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CUSTOMER SATISFACTION AND SUSTAINABLE FIRM PERFORMANCE: THE ROLE OF UNCERTAINTY

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ABSTRACT

Is it possible for a firm in a competitive industry to generate and sustain superior long-term financial performance? There are two directly opposing views on whether a firm can attain sustainable long-term superior financial performance: Classical microeconomics theory which says that competition, free entry and imitation by competitors mean that above-normal profits cannot exist in the long run; and the marketing strategy theory which says that a firm's marketing investments in customer satisfaction and retention efforts create sustainable advantages for brands and firms in the long-run. Using an analytical model of customer satisfaction investments and long-term financial performance, we demonstrate that, in the face of the uncertain nature of the outcome of such investments, firms can indeed sustain superior long-term financial performance. But the impact of these investments in customer satisfaction last only up to a point, beyond which such investments do not generate superior financial performance.

KEYWORDS

Customer Satisfaction, Uncertainty, Financial performance, Microeconomic modeling.

INTRODUCTION

There are two directly opposing views on whether a firm can attain sustainable long-term superior financial performance: Classical microeconomics theory which says that competition, free entry and imitation by competitors (reasonable assumptions for most industries) imply that (above-normal) long-term profits cannot exist in the long run. Such profits might exist in the short run for a variety of reasons (market power, barriers to entry) but will definitely be eroded away (Tirole 1988, Varian 1992); and the marketing strategy approach which says that a firm's strategic and marketing investments in customer satisfaction and retention efforts create sustainable advantages for firms in the long-run (Day 1994, Hunt and Shelby 1995, Srivastava et al, 1998). These two approaches, interpreted narrowly, are clearly at odds with each other.

The empirical evidence from academic research somewhat more conclusive (Ittner and Larcker 1998, Gruca and Rego 2005, Mittal at al 2005) and of course the real-world is full of examples of specific firms within industry who consistently perform better than their competitors For example, since the early 1980s to the mid-2000s, Japanese car makers have always rated higher on satisfaction than their competitors. Among service firms, firms like Geico and Met Life Insurance Company and more recently, NBC broadcasting company are further prominent examples. These firms (ex-ante) seem to be operating in very similar environments (for example in the same industry/product market) with access to the same resources, but they produce very different ex-post long-term results, seeming to support the marketing paradigm rather than the economics based ones.

UNCERTAINTY, MARKETING EFFORTS AND FIRM PERFORMANCE

Can we reconcile these two approaches? Yes, if we can illustrate that even in equilibrium, customer satisfaction affects a firm's performance levels. Are there reasons to expect that, under reasonable assumptions of firm and consumer behavior, certain firms will be able to build sustainable competitive advantages and hence obtain superior firm performance? We show that this is indeed possible. We draw on the modeling literature in economics, specifically those incorporating uncertainty in innovation and imitation (Lippman and Rumelt 1982, Telser 1982). This framework allows us to make a conceptual and analytical link between a firm's resources and actions, the outcomes of those actions (firm satisfaction levels) and its long-term financial performance.

It also captures two key features of marketing expenditures: *Its irreversibility and the uncertain nature of its outcomes.* While most models have treated marketing expenditures as being irreversible, they do not consider the uncertain nature of its outcome. What might be the consequences of such uncertainty? Firms make decisions involving expenditures on strategic and marketing variables, but the outcome of these expenditures is posited as being stochastically uncertain, in the sense that it is a random draw from some probability distribution. Over time, this uncertainty in the outcome of marketing and strategic innovations can lead to differences in customer satisfaction in several ways. Attempts to improve the quality of a service are fraught with similar uncertainties. High technology firms, for example, even with identical products might end up delivering them very differently to the market. Similarly, efforts to imitate the strategy of a successful competitor are also uncertain in terms of the result obtained. Southwest Airlines, for example, offers short-haul, low cost, point-to-point service between mid-sized cities and secondary airports in large cities. As a result, Southwest has consistently been rated highly by customers on satisfaction as well as service quality levels (Bowen and Headley 1998). Southwest Airlines is also been the most profitable airline in the industry over the long-term. Many competitors, for example Continental and Value Jet, have tried to imitate Southwest's strategy but have been able to do so with only partial success (Porter 1985). Thus, it is important that any modeling attempt to link marketing actions and performance consider the uncertain nature of all (and in our specific case satisfaction improving) marketing activities.

FIRM PERFORMANCE AND UNCERTAINTY: AN ANALYTICAL APPROACH

We propose a parsimonious singe-firm analytical modeling framework where the firm can either be thought of as one that faces competitive markets with access to similar resources or one that is in a monopolistic environment. A firm makes decisions on satisfaction improving marketing effort. We explore the effects of stochastic uncertainty in outcomes on achieved satisfaction levels and long-term firm performance. We discuss how such a framework might be extended to more than one firm.

A MODEL OF UNCERTAINTY, CUSTOMER SATISFACTION AND FIRM PERFORMANCE

We propose a similar modeling framework as Tesler (1982) to formally link uncertainty of outcomes, customer satisfaction and firm performance. The model depicts the evolution of a firm from the initial stage where the product has just been introduced. This is very similar to recent models in economics which describe evolution of firms over time (Reinganum 1985, Klepper and Graddy 1990, Cohen and Klepper 1996) and thus are more in the spirit of evolutionary economics than pure neo-classical microeconomics (Nelson and Winter, 1982). I first outline the model, its assumptions and distinctive features. I then set up the model and state and prove the propositions and results. Finally, implications of the model are derived.

A MODEL OF INNOVATION, UNCERTAINTY AND CUSTOMER SATISFACTION

In this discrete time model, a single firm introduces a product into the market at the beginning of the first time period. This product faces a standard, downward sloping demand curve. We can think of this as the demand for a basic product by heterogeneous consumers with different reservation prices. This situation typically describes a firm in a monopoly situation, but it can also be thought of as a firm in competitive situation with the downward sloping demand curve being the residual demand curve of one of the firms in the industry.

Clearly, the firm need not be content with this level of demand. The firm may choose to undertake satisfaction-improving marketing efforts that increase demand. By doing so, the firm can change this level of demand that it is facing i.e. the industry is such that there is clearly an incentive for the firm to innovate. This incentive depends on the level of demand the firm faces (following Dasgupta and Stiglitz, 1980; Shaked and Sutton, 1987).

Formally following Telser (1982), a firm makes a single product at constant marginal cost c. When introduced in the market, this product faces a downward sloping demand curve with a continuum of different consumers, each having different reservation prices. The initial aggregate demand can then be represented by a continuous inverse demand function

$$p = b(q) \qquad (1)$$

where *p is the market clearing price*
q is the quantity demanded and
b(q) is the Inverse demand function.

Further, the demand is such that above a certain maximum price, p_M, there is zero demand for the product. And even at zero price, the quantity demanded is finite, q_M. Thus, both (p_M, 0) and (0, q_M) satisfy Equation (1) i.e.

$$p_M = b(0) \text{ and } 0 = b(q_M).$$

Thus, the inverse demand function b(q) is a closed, bounded and continuous function.
A linear demand curve of the form

$$p = p_M - (p_M / q_M)\ q \qquad (2)$$

satisfies the above conditions. Let $p_M = B$ and $p_M / q_M = a$.
Thus Eqn. (1) can be rewritten as

$$p = B - aq$$

where B is the Y-intercept and a is the slope of the inverse demand function.
Let R(q, c) be the revenue function per period.

$$R(q,c) = q(B-aq)-cq \qquad (3)$$

The profit maximizing quantity is obtained in the standard way by setting the first derivative of (3) with respect to q equal to zero. The optimal values of q and R(.) are as follows :

$$q_A(c) = (B-c)/ 2a \quad \text{and} \quad R_A(c)=(B-c)^2/ 4a \qquad (4)$$

$R_A(c)$ would be the return that the firm would get in every discrete time period.

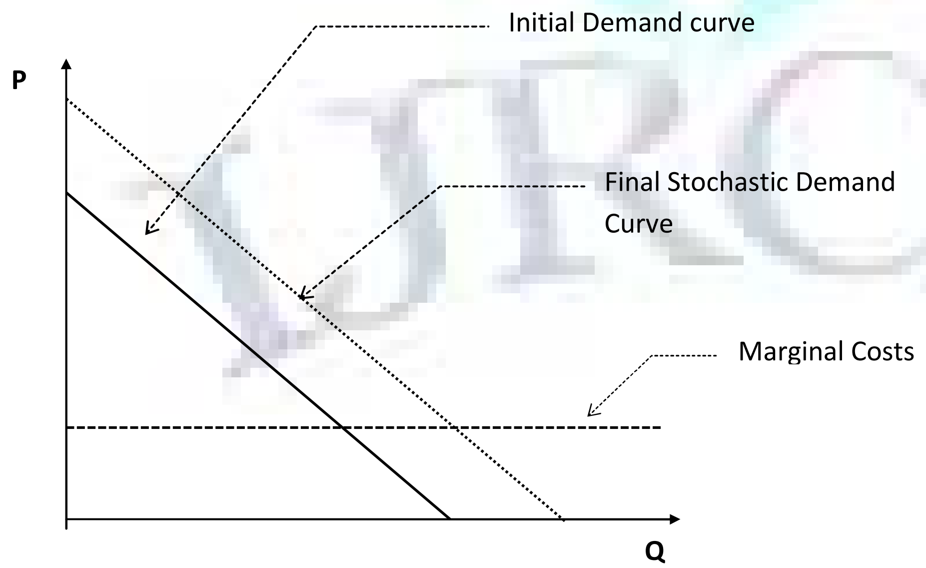
But, as pointed out earlier, the firm can do more. By spending money on marketing innovation, the firm can affect its level of demand by increasing the level of customer satisfaction. At the beginning of each period, the firm decides how much to spend on such customer satisfaction-improving marketing activity. This could include product improvement, increased service levels, better distribution and sales strategy, an attempt to gain a superior understanding of the service delivery process etc. The outcome of this expenditure is, however, uncertain. We posit the results of these marketing activities to be a customer satisfaction level, which, rather than being deterministic, is a random variable that depends on the level of expenditures.

By spending an amount x_t in time period t (t=1,2,3,......) the firm in return gets a satisfaction level which is a random variable S_t drawn from a cumulative distribution function $F(s_t,x_t)$. s_{t-1} is the satisfaction level at the beginning of time period t. Each of these draws is independent over time. (s_0, the satisfaction level when the new product is introduced, is initialized, without loss of generality, to zero). The obtained satisfaction level of the firm of the firm s_t thus directly affects its demand for the product in the following way: it increases the reservation price that each customer is willing to pay. An increase in satisfaction shifts the demand curve to the right. This conceptualization of the effect of satisfaction is similar to what economists call product innovation expenditures which affect the demand for a product as contrasted with process innovation which is primarily presumed to affect costs of production (Cohen and Klepper, 1996; Klepper, 1996). It is also consistent with the effect of satisfaction on consumers' price-tolerance and willingness to pay (Anderson 1998, Fornell et al 1996)

In our model, increased satisfaction only affects reservation prices but not price elasticity. This implies that shifts in the demand curve are parallel and do not affect its slope. This assumption is made for purposes of mathematical exposition so that we can focus on the main issue i.e. the effects of uncertainty. In the main, the results of this section would not be affected by relaxing this assumption as long as increased satisfaction leads to weakly higher satisfaction levels for every customer. For example, our model corresponds to Fig. 1.

POSSIBLE SHIFTS IN DEMAND CURVES

FIGURE 1



Analytically, this new demand curve is represented by

$$p = (B + \tilde{S}_t) - aq \quad (5)$$

where $\tilde{S}_t$ is the satisfaction level at time t of the firm's product.
Once the new demand has been determined, the firm chooses its quantity so as to maximize its profits in each period.

Now the optimal quantity and revenue functions are given by

$$q_B(c) = (B + \tilde{S}_t - c)/2a \quad \text{and} \quad R_B(c) = (B + \tilde{S}_t - c)^2/4a \quad (6)$$

Thus, the firm's profit maximizing decision is a function of the realization of its satisfaction levels. The firm receives its revenues at the end of the period. In each period, the firm chooses its marketing expenditure so as to maximize the expected present value of its net profits.

But how is $\tilde{S}_t$ determined? Obviously, it is a function of the 'S_t's, which are realizations of past satisfaction levels and in the most general case is given by

$$\tilde{s}_t = \frac{(\phi_1 s_1 + \phi_2 s_2 + \ldots\ldots + \phi_t s_t)}{t} \quad (7)$$

Where the ϕ's are weights attached to each level of satisfaction. The value of the ϕ's will depend on how we presume that the satisfaction draws are incorporated into the demand curve by the firm.

Here we consider the situation where $\tilde{s}_t$ incorporates persistence of satisfaction as follows. In every period, the firm compares this period's realization of satisfaction with the one in last period and if the new satisfaction level is higher, then it uses this level, otherwise the firm continues with the extant level of satisfaction. This rule is followed in every time period. While this is an assumption, this would be true if the firm can in some way observe the realizations s_t, through for example market research or accumulated managerial knowledge about the consumer and category or even satisfaction surveys along the lines of the ACSI. Alternatively, this would be true if the firm changes its strategy only when it gets a higher level of satisfaction, s_t.

In such a case the ϕ's are given by

$\phi_t = \phi_t$ If $s_t > s_{t-1}$;

$\phi_t = \phi_{t-1}$ If $s_t \leq s_{t-1}$;

and $\phi_1, \phi_2, \ldots\ldots\ldots, \phi_{t-1} = 0$ (8)

Recall that the probability of drawing a realization *s* is given by

$$P(S \leq s) = F(s,x) = \int_0^s f(z,x)dz \quad (9)$$

Where f(z, x) is the p.d.f. corresponding to F(s,x). Thus the probability of drawing a satisfaction level in period t that is no higher than the current satisfaction level is given by $F(s_{t-1}, x_t)$. This implies that the higher the current satisfaction level the less probable that the firm would surpass it, which is what one would expect intuitively too. For example, a firm trying to imitate a competitor which has a very high level of satisfaction is less likely to succeed.
We also make the additional reasonable assumption that the higher the amount of marketing effort x, the greater the chance that the existing satisfaction level will be improved. This can be represented by the expression

$$F_x(s,x) = \int_o^s f_x(z,x)dz < 0$$

The Expected Return for the firm in period t when it has a satisfaction level s_{t-1} at the beginning of the period and spends an amount x_t in that period is given by

$$ER_t(s_{t-1}, x_t) = R(s_{t-1})F(s_{t-1}, x_t) + \int_{s_{t-1}}^{\infty} R(z)f(z, x_t)dz \quad (10)$$

Recall that R(.) is the revenue earned in that period and given by Eqn. (6). This revenue is received by the firm at the end of the period. The first term in (10) is the case when the satisfaction level that is obtained from the random drawing is lower than the current satisfaction. This can happen with probability $F(s_{t-1}, x_t)$ and the revenue of the firm is $R(s_{t-1})$ The second term is the expected revenue in the case where the satisfaction level obtained in the draw is higher than the existing satisfaction level.
If the firm does not spend any money on marketing innovation expenditures, then its expected returns in each period will be identical and will be equal to the $R_A(c)$ from equation (4). For notational consistency, denote this as

$$ER_t(s_0, 0) = R(s_0)F(s_0, 0) = R(s_0) \quad \text{for all } t = 0,1,2,\ldots. \quad (11)$$

Given these expected returns, we now calculate the value of the firm.

In the case where the firm does not spend any money on satisfaction the value of the firm, computed as the expected present value of all future net returns, is given by

$$\overline{V}_o = \left(\beta R\left(s_o\right)\right) + \left(\beta^2 R\left(s_0\right)\right) + \ldots\ldots\ldots\ldots + \left(\beta^t R\left(s_0\right)\right) + \ldots\ldots\ldots \quad (12)$$

In the case where the firm decides to spend on satisfaction, the value of the firm is given by,

$$\overline{V}_o^s = \left(\beta ER_1\left(s_o, x_1\right) - x_1\right) + \left(\beta^2 ER_2\left(s_1, x_2\right) - \beta * x_2\right) + \ldots\ldots + \left(\beta^t ER_t\left(s_t, x_t\right) - \beta^{t-1} x_t\right) + \ldots \quad (13)$$

where β is the discount rate, or the present value of one dollar.

The firm's overall objective at any stage is to maximize its value. At the beginning of each period, the firm can either accept the satisfaction level it has and stop further marketing innovation expenditures or decide to continue its efforts to find a higher level of satisfaction. Recall that as the satisfaction level increases, it is harder to improve on it. The firm will make its decision based on the effects of its action on its value i.e. on $\overline{V}_o^s$.

Proposition 1 : The firm will invest in satisfaction efforts until a time period T with a satisfaction level s^* such that for all $s > s^*$ it is true that

$$\underset{x}{\text{Max.}}\left[ER(s, x) - \frac{(1-\beta)}{\beta}x\right] \le R(s) \quad (14)$$

Proof : See Appendix A.

Proposition 2 : It is always optimal for the firm to invest in satisfaction i.e.

$$\overline{V}_o > \overline{V}_o^s \quad (15)$$

Proof : See Appendix B.

DISCUSSIONS AND LIMITATIONS

We find that, at least in the one-firm case, there is indeed an optimal level of satisfaction beyond which the firm will not make efforts to improve it. Equation (14) at which this optimal level is reached also has a nice intuitive explanation. The left hand side of (14) gives maximum expected return in a particular period when an amount ***x*** borrowed at a cost [((1-β)/β)***x***] is spent on improving satisfaction. (As β is the discount rate then (1-β)/β gives the interest rate at which money is borrowed). The right hand side gives the rate of return if the firm does not spend money in that period but rather accepts its satisfaction level. When this return is greater than the right hand side, the firm stops satisfaction improvement efforts. This is also the satisfaction level at which the firm's value $\overline{V}_o^s$ is maximized.

Thus it does not pay off continually to invest in satisfaction in the presence of uncertainty of outcomes. This corresponds to empirical and conceptual research, which we saw earlier, and which says that improving satisfaction has trade-offs involved and hence maximizing satisfaction might not always be the best strategy (Fornell 1995, Mizhik and Jacobson 2009).

Expenditures that improve a firm's satisfaction also increase its future firm value. Therefore it pays off for a firm to invest in satisfaction. The firm's incentive to do so of course comes from the fact that satisfaction increases demand for the product. The incentive to innovate is conditioned by the demand (and satisfaction level) that the firm faces in each period.

To summarize, we find that under these circumstances it is profitable for the firm to invest in marketing efforts that improve satisfaction. The firm will continue to invest until it reaches a stage where it is no longer marginally profitable to do so. At this point, firm marketing expenditures on improving satisfaction cease and both demand and profits are higher than they would have been in the case with no investment in satisfaction improving marketing efforts.

While the above analytical model described a single-firm case, it can also be interpreted as the partial-equilibrium analysis of a firm in a competitive market with the downward sloping demand curve representing the demand curve facing the firm in each period. However, a natural extension of our analytical model would be to consider the competitive dynamics of two or more firms involved in satisfaction-improving marketing efforts under uncertainty.

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APPENDIX

APPENDIX A

PROOF OF PROPOSITION 1:
Denote marketing efforts in time period 1,2,3,...,T,..... by x_1, x_2,.......x_t, ...respectively
And satisfaction outcomes of those efforts by s_1, s_2, ..., s_t, ... respectively
Let $x_t > 0$,
(i) $P(s_t \le s_{t-1}) = F(s_{t-1}, x_t)$
If $s_t \le s_{t-1}$, then the return in period t for the firm is given by $r = R(s_{t-1})$
(ii) Prob. $(s_t \ge s_{t-1}) = (1-F(s_{t-1}, x_t))$
If $s_t \ge s_{t-1}$, then the return in period t for the firm is given by $R(s_t)$
Thus the total expected return in any period is given by

$$ER(s_{t-1}, x_t) = R(s_{t-1})F(s_{t-1}, x_t) + \int_{s_{t-1}}^{\infty} R(z)F(z,x)dz \quad \text{(A1)}$$

At the beginning of each period, the firm decides whether or not to invest in marketing effort x.
Consider a finite period T.
If the firm decides to stop investing in this time period then the stream of revenues in all future periods would be identical and given by $R(s_t)$.
If, however, the firm decides to invest an amount x for one more period and then stop investing in satisfaction then its expected revenue for one period is given by
$(ER(s_{t-1}, x_t) - x_t)$ and for all future periods is given by $ER(s_{t-1}, x_t)$, where $ER(s_{t-1}, x_t)$ is from Eqn. (A1).

The difference in present value between these two strategies is given by

$$\Delta = \left(\left(\beta\left[ER(s_{t-1}, x_t) - x\right]\right) + \beta^2 ER(s_{t-1}, x_t) + ...\right) - \left(\beta R(s_t) + \beta^2 R(s_t) + ...\right) \quad \text{(A2)}$$

$$\beta + \beta^2 + \beta^3 + ... = \frac{\beta}{(1-\beta)}$$

Using the following the infinite sum
and dropping subscripts for notational ease, we can rewrite (A2) as follows :

$$\Delta = \frac{\beta}{(1-\beta)}\left[ER(s,x) - R(s) - \frac{(1-\beta)}{\beta} * x\right] \quad \text{(A3)}$$

(A3) can be written as

$$\underset{x}{\text{Max.}}\Delta = \frac{\beta}{(1-\beta)}\underset{x}{\text{Max.}}\left[\text{ER}(s,x) - \frac{(1-\beta)}{\beta}x - \text{R}(s)\right] \quad \text{(A4)}$$

Now, for it to be optimal for the firm to stop investing in marketing effort in period t, we need the expression in the brackets in (A4) to be positive i.e.

$$\underset{x}{\text{Max.}}\left[\text{ER}(s,x) - \frac{(1-\beta)}{\beta}x\right] \le \text{R}(s) \quad \text{(A5)}$$

APPENDIX B

PROOF OF PROPOSITION 2:
From Eqns (12) and (14) we have

$$\overline{V}_o = \left(\beta R(s_o)\right) + \left(\beta^2 R(s_0)\right) + ...+ \left(\beta^t R(s_0)\right) + ... \quad \text{(B1)}$$

$$\overline{V}_o^s = \left(\beta ER_1(s_o, x_1) - x_1\right) + \left(\beta^2 ER_2(s_1, x_2) - \beta * x_2\right) + ...+ \left(\beta^t ER_t(s_t, x_t) - \beta^{t-1}x_t\right) + .. \quad \text{(B2)}$$

Subtracting (A11) from (A12), we get

$$\overline{V}_o^s - \overline{V}_o = \begin{array}{l}\left\{\left(\beta ER_1(s_o, x_1) - x_1\right) + \left(\beta^2 ER_2(s_1, x_2) - \beta * x_2\right) + ...+ \left(\beta^t ER_t(s_t, x_t) - \beta^{t-1}x_t\right) + ...\right\} \\ -\left\{\left(\beta R(s_0) + \beta^2 R(s_0)\right) + ...+ \beta^t R(s_0)\right) + ...\right\}\end{array} \quad \text{(B3)}$$

Now, from Proposition will, there is a finite time period until which the firm invests in satisfaction and beyond which it does not. Let this time period be noted by T.

Therefore rewriting (A13) we have,

$$\overline{V}_o^S - \overline{V}_o = \begin{array}{l}\left\{\left(\beta ER_1(s_o,x_1) - x_1\right) + \left(\beta^2 ER_2(s_1,x_2) - \beta x_2\right) + \ldots\ldots + \left(\beta^T ER_T(s_T,x_T) - \beta^{T-1}x_T\right) + \ldots\ldots\right\} \\ -\left\{\left(\beta R(s_0) + \beta^2 R(s_0) + \ldots\ldots\ldots + \beta^T R(s_0) + \ldots\ldots\ldots\right)\right\}\end{array}$$

$$\overline{V}_o^S - \overline{V}_o = \begin{array}{l}\left\{\left(\beta ER_1(s_o,x_1) - x_1\right) + .. + \left(\beta^T ER_T(s_T,x_T) - \beta^{T-1}x_T\right) - \left(\beta R(s_0) + .. + \beta^T R(s_0)\right)\right\} \\ + \left\{\left(\beta^{T+1}\left(ER_{T+1}(s_{T+1},x_{T+1}) - R(s_o)\right)\right) + \ldots\ldots\right\}\end{array}$$

As expected revenue is Non-decreasing in s, we have

$$\overline{V}_o^S - \overline{V}_o \geq \left\{\left(\beta ER_1(s_o,x_1) - x_1\right) + .. + \left(\beta^T ER_T(s_T,x_T) - \beta^{T-1}x_T\right) - \left(\left(\beta R(s_0) + .. + \beta^T R(s_0)\right)\right)\right\}$$

$$= \left\{\left(\beta\left[ER_1(s_o,x_1) - \frac{1}{\beta}x_1 - R(s_0)\right]\right) + .. + \left(\left[\beta^T ER_T(s_T,x_T) - \frac{1}{\beta}x_T - R(s_0)\right]\right)\right\}$$

$$= \left\{\left(\beta\left[ER_1(s_o,x_1) - \frac{1}{\beta}x_1 - R(s_0)\right]\right) + .. + \left(\left[\beta^T ER_T(s_T,x_T) - \frac{1}{\beta}x_T - R(s_0)\right]\right)\right\}$$

$$= \left\{\left(\beta\left[ER_1(s_o,x_1) - \frac{1}{\beta}x_1 - R(s_0)\right]\right) + .. + \left(\left[\beta^T ER_T(s_T,x_T) - \frac{1}{\beta}x_T - R(s_0)\right]\right)\right\}$$

Now, $\forall$ t < T, from Proposition 1 we have,

$$\frac{1}{1-\beta}ER_t(s,x) - R(s_0) \geq \frac{1}{\beta}x_t$$

Hence,

$$\overline{V}_o^s - \overline{V}_o \geq 0$$

QED

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