

Anchoring Bias in Public Procurement Tenders: A Bidder Lifetime Value (BLV) Analysis

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Abstract: Building a deep understanding of bidder behaviour and preferences allows procurement authorities to spend more efficiently and make sure the tender process is in line with their strategic goals. In this paper, in order to understand how the presence of a price anchor in public procurement tenders (an opening price or an official cost estimate) affects bidder lifetime value (BLV) and long-term retention rate, we apply the Customer Lifetime Value (CLV) model of Exponential Maximum Likelihood Estimation (MLE) to data that is collected from the public procurement tenders published by Israel Electric Company and Israel Railways Company for 211 bidders during January 2022 - October 2025. The With Estimate segment of the market has the highest CLV (31,612,906) as well as the highest retention rate (99.07%), while the No Anchor segment has the lowest CLV (4,064,971) and retention rate (88.65%). The sensitivity analysis indicates a CLV multiplier of up to 2.73× with a 5% increase in retention rates. These results support the hypothesis that price anchors are designed to increase bidder involvement and the cumulative value of their participation.

Keywords: Customer Lifetime Value, Anchoring Bias, Public Procurement, Retention Rate, Survival Analysis, BLV.

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I. INTRODUCTION

As competition intensifies in public procurement markets and tender procedures become more complex, understanding the factors that influence bidder decision-making has become an essential part of resource management (Tversky & Kahneman, 1974; Ariely, Loewenstein, & Prelec, 2003). The central aspect of the present study is anchoring bias, which is a cognitive function whereby the first price reference affects all subsequent bids. When it comes to public tenders, an initial opening price or official cost estimate can be known as a price anchor and may help reduce the spread of bids, prolong the duration of participation and help bidders return to the market in the future. Winning bidder loyalty (labelled in this study as BLV) is no longer just a marketing tool but also an effort to keep the company competitive and create value for the procuring entity (Gupta et al., 2006). Procurement companies are confronted with few good suppliers and so identifying and retaining top-tier suppliers is very crucial. Retention-based strategies can reduce costs (Tariq, 2025), and are more resilient to market fluctuations (Tremblay & Parent-Rochelleau, 2025). A systematic approach that combines satisfaction analysis with risk factor analysis has likewise been shown to provide sufficient grounds for initiating improvements in service and supplier relationship quality (Stefanova, 2022). Our study is about the following research question: How does the price anchor in public procurement tenders affect bidder lifetime value, attrition rates and responsiveness to retention improvements?

We incorporate data from Israel Electric Company and Israel Railways Company over 36 months from 2022 to 2025.

II. MATERIALS AND METHODS

The study employs a quantitative approach to assess the value of bidder relations in public procurement using CLV models (Gupta et al., 2006). Data were obtained from publicly available tender registries of Israeli public authorities. The data included 211 bidders for 13 different tenders. The key variables extracted in this study are date of first bid submission, date of last bid submission, segment affiliation by tender type, and bid price. XLSTAT 2024 (Addinsoft, 2024) was used for processing and analysis as well as in Microsoft Excel.

➤ Segmentation

The Bidders were divided into three groups (With Opening Price, With Estimate and No Anchor) according to the tenders in which they participated. The With Opening Price segment (n=70) consists of bidders who participated in tenders where the highest opening price was disclosed. The With Estimate group (n=71) consists of bidders that were given an official cost estimate. The No Anchor group (n=70) consists of bidders who participated in tenders for which no price estimate has been made before. The ARPA (Average Revenue Per Account) of each bidder is calculated as the average of bid amounts submitted by the bidders across their participation history.

➤ Life-Cycle Analysis

Our Exponential distribution model with Maximum Likelihood Estimation (MLE) was used to estimate the monthly churn rate (λ) and the expected duration of bidder relationships. The survival function $S(t) = \exp(-\lambda t)$ was used to cross-segment data over 60 months. We calculated the median, quartile, and average defection times for each segment and calculated the churn probability and retention rate.

➤ Simulation Scenarios

The impact of the +5% change in retention rate on overall CLV was modeled in each segment. The basic CLV formula (Gupta, Lehmann & Stuart, 2006) is:

$$CLV = ARPA \times r / (1 + d - r),$$

Where r is the monthly retention rate and d is the monthly discount rate (10% per annum = 0.8333% per month). This approach is advantageous because it is able to incorporate both the behavioral and financial characteristics of the bidders into one analysis.

III. RESULTS AND DISCUSSION

The empirical analysis based on segmentation and lifecycle modeling provides significant insights into the behaviour and financial behavior of bidders in public procurement. There is significant variation across segments in loyalty potential and expected long-term value.

➤ CLV Analysis by Segment

The Bidder Lifetime Value analysis by segment of the bids is shown in Figure 1 and Table 1 and indicates distinct differences in the contribution of each bidder group.

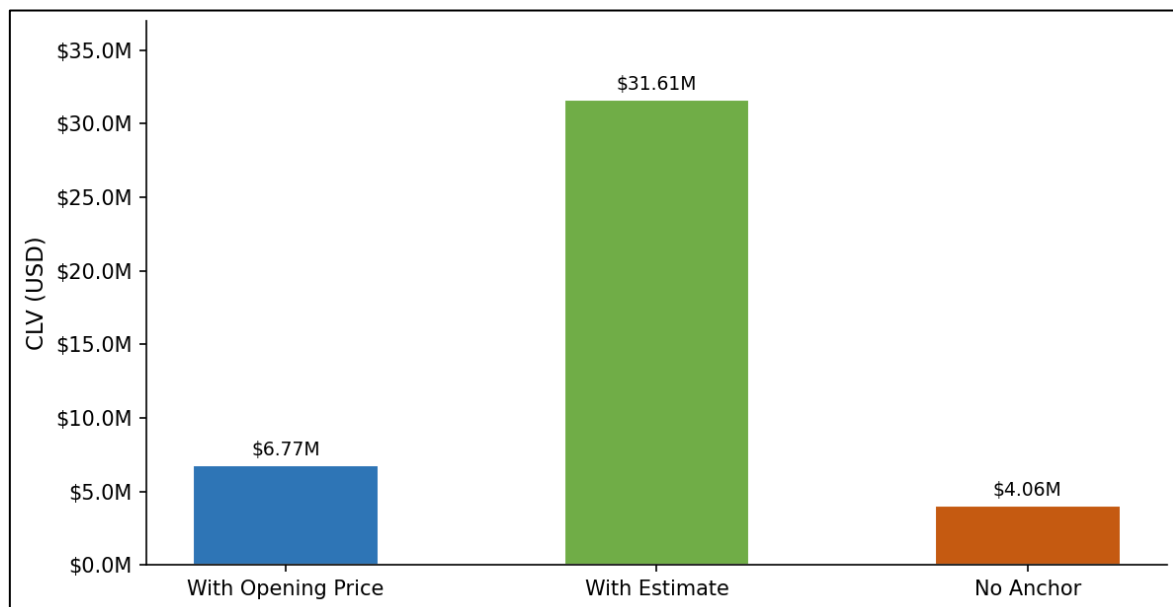


Fig 1 CLV Analysis by Segment - Discounted Values (n=211; Annual Discount Rate: 10%)

Table 1 CLV Analysis by Procurement Tender Segment

Segment	Bidders (n)	Active	Churned	Mean ARPA (\$)	Retention Rate	CLV (\$)
With the Opening Price	70	8	62	595,540	92.69%	6,774,869
With Estimate	71	61	10	561,575	99.07%	31,612,906
No Anchor	70	1	69	558,460	88.65%	4,064,971

Source: XLSTAT 2024, Exponential MLE Model, n=211 | Data: Israel Electric Company, Israel Railways Company

The highest value was attained in the With Estimate segment, with CLV of \$31,612,906 - 7.8 times the value of the No Anchor segment. This implies that bidders in this segment generate the most significant long-term revenue for the procuring entity and represent an important strategic asset, hence priority within retention and loyalty programs. The With Opening Price segment brings in CLV of \$6,774,869, and has a retention rate of 92.69%. While it has the highest mean ARPA (\$595,540), its high monthly churn rate (7.31%) limits the lifetime value. The No Anchor segment has the lowest CLV of \$4,064,971 and the lowest

retention rate (88.65%). The lack of price reference increases the uncertainty among the bidders and leads to earlier dropout, resulting in a lower total value of participation. These results show that segmentation can be used as a valid mechanism for differentiated bidder management based on projected lifetime value.

➤ Estimated Defection Time by Segment

The data shown in Table 2 and Figure 2 provide a detailed view of defection time by segment, with quartile values and mean relationship durations.

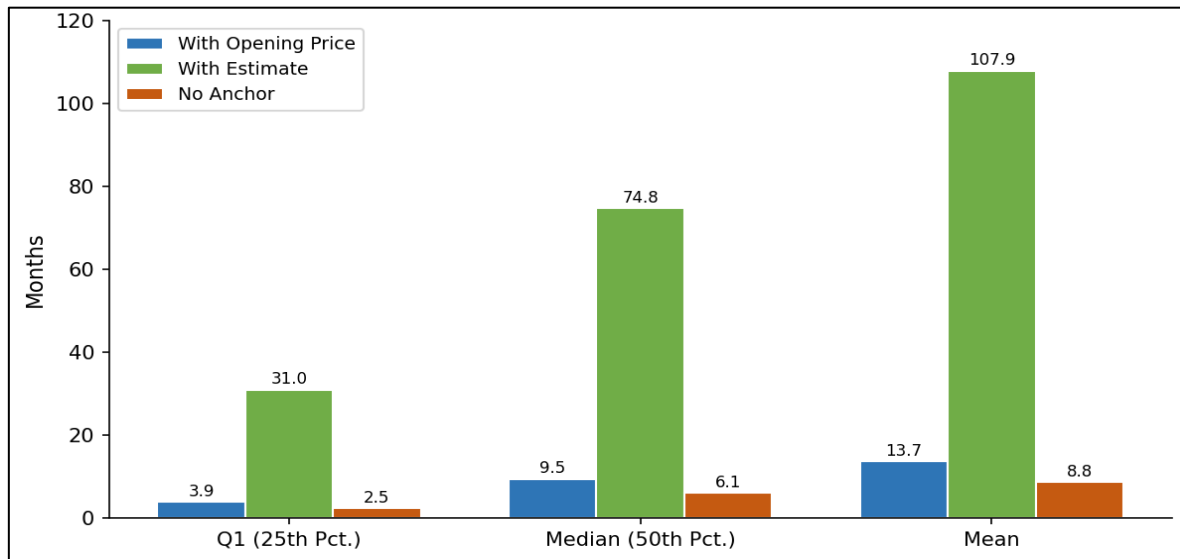


Fig 2 Estimated Defection Time by Segment - Q1, Median, and Mean Duration (Months)

Table 2 Defection Time Analysis by Procurement Tender Segment

Segment	λ (Monthly Churn)	Q1 – 25th Pct. (months)	Median – 50th Pct. (months)	Mean Duration (months)	Monthly Churn Rate
With the Opening Price	0.0731	3.9	9.5	13.7	7.31%
With Estimate	0.0093	31.0	74.8	107.9	0.93%
No Anchor	0.1135	2.5	6.1	8.8	11.35%

Source: Exponential MLE Model | Reference Date: 31/10/2025 | Unit of Measurement: Months

- First Quartile (Q1): For the With Estimate segment, 25% of the bidders leave after 31.0 months, while 3.9 months in With Opening Price and 2.5 months in No Anchor. These numbers indicate that the No Anchor segment is the most prone to early churn, as about 1/3 of the bidders leave in 3 months, and therefore the initial engagement and relationship are poor. Median: For the With Estimate segment, 74.8 months are taken for the median, which means that more than half the bidders are there for more than 6 years. The respective figures for With Opening Price and No Anchor are 9.5 months and 6.1 months, respectively. For the mean defection time, 107.9 months

(for With Estimate), 13.7 months (for With Opening Price), and 8.8 months (for No Anchor). The large difference between the mean and median in the With Estimate segment indicates the presence of a long-tail distribution, where a minority of highly loyal bidders are above the average, which is of particular relevance for CLV modeling.

➤ Survival Curves by Segment

The survival curve analysis (Figure 3) supports the above findings. The divergences in segments are evident from the very first month of the observation window.

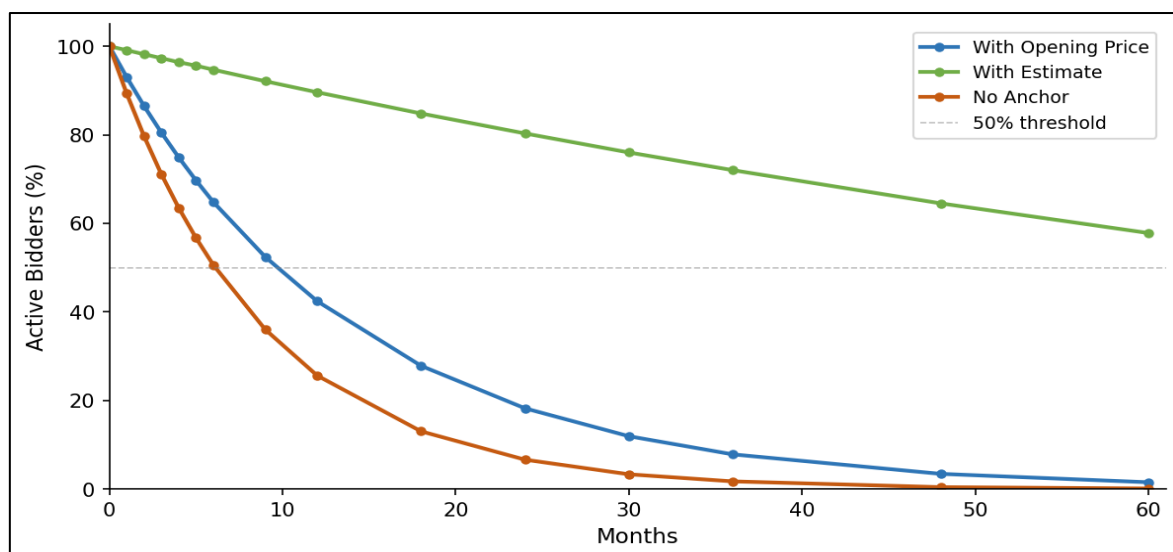


Fig 3 Survival Curves by Segment - $S(t) = \exp(-\lambda t)$, $n=211$

In 12 months, 89.6% of With Estimate bidders were still active compared to 42.4% in With Opening Price and 25.6% in No Anchor. The gap is even larger after 36 months: 72.0% vs 7.8% and 1.7% for No Anchor, respectively. These findings highlight the protective nature of price anchors on long-term bidder engagement, and the engineer's estimate is the most effective way to keep them engaged.

➤ Sensitivity Analysis

Table 3 and Figure 4 show the sensitivity of a 5% increase in the retention rate on CLV across the three segments. Strategic bidder portfolio management requires an understanding of the CLV potential that can be achieved through targeted retention improvements.

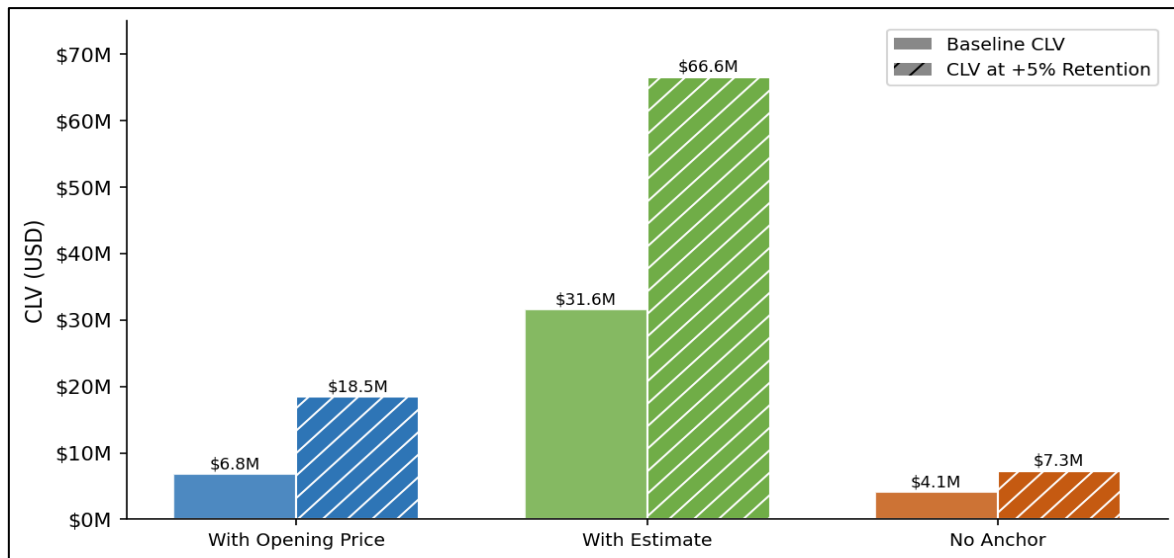


Fig 4 Sensitivity Analysis - Impact of a +5% Retention Rate Improvement on CLV by Segment

Table 3 Sensitivity Analysis - Effect of +5% Retention Rate Increase on CLV

Segment	Baseline Retention	Baseline CLV (\$)	New Retention (+5%)	New CLV (\$)	CLV Multiplier
With the Opening Price	92.69%	6,774,869	97.69%	18,483,270	2.73×
With Estimate	99.07%	31,612,906	99.99%*	66,583,255	2.11×
No Anchor	88.65%	4,064,971	93.65%	7,284,825	1.79×

* With Estimate: retention already approaching theoretical ceiling; computed at 99.99% | Formula: $CLV = ARPA \times r / (1 + d - r)$

In the Opening Price segment, the baseline retention rate is 92.69% and the CLV is \$6,774,869. The simulated increase of 5 percentage points (to 97.69%) will yield a CLV of \$18,483,270. This is the most positive reaction of all three segments and also shows anchored bidders will get the greatest marginal benefits from retention improvements and will also get the best revenue boost through targeted interventions. In the Estimate segment, there is a baseline CLV of \$31,612,906 with 99.07% retention. A simulated increase to 99.99% will result in a CLV of \$66,583,255: 2.11×. The low baseline retention of this segment indicates that for the most part the latent value is still untapped; even small improvements can bring the absolute value up. No Anchor segment: a baseline CLV of \$4,064,971 with 88.65% retention. A 5% upgrade to 93.65% and CLV is \$7,284,825 - a factor of 1.79× higher. While the multiplier is lowest for the three segments, the absolute gain is still significant, and even the least competitive segment benefits from retention-enhancing strategies. Overall, CLV is highly sensitive to retention rates, with a strong focus on anchored segments. These findings are in strong support of targeted investment in bidder retention, including personalized communication, early-stage intervention when churn risk is detected and

structured loyalty mechanisms. Embedding quality and risk management practices into such retention programs supports the early identification of non-conformities before they escalate into supplier defection (Stefanova, 2022).

IV. CONCLUSIONS

We have studied how price anchors of public procurement tenders affect bidder lifecycle management. Three main conclusions are emerging. First, price anchor in the public procurement tenders, particularly an official cost estimate, significantly extends bidder participation and thus lowers the overall discounted value. The With Estimate segment delivered a CLV 7.8 times higher than the No Anchor segment. Second, retention rates differ significantly between segments (99.07% vs 88.65%), which results in dramatic differences in accumulated financial outcomes over the period of the observation. Third, sensitivity analysis indicates a high leverage potential: a 5% improvement in retention in the With Opening Price segment multiplies CLV by 2.73×. The results in this study suggest a balanced and strategic approach to the disclosure of price information in tender design, as the type and presentation of anchor

information is one of the key policy levers for procurement authorities.

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