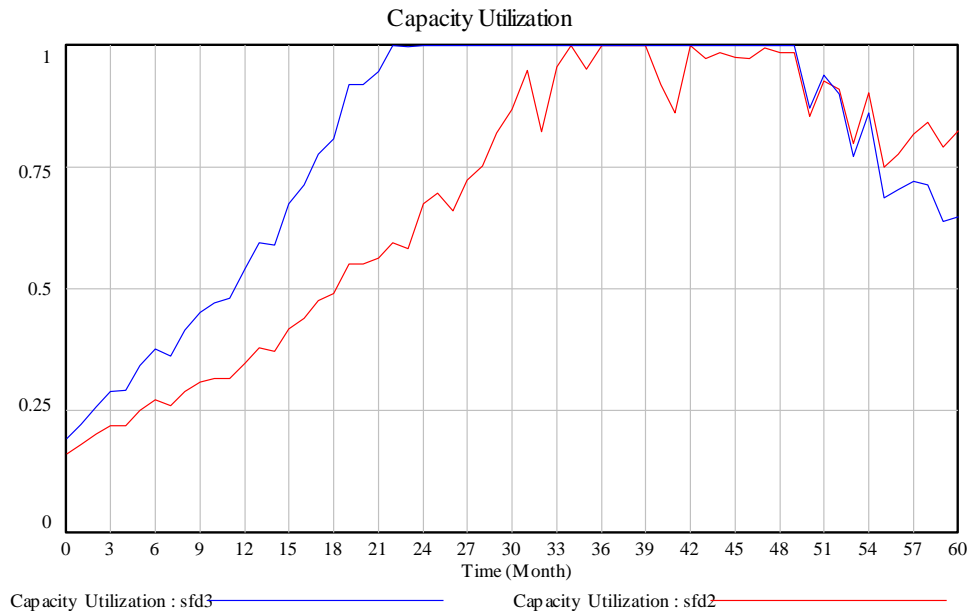


Figure 6: Simulation results of Capacity utilization of Auto cars manufacturers in India

Conclusion and Future Work

The hypothesis that endogenous factor are responsible for the slowdown in Auto Industry seems to be supported by the System Dynamics analysis done on a model developed using the publicly available data. Preliminary investigation suggests that the slowdown was due to overselling in the boom times which gave rise to a false sense of anticipated demand. This false sense of anticipated demand led to capacity acquisitions which led to high investments and low returns after 24 months leading to slowdown as can be perceived in the markets over period of 2010-12.

The work in this paper can be further extended to validate the model for more diverse cases and analyze the impact of resale of cars which seems to be an important factor but has not yet been analyzed in the model developed by us. The impact of interest rate and self-driven financing schemes offered by various auto firms on the final sale of passenger cars also needs to be examined.

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