

Report on “Pricing as a risky choice: Uncertainty and survival in a monopoly market” by Per Andersen and Henrik Vetter

1 Summary

This paper re-examines the pricing behavior of a monopolist under demand fluctuation. It considers the situation where the monopolist needs to commit the price of its product before it observes the actual demand level. The object of the monopolist is minimizing the probability of earning negative profits (the safety-first principle), rather than maximize the expected profits. The optimal price under the safety-first principle (p^*) is compared with the optimal price that maximizes the expected profits (p^π). The paper also suggests that considering the safety-first principle in pricing may explain some real-world pricing behaviors, such as mark-up pricing, more than 100% pass-through rate of marginal cost increase, inelastic pricing in demand changes, etc.

The main results of the paper are summarized as follows:

1. $p^* < p^\pi$, that is, the safety-first motive of the monopolist *lowers* the optimal price. The result is a bit surprising because it is in contrast to the old seminal works by Day et al. (1971) and Arzac (1976). In the previous papers, the monopolist reduces the optimal supply and thereby increases the gap between the average cost and the price to maximize the “safety margin”. The difference comes from the particular property of this model that the variance of profit is increasing in price.
2. Demand changes affect the optimal prices differently. Specifically, a uniform increase in willingness to pay does not affect p^* while it increases p^π . A change of demand by rotation, however, *decreases* p^* while it does not change p^π .
3. An increase in the fixed cost increases p^* while it does not change p^π , suggesting that the

monopolist takes more risk as positive gain becomes less likely.

4. An increase in the marginal cost (including the imposition of a production tax) results in $dp^*/dc = 1 > dp^\pi/dc = 1/2$ with linear demand. Thus, the monopolist behaves as if it employs mark-up pricing. Furthermore, $dp/dt > 1$ may hold with non-linear demand under the safety-first principle, and an increase in a production tax may increase the expected profit in this case.

2 Comment

Overall, the paper is well written and derives some interesting results. From an analytical viewpoint, there seem to be no serious shortcomings. The main strength of this paper is to provide new insights into the firm's pricing behaviors in a simple model, whose results are different from the previous papers. Especially, I like a counter-intuitive result that the monopolist sets a *lower price* to avoid the risk of bankruptcy.

The main weakness of this paper, however, is that readers will have difficulty in understanding why the results of this paper are different from those of previous papers. Investigating the safety-first principle in a monopoly model itself is not new and has been analyzed since several decades ago. Then, the paper's main contribution is providing several new results in this strand of research. To make clear the contribution, the paper should elaborate and discuss why new results are obtained.

Among others, I'm wondering why the "safety-first" monopolist lowers the price in the current model while it generally increases the price in Day et al. (1971) and Arzac (1976). As long as I read the paper, the key difference should be the variance of profit is always increasing in price in the current model, while it can be decreasing in price in the previous works. Then, why the price affects the variance differently?

Correct me if I am wrong, but my rough understanding is that this is (at least partly) because the demand shock is independent of the price level and marginal cost is constant in the current model, while demand shocks are more generally defined and marginal cost is increasing in the previous papers. Due to these two properties, the variance of profit becomes simply proportional to the price minus the marginal cost, $p - c$, and it is straightforward that lowering the price decreases the variance of profit and the likelihood of earning negative profit.

Even if the demand shock is additive and independent of p , the relationship between p and the variance would be more complicated if the marginal cost were increasing in quantity. With

the increasing marginal cost, the average cost curve becomes a U-shaped curve and lowering p doesn't necessarily decrease the (expected) zero-profit sale. With the constant marginal cost, however, average cost curve is always decreasing in sales and the monopolist that follows the safety-first principle has an additional incentive to reduce price and increase its sales to decrease its average cost.

I'm not 100% sure whether my conjecture is correct, but it appears that two restrictive assumptions on the demand shock and the cost function play crucial roles in deriving the results. In any case, it would really help understand the mechanism behind the results if the authors explain which specific properties of the model contribute to the distinctive results of the paper.

Besides that, it should be also explained why the sales tax increases the safety-first price, p^* , in the current model while it does not affect p^* in Arzac (1976). It is hard to understand the difference because, in Arzac (1976), p^* is independent of a sales tax only if the demand shock is additive, the same assumption of the current model. Please explain where the difference comes from.

The followings are some additional comments.

- It should be explained more what sort of demand uncertainty the authors are considering. The paper has examined as comparative statics a change in willingness to pay and a change of demand by rotation (that can be interpreted as a change in the number of consumers). These two demand changes are observable for the monopolist. Then, what does θ represent? It seems to be the demand shock which is observed only after the good is sold to consumers. The authors should provide some real-world examples of demand shocks that correspond to θ . I think this point is important because, as explained above, this specific forms of demand shock appears to be very important to obtain the main results.
- There are some questions about Proposition 4: (i) It makes sense that an increase in sales tax increases the expected profit, but I wonder whether the likelihood of negative profit always increases with the tax rate; (ii) It should be clarified whether $\mu > \xi/2$ is consistent with the second-order condition of the profit maximization. When the demand curve is "sufficiently curvy", the marginal revenue curve becomes upward sloping and there will be no interior solutions with the constant marginal cost.
- I'm wondering whether the emergence of inelastic pricing is a new result. One of the authors have already found in Andersen and Nielsen (2013) a risk-averse preference of the monopolist leads to inelastic pricing in demand changes by considering a more general

demand shock. It seems to me that the two papers share the same qualitative result. I'm interested in whether the current paper has a new property in this regard.

- It should be explained more intuitively why the safety-first principle makes dp/dc larger.
- I'm interested in whether $dp(t)/dt > 1$ is possible only if the monopolists follows the safety-first principle, or it can be obtained (though less likely) even if it maximizes the expected profit.

I hope these comments help improve the paper.