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**IS102**

# **Computer as an Analysis Tool**

## **G13**

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# BACKGROUND & PROBLEM

## CLIENT

Freda'D, a Singaporean perfumery start-up, since 2014 with patented technology that enhances the concentration and long-lastingness of perfumes. Only the highest grade of perfumes is produced, Eau De Parfum (30ml and 50ml), and body mists (100ml).

Freda'D has a compounded annual revenue growth rate (CAGR) of 32.6% from 2014 to 2018, valued at \$5 million by a Venture Capital with a current revenue of \$127.7K.

## COMPETITIVE PRICING

Perfume prices are currently at \$63 for 30ml and \$90 for 50ml which are too close with the cheapest Chanel Eau De Parfum at \$226 for 100ml. Such prices will deter the higher-middle tier target market from buying but also being unable to grasp the high-end consumer market.

## VALUATION

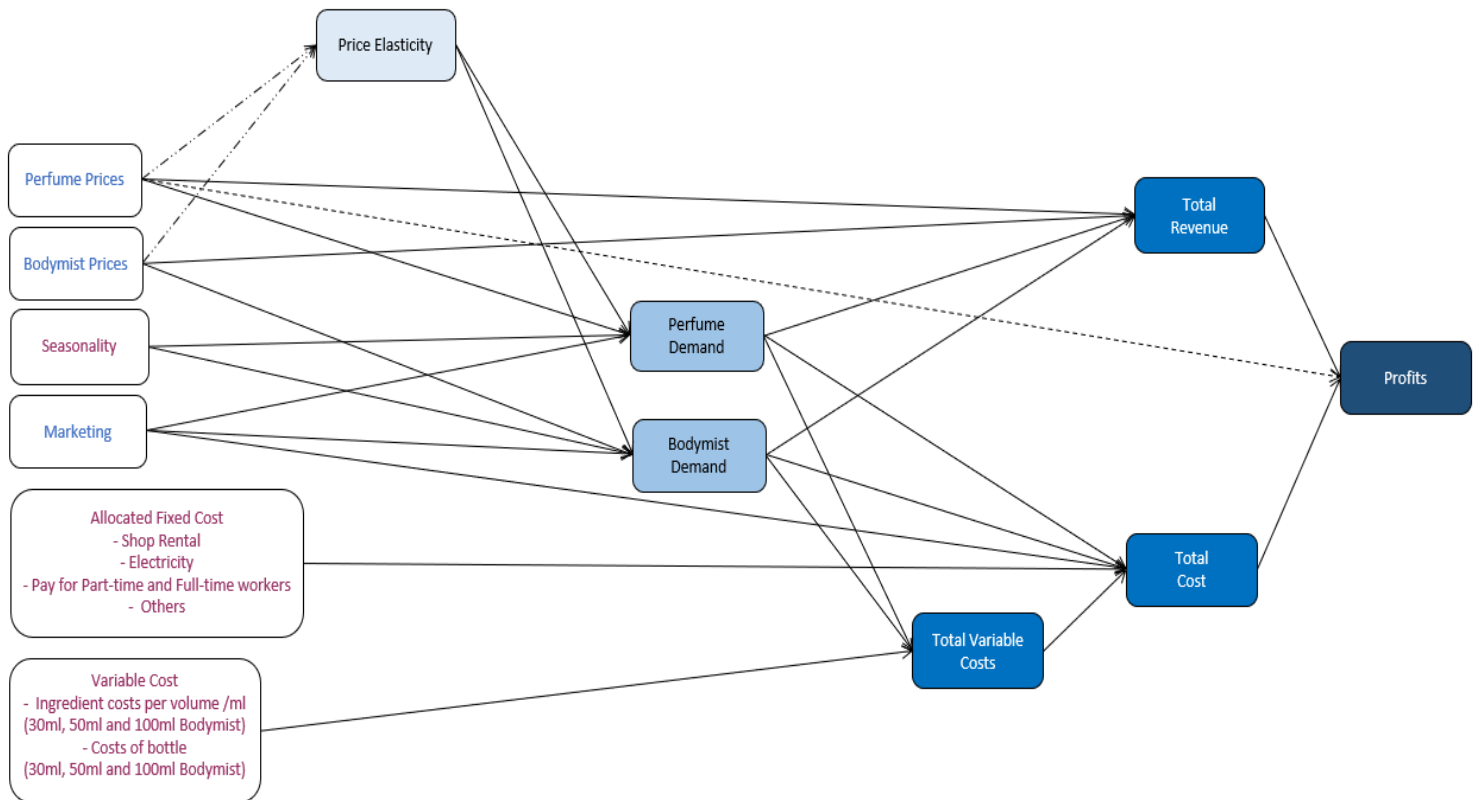
Freda'D's long-term goal of being taken over at \$100m by VCs and their stand on having full equity stake until sell-out led to them never receiving VC funding and have been self-sustaining their growth. The valuation requires a CAGR of 34.93%, or 20 times in 10 years. VCs apply the use of extrapolations for total revenue, total costs and total profits instead of the standard cash flow models. The aim is to help Freda'D be valued highly by VCs with a high revenue CAGR % along with high profit margins.

## INVENTORY MANAGEMENT

Monthly stocktake results in occasional shortage of a particular scent or an over-quantity. Their best-sellers, Sexy and Diamond, can possibly run out quite quickly while the manufacturing and shipping process takes at least 2 weeks. Realisation of the shortage may come too late. This leads to the potential loss of customers should this leads to loss of customers from the wait or an economic loss should their scents not sell out. There are also opportunity costs incurred when spaces are taken for less popular scents that cannot be sold.

# SOLUTIONS AND BENEFITS

## 1. PRICE OPTIMISATION MODEL

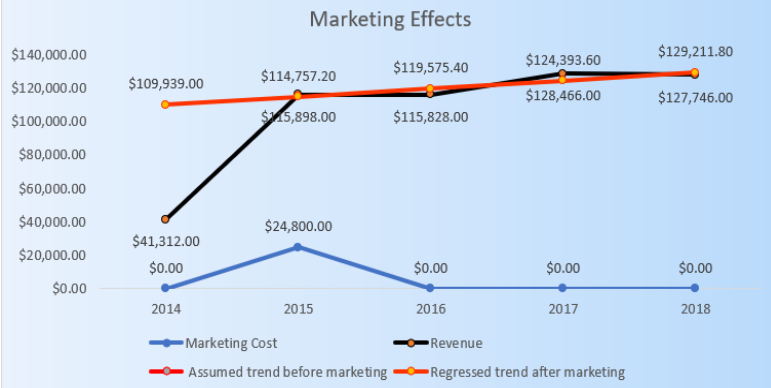


## ANALYSIS OF HISTORICAL VALUES

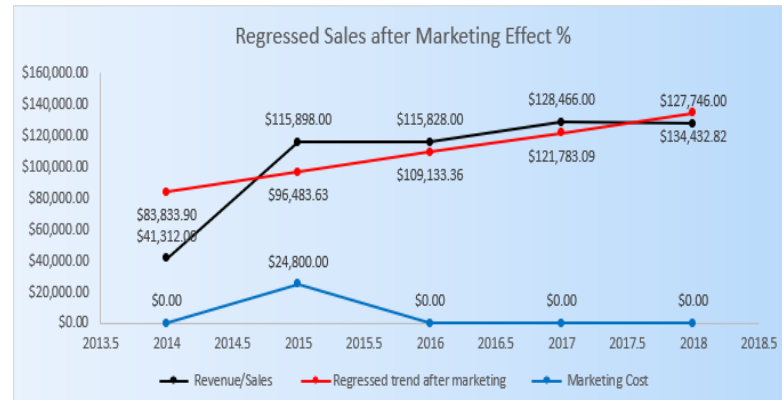
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# SOLUTIONS AND BENEFITS

## ANALYSIS OF MARKETING EFFECTS



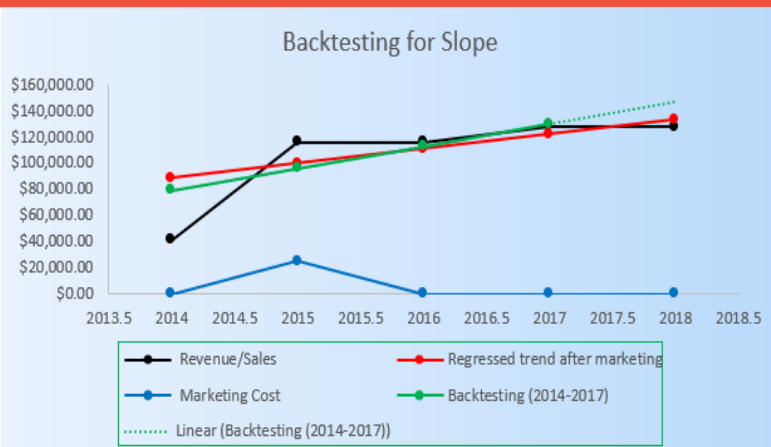
Marketing efforts of \$24,800 spiked only in Year 2015 while other years without marketing efforts. Regression Discontinuity on Revenue will be applied. By removing the first year's data (without marketing), the regressed trendline for the revenue for Year 2015 to Year 2018 will be plotted. The assumption is that marketing effects will be fully played out in Year 2015 and not linger in Year 2016. The regression line will be used to account for marketing effects by adding into Year 2014.



Next, sensitivity of the marketing effects would be done to determine the lowest marketing effect possible, considering the possibility of high growth for a start-up. The graph above indicates 65% marketing effects.

The variance of the original Revenue from Year 2015 to Year 2018 (excluding the first year) is used to calculate the 95% confidence interval (2 SD) of where the regression line can possibly lie. This gives us the lowest possible marketing effect of about 38% by goal-setting p-value to 0.05. Marketing contributed minimally 38% of the growth in Year 2014.

## BACKTESTING OF MARKETING EFFECT



Growths from Year 2014 to 2017 are used to estimate the total revenue in Year 2018. To prove that the trend for Year 2014 to Year 2017 can accurately predict Year 2018's revenue, Year 2018's revenue using the back-tested regressed trend (green) must be within 10% error of Year 2018's revenue using the original regressed trend (red).

With goal-seeking and setting the error to 10%, the lowest marketing effect would be **71.5%**.



# SOLUTIONS AND BENEFITS

## TRADE-OFF ANALYSIS AND PED

Prices changed from \$60 to \$63 for 30ml and \$100 to \$90 for 50ml in Year 2017.

Marketing effects and natural increase in demand of each product are considered. Demand for Year 2016 are rebased into Year 2017 from proportionating actual and regressed demand growth. The Price Elasticity of Demand for both 30ml and 50ml would be calculated based on the formula:

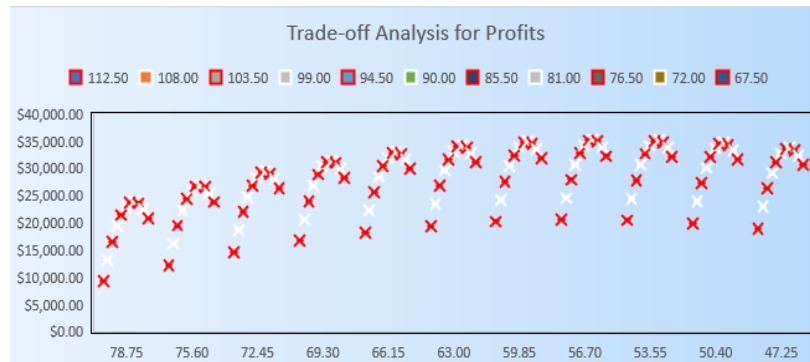
$$PED = \% \text{ change in demand} / \% \text{ change in price}$$

At 71.5% marketing effect level, PED values are -1.782 for 30ml and -1.690 for 50ml. This means that 30ml perfumes are relatively more price elastic than the 50ml perfumes. This effect assumes Income Elasticity of Demand to be the same for both – proportion of price on income would not affect a customer's decision.

Both perfumes and their prices will be changed in tandem (both up, or down, 10% at the same time) for Year 2018. The results show that decreasing prices improves their profits which is in line with what we expect from the PED values.

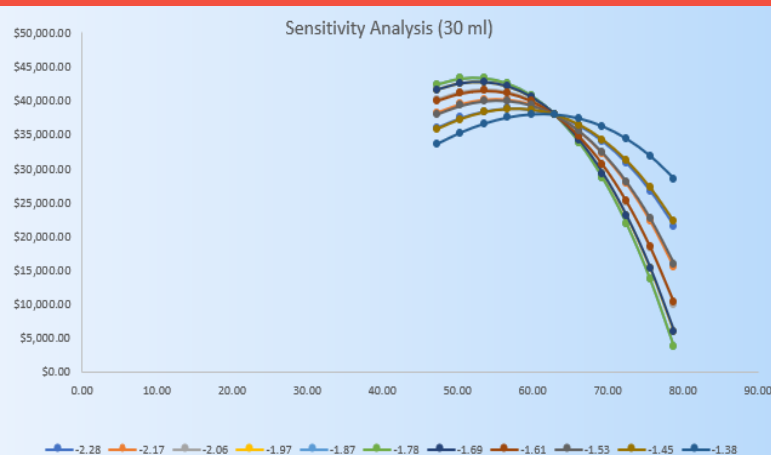


The highest profit can be roughly estimated at about 90% below their current prices



With the known PEDs, demands and current prices, trade-off analysis will seek the best mix of prices that maximises profits. From the graph, profit maximisation occurs by lowering prices. By using Solver to maximise the Total Profit by changing the Prices of the 30ml and 50ml perfumes at 71.5% marketing effect level, the most optimal price would be \$56 and \$82 respectively, rounded off to the nearest dollar for the cognitive appeal to consumers.

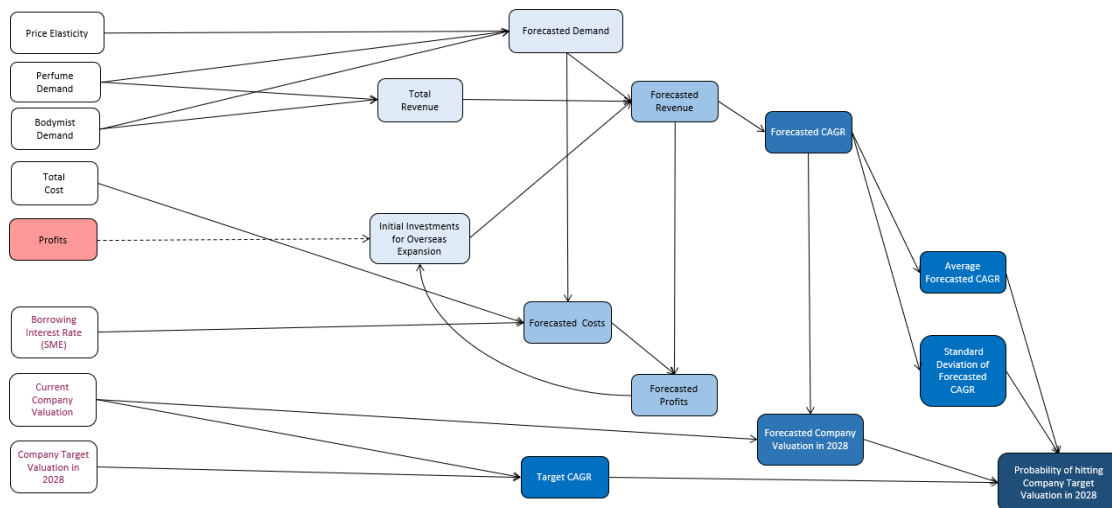
## SENSITIVITY ANALYSIS FOR PED



The PED calculated may vary across time, space and measurement methods. An example taken from 30ml perfume shows that by placing prices at \$52, maximum profit is achieved with little variance (risk) at the current PED.

# SOLUTIONS AND BENEFITS

## 2. VALUATION



## GROWTH PROJECTION

	Eau De Parfum (30ml) Price	Eau De Parfum (50ml) Price
PED	-1.783625731	-1.689661177
Price (2014-2016)	\$60.00	\$100.00
Price (2017-2018)	\$63.00	\$90.00
Price (2019+)	\$56.00	\$82.00

Actual Demand	Price (2019+)	\$56.00		\$82.00	
Yearly Demand	2014	2015	2016	2017	2018
Eau De Parfum (30ml)	283	769	758	760	762
Eau De Parfum (50ml)	212	647	652	839	827
Body Mist (100ml)	174	281	286	282	295

Previous Demand after PED Balancing					
Yearly Demand	2014	2015	2016	2017	2018
Eau De Parfum (30ml)	317	860	848	911	913
Eau De Parfum (50ml)	276	844	850	965	951
Body Mist (100ml)	174	281	286	282	295

By utilising the prices of \$56 and \$82 respectively for 30ml and 50ml, as well as the \$18 body mist, the company's growth will be projected. The \$18 body mist's demand growth will be extrapolated without rebasing and considerations as it is not the main-seller at Freda'D.

Actual demand will be taken into account for Year 2014 to Year 2018 while rebasing demands with the PED to Year 2019's price.

Total revenue, costs and profits will be generated from the growth in numbers projected.

## CAGR CALCULATION (SG)

Forecasted Demands					
Yearly Demand	2019	2020	2021	2022	2023
Eau De Parfum (30ml)	1143	1267	1391	1516	1640
Eau De Parfum (50ml)	1219	1366	1513	1660	1807
Body Mist (100ml)	337	361	385	409	434

The standard deviation of yearly quantity sales is taken across the 3 product types. The randomisation of the quantity sales with their means taken from 'Growth Projection' are assumed to be normally distributed. The Total Revenue, Total Costs and Total Profits are tabulated for all 10 years.

CAGR of the company will be calculated with revenue growth as proxy. The target of \$100m by end 2028 translates to a CAGR of 34.93%. With the current prices, profit maximisation assumption and zero marketing efforts, it is a 0% chance that the company will be able to attain a valuation of \$100m by end 2028 if it was only to be in Singapore.

# SOLUTIONS AND BENEFITS

## EXPANSION MODEL

The owners have considered expanding their business into Vietnam, Philippines, India, Indonesia, US, UK and EU. Past profits, after withdrawal, will be fully invested into the expansionary plans, and the cycle will repeat every 5 years. Borrowing to finance the total costs occurs at the beginning of the year, followed by the repayment of the debt through the total revenue at the end of the year at 7% interest rate. GST of 7% has also been included into the calculations.

Also, other assumptions include the same proportion of revenue and costs as compared to Singapore. Total fixed costs proportions are also assumed to be the same throughout time, and in other countries, but should likely not deviate as much.

### OPTIMISED PRICES

Average CAGR Company Revenue %	
36.18%	

Current Valuation (2018)	\$5,000,000
Target by 2028	\$100,000,000
Target CAGR	34.93%

Standard Deviation of CAGRs	
0.006569946	

Probability of hitting target	
97.14%	

### PREVIOUS PRICES

Average CAGR Company Revenue %	
35.76%	

Current Valuation (2018)	\$5,000,000
Target by 2028	\$100,000,000
Target CAGR	34.93%

Standard Deviation of CAGRs	
0.006657072	

Probability of hitting target	
89.39%	

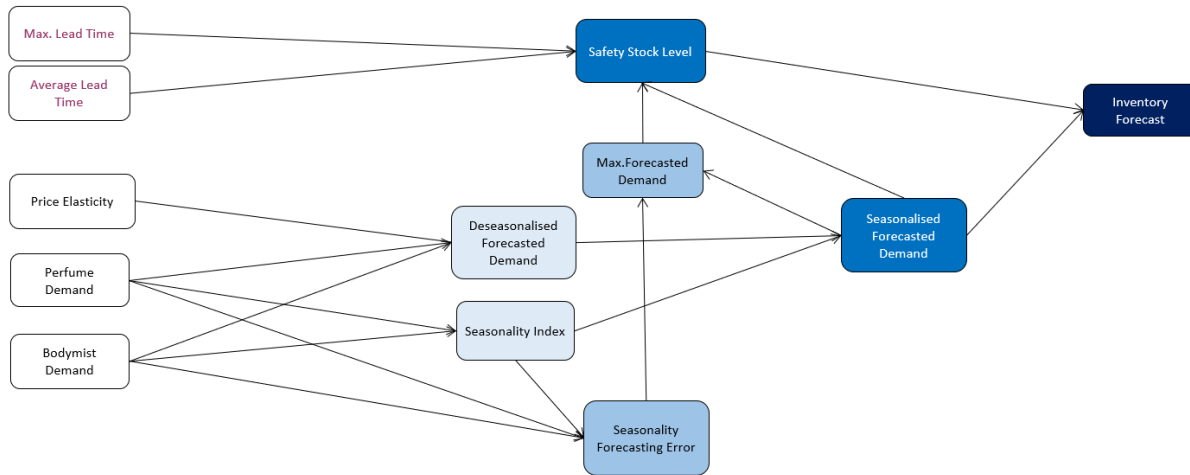
A CAGR of 36.2% is achieved, allowing for an estimated 97.1% chance to attain the target valuation of \$100m by the end of 2028 as compared to 89.4% maintaining the same prices. If more profits are withdrawn, a higher interest rate charged or an increase in GST, the probability of hitting target from previous prices will fall at a faster rate.

Modelling realistically, 20% of the total profits are taken out yearly instead of having the full investment for expansion. Revenue forecasting should be recalculated for the outlets expanded into other countries considering the different economic environment, demographics and competitors in other countries.

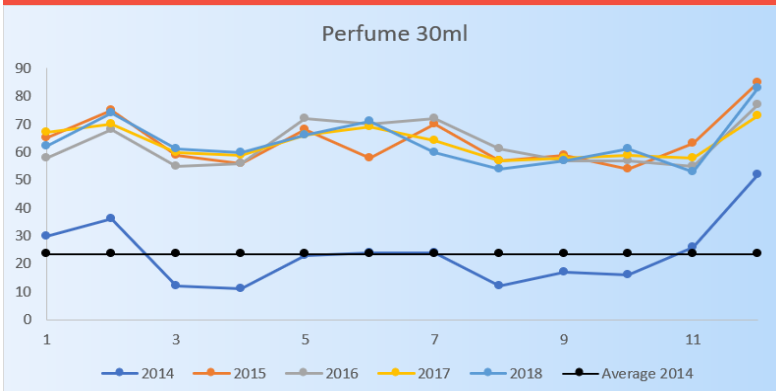
Nevertheless, there is still a significant probability that the valuation of \$100m can be attained should there be downsides that have not been picked up.

# SOLUTIONS AND BENEFITS

## 3. INVENTORY MANAGEMENT AND FORECASTING



### SEASONALITY FACTOR



Products are divided into 3 categories: 30ml perfume bottles, 50ml perfume bottles and 100ml body mist bottles. As the perfume industry experience seasonality during festive seasons such as Chinese New Year, Valentine's Day, Mother's Day, Hari Raya Puasa, Great Singapore Sale and Christmas, de-seasonalising the historical sales work through the formula:

$$\text{Seasonality Factor} = (\text{Month's Sales}) / (\text{Average Monthly Sales})$$

### SEASONALITY FORECAST

Forecasted Demands			
Yearly Demand	2019	2020	2021
Eau De Parfum (30ml)	948	1031	1115
Eau De Parfum (50ml)	1000	1228	1390
Body Mist (100ml)	337	361	385

Month	Seasonality Index	Deseasonalised Forecast	Seasonalised Forecast
1/Jan/19	101.55%	95	97
1/Feb/19	108.70%	95	104
1/Mar/19	91.46%	95	87
1/Apr/19	91.46%	95	87
1/May/19	108.37%	95	103
1/Jun/19	101.58%	95	97
1/Jul/19	111.79%	95	106
1/Aug/19	91.46%	95	87
1/Sep/19	91.46%	95	87
1/Oct/19	91.46%	95	87
1/Nov/19	91.46%	95	87
1/Dec/19	128.86%	95	123

Next, projected demand for each product from the Growth Projection tab are divided by 12 months for de-seasonalised sales. The forecasted seasonalised sales will be attained by multiplying de-seasonalised sales figures with the seasonality index.

Lastly, Quantity of total products to be ordered at the start of each month is calculated by: *Forecasted demand + Safety stock*; wherein safety stock is the number of additional products stored to mitigate risks of stockout.

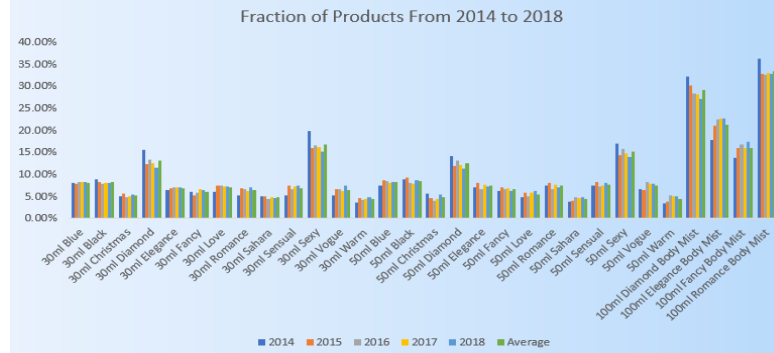


# SOLUTIONS AND BENEFITS

## SEASONALITY BACKTEST

Back-testing for seasonality factor and seasonality forecasting has been done to examine the accuracy of the model. By taking the averaged seasonality factor from Year 2014-2017, Year 2018's seasonal demand will be tested with the actual sales. The maximum error that can be accepted will be within 90% confidence interval (2SD) which translates to 10% error on average.

## FRACTION SALES



Estimation of order quantity for individual scents is done by taking the total forecasted demand for the product type and multiplying with average historical sales fraction of the product. We can then better gauge the products that need more stock or a reduction in stock. The numbers here are arbitrary. Records of the next few months' sales of perfume are needed to determine the fraction of sales of each product.

## LIMITATIONS AND COUNTERMEASURES

1) True level of marketing effects are unknown, affecting the calculation of PED and thus every part of the model. However, we can control for PED (30ml) being more price elastic than PED (50ml) because the Price per ml of 50ml < 30ml. Conditional formatting is applied to signal this. A very tight range of 71.5% to 72.5% marketing effects is expected and thus highly accurate.

2) Income Elasticity and Cross Elasticity of Demand are not considered in this model which will likely affect calculations to some extent. However, the affluence of the target consumer base would treat perfumes of these prices as an extremely small percentage of their incomes, thus ignoring Income Elasticity. Also, with similar PEDs, prices of both products move down closely in tandem, translating to Cross Elasticity effects being cancelled out, and thus insignificant.

3) Body Mist 100ml products are not considered into the effects from Cross though negligible. Change of prices can be considered to best examine the optimal price for body mists.

4) Assumptions for Growth Projection and Expansion will likely not hold in reality. More research on entry into a new country is needed to best proportionate the revenue, costs and profits. However, because of the high probability of achieving the \$100m valuation, there is a significant buffer should there be more downsides than upsides.

5) Discounts are not considered into pricing decisions. By having discounts, Freda'D may be able to tap upon a larger consumer base and revenue. However, discounts will dilute the prestige of the brand.

6) The use of marketing can be increased should the returns be higher than the costs. More analysis could be done if there were more rounds of marketing.

# APPENDIX

## FREDA'D



# APPENDIX

## FREDA'D FEEDBACK

Fwd: Re: Collaboration with Freda-D



sales@freda-d.com

Wed 13/03, 19:50

Lynn KOH Rui Xia



Reply all | v

Dear Lynn,

We would like to express our sincere thanks to you and your team for the hard work placed into helping our business. We are truly impressed and amazed at what SMU students such as yourselves can accomplish.

As mentioned earlier in the day, it is our delight to write the feedback that your team has requested for your assignment report.

Overall, the analysis that has been presented to us was of great value and the steps to arrive at the best prices to attract more customers, expectations of sales and growth, as well as the inventory management model were quite realistic.

For the prices that your team has derived, we would take that into firm consideration and you have done a wonderful job in competitor research with companies such as Chanel, Dior and Gucci. This is also why we decided to change our prices back at the start of 2017 but had no idea how much exactly to place.

For the inventory management model, it is great to have coloured labels on our stock to tell us if it's running low and make our pre-orders to manufacture from our factory back in China. We have been facing this issue for some time and apologies for today especially when Elijah wanted to buy our perfumes, but we ran out of stock. Once we are able to connect our cashier to your excel sheet, we're good to go!

Back when Hairul was doing our valuation, we thought our company was that profitable as we saw huge growth rates and forecasted it to even higher numbers. I guess we were overly optimistic of our growth and thanks for pointing that out during our first meeting. We realised that without the funding from financial institutions, it was impossible to achieve a \$1 billion market capitalization in 10 years' time. We will still maintain our stand on not having funding until we have achieved our new found goal of \$100 million so as to maintain our undiluted shares in the company.

Thank you, team, for also being supportive of our business and even sharing with us the business strategies out of your own initiative to help us increase the likelihood of achieving the \$100 million goal by end 2028. Special thanks to Elijah for the game theory shared for relocating our business into Waterway Point as the sole producer there, or into the heart of Orchard where we will be pitting against other top brands to improve our branding and to tap on the strong demand there. This also extended into brand consulting – and yes, thanks to your suggestion, we'll soon remove "Singapore" from our brand so as to give people a better impression of our brand. Expansion plans will also be underway too!

Should you want to buy more of our perfumes, please feel free to pop by and we'll definitely provide you with some discounts!

All the best with your assignment and wishing you the best grades for all your help provided!

Yours sincerely,

Faridah  
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