

K.J. SOMAIYA INSTITUTE OF MANAGEMENT STUDIES & RESEARCH
 Course : PGDM (Financial Services) Batch : 2018 - 20
Subject : Quantitative Models in Finance
 Trim : IV TRIM END TERM EXAM

Date of Exam : 18th Sept, 2019 Duration : 3 Hours Marks : 50

Instructions : 1. Answer any complete five questions (All the sections)

2. Calculator is allowed.

1.a. A firm sells a product for Rs.500 per one thousand units. The cost of making x thousand units is given by $C = 6 + 2x + .01x^2$. Calculate the no. of thousand units that would give maximum profit. **(5 Marks)**

1.b. The revenue function for a product is $R = 600q - 0.5q^2$ and the cost function is $C = 1500 + 140q - 4q^2 + .5q^3$. Determine the profit function and the value of q for which profits are maximum. Is this also the value of q for which the revenue is maximum? **(5 Marks)**

2. a. A leading CA is attempting to determine a 'best' investment portfolio and is considering six alternative investment proposals. The following table indicates point estimates for the price per share, the annual growth rate in the price per share, the annual dividend per share and a measure of the risk associated with each investment.

Portfolio Data

Shares under consideration						
	A	B	C	D	E	F
Current price per share (Rs.)	80	100	160	120	150	200
Projected annual growth rate	0.08	0.07	0.10	0.12	0.09	0.15
Projected annual dividend per share (Rs.)	4.00	4.50	7.50	5.50	5.75	0.00
Projected risk in return	0.05	0.03	0.10	0.20	0.06	0,08

The total amount available for investment is Rs.25 lakh and the following conditions

Statistical significance
The *F*-ratio in the ANOVA table (see below) tests whether the overall regression model is a good fit for the data. The table shows that the independent variables statistically significantly predict the dependent variable, $F(4, 95) = 32.303, p < .00005$ (i.e., the regression model is a good fit of the data).

Model	Sum of Squares	df	Mean Square	F	Sig.
1	3100.492	4	775.123	32.303	.000
Total	222.241	99			
Error	191.749	95			

Estimated model coefficients
The general form of the equation to predict \hat{Y} (COMPS) from X_1 (age), X_2 (gender), X_3 (heart_rate), X_4 (gender) is:
predicted \hat{Y} (COMPS) = 87.83 + (0.165 × X_1) + (-0.385 × X_2) + (-0.118 × X_3) + (13.208 × X_4)

are required to be satisfied :

a.
The
maximum
rupee

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
Constant	87.830	6.385		13.756	.000	75.155	100.506
Shanghai Comp	-.165	.063	-.176	-2.633	.010	-.290	-.041
Oil Price	-.385	.043	-.677	-8.877	.000	-.471	-.299
DOW Jones	-.118	.032	-.252	-3.667	.000	-.182	-.054
KOSPI	13.208	1.344	.748	9.824	.000	10.539	15.877

rupee amount to be invested in alternative F is Rs.2,50,000.

- No more than Rs.5,00,000 should be invested in alternatives A and B combined.
- Total weighted risk should not be greater than 0.10.
- At least 100 shares of each stock should be purchased.
- At least 10 percent of the total investment should be in alternatives A and B combined.
- Dividends for the year should be at least Rs.10,000.

Rupee return per share of stock is defined as the price per share one year hence less the current price per share + dividend per share. The objective is to maximize the total rupee return. Formulate the linear programming model for determining the optimal no.of shares to be purchased in each of the shares under consideration. You should consider time horizon of investment as one year. The formulated LP problem is not to be solved. **(5 Marks)**

2.b. State the assumptions of linear programming problems(LPP). Explain in detail. **(5 Marks)**

- Analyst wants to predict the opening value of NSE index – NIFTY .
He uses the opening value of Shanghai Composite index of the same day.
Closing price of Brent Oil the previous night.
Closing value of DOW Jones the previous night.
Opening value of KOSPI index of the same day.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.760 ^a	.577	.559	5.69097

Based on above information answer the following questions

- List the independent and dependent variables
- Frame the necessary prediction equation?
- Which of the indices has the highest influence on Indian stock markets and why?
- What is the total no. of pairs of readings considered?

(10 Marks)

4. Cost accountants often estimate overhead based on the level of production. At the Standard Kitting Company, they have collected information on overhead expenses and units produced at different plants and want to estimate a regression equation to predict future overhead.

Overhead	191	170	272	155	280	173	234	116	153
	178								
Units	40	42	53	35	56	39	48	30	37
	40								

- Develop the regression equation for the cost accountants.
- Predict overhead when 50 units are produced.
- Test the significance of the regression equation at 5% level of significance. Use $F_{tab} = 5.32$ (i.e using ANOVA table)

(10 marks)

5.a. The data of table below is the annual sales(rounded off to Rs.crores) from 2001-2018 of a medium-sized company.

Year	Annual Sales
2001	13
2002	14
2003	15
2004	14
2005	13
2006	14
2007	15
2008	16
2009	15
2010	14
2011	15
2012	16
2013	17
2014	16
2015	15

2016	16
2017	17
2018	18

Calculate the three year and five year moving average values to predict the sales of 2019. Also, confirm which of the two averages (three year or five year average) is more suitable using MAD(Mean Absolute Deviation).

(5 Marks)

5.b. M.C.Company is evaluating an investment proposal that has uncertainty associated with the three important aspects : the original cost, the useful life and the annual net cash flows . The three probability distributions for these 3 variables are as shown below :

Original Cost		Useful Life		Annual Cash Flows	
Value	Probability	Period	Probability	Value	Probability
Rs.60,000	0.3	5 years	0.4	Rs.10,000	0.1
Rs.70,000	0.6	6 years	0.4	Rs.15,000	0.3
Rs.90,000	0.1	7 years	0.2	Rs.20,000	0.4
				Rs.25,000	0.2

The firm wants to perform five five simulation runs of this project's life. The firm's cost of capital is 15 percent and the risk-free rate is 6 percent. For simplicity, it is assumed that these two values are known for certain and will remain constant over the life of the project.

To stimulate the probability distributions of the original cost, the useful life and the annual net cash flows, use the following sets of random numbers for :

original cost 09,84,41,92,65;

useful life 24,38,73,07,04;

annual cash flows 07,48,57,64,72, respectively.

Determine the NPV and the payback period for each of the five simulation runs.

(5 Marks)

6.a. On 1st April 2014, Mr. Ram Kumar had invested Rs.20,000 in mutual funds of Company A , Rs.50,000 in mutual funds of Company B and Rs. 30,000 in mutual funds of Company C. The transitional probability of switching from one mutual fund to another is given in the following matrix:

$$P = [0.90 \ 0.03 \ 0.07$$

0.10 0.70 0.20
0.10 0.10 0.80]

What is the amount of funds invested in the end of one year and two years in funds A, B & C. Make necessary assumptions? **(5 Marks)**

6.b. Construct a '4' step stock price Binomial Lattice. The initial price is Rs.100 and the change ratio is 1.1(i.e. while the stock goes up the value becomes 1.1 times and when it comes down its value becomes 0.90909 times).

You have an option of using any other method of arriving at the different prices the stock can take after 4 days along with their probabilities. **(5 Marks)**
